Pragmatic Language across the Lifespan: Evaluating Nonverbal Language and Social Competence Skills Overtime in Individuals with High Functioning Autism and Pragmatic Language Impairment

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ABSTRACT

Pragmatic language deficits are becoming more apparent and can be seen early on in life in individuals who present with Autism Spectrum Disorder (ASD), Asperger Syndrome (AS), and Social Communication Disorder (SCD) or Pragmatic Language Impairment (PLI). As our awareness and understanding of social communication disorders advance, so does our assessment and treatment of social language impairments. The current study aims to explore how paralinguistic cues (i.e., facial expressions, intonation/prosody), affective expression, and social context skills develop across the lifetime in students who are typically developing and students with ASD, AS, and PLI. The Clinical Assessment of Pragmatics (CAPs) was given to all students to assess current pragmatic language function. Four subtests from the CAPs were comparatively analyzed in individuals between the ages of 7:0 to 15:11 who present as: typically developing, present with PLI, and present with high functioning autism (HFA). The four key constructs analyzed for the purpose of this study include: affective expression, paralinguistic decoding, paralinguistic signals, and social context appraisal. Results of the current study revealed significant differences in both the typically developing group and PLI group across all ages in nonverbal language (paralinguistic decoding and paralinguistic signals) and social competence (affective expressive and social context appraisal) tasks. Additionally, the current study revealed that students with PLI disorder acquire social language skills in a similar pattern to typically developing students, however, at a delayed rate. Students with HFA did not appear to follow the same pattern of social language acquisition as typically developing students. Students with PLI and HFA may differ in their understanding and acquisition of nonverbal and social competence skills.

Keywords: Pragmatic language; Assessment; High-functioning autism; Social language; Affective expression; Paralinguistic cues; Facial expressions; Prosody; Social context

INTRODUCTION

Pragmatic Language Development

Anxiety From the day a baby is born; he/she is developing social and emotional skills through their environment and their relationships with others [1]. Early on in development, infants rely heavily on others and try to connect with their environment through eye gaze, crying, and facial expressions [2]. Early attempts at language can also be observed through a combination of gestures and vocalizations. As children become more mobile and motivated, their skills and capabilities grow with new experiences in their environment and increased interaction with others. In order for a child to be a proficient communicator, he/she must have an interest in socializing and communicating with others [1]. Additionally, children must demonstrate joint attention in order to show communicative competence [3]. Research has shown that children with Autism Spectrum Disorder (ASD) demonstrate an absence or lack of joint attention that begins in infancy and thus, may have difficulty understanding and using gestures and attending to a communicative partner or shared object [4]. Moreover, it has been documented that 30% of individuals with ASD develop very little verbal communication, which further emphasizes the need for nonverbal social language skills [5]. Furthermore, students with ASD may have difficulty with the interpretation and use of: paralinguistic cues (e.g., facial expressions, body language, and prosody), affective expression, and social context. Since most of these skills progress over the course of development, it is crucial that skills are assessed and treated early on in development to increase future social language development [6].

Paralinguistic Cues

Paralinguistic cues refer to non-verbal signals that are interpreted and used during social situations. Social interactions are full of verbal language as well as important nonverbal language such as facial expressions and body language that can provide a wealth of information as to how a person is feeling [7]. Thus, social interactions rely heavily on the understanding and use of verbal language as well as the understanding and use of nonverbal language. When associating a specific emotion to a facial expression, there are various details that can be used to gain information. For example, the actual facial movement is interpreted as well as the context (e.g., Situation), body language (e.g., Posture), and if the facial expression is accompanied by words, the message and intonation (i.e., Prosody) of the message can also be interpreted. Widen suggests that typically developing children understand facial expressions in broad categories and slowly begin to associate these expressions with more specific categories (i.e., anger, sadness) over the course of development. Widen and Russell collected data in various studies of typically developing children between the ages of 2 and 9 to determine how children label facial expressions [8-21]. Children first divide facial expressions into simple categories and then eventually begin to divide into more discrete categories. For instance, at 42 months of age, children will associate sad cry, angry scowl, and disgusted nose scrunch as "angry," at 48 months children begin to differentiate this broad negative category angry scowl and disgust nose scrunch are classified under "angry" sad cry and the scared gasp are classified under "sadness". Further, at 64 months, children begin to discern the angry scowl and disgusted nose scrunch as "angry," the sad cry as "sadness" and the scared gasp as "fear" and at 80 months, children are able to differentiate even further into the categories angry scowl as "anger," disgusted nose scrunch as "disgust" sad cry as "sadness" and scared gasp as "fear". As children recognize these feelings more distinctly, they're definition becomes closer to the adult definition. Children with ASD have difficulty with social communication, specifically in the areas of facial expressions or micro-expressions [22]. Evers, Steyaert, Noens and Wagemans explored emotion labelling in children with ASD and typically developing children aged 6 to 14 years old [23]. As expected, children with ASD displayed poorer emotion recognition than typically developing students. Kuusikko evaluated facial expression recognition (i.e., Specifically the eye region) and explored whether recognition skills improve with age [24]. The study consisted of participants between the ages of 9 and 25 with a diagnosis of ASD, AS and typically developing participants as a control group. Kuusikko found that ASD participants performed significantly lower on emotional recognition compared to typically developing participants [24]. In particular, the researchers found that girls with ASD had a more difficult time interpreting expressions of happiness and anger when compared to typically developing peers. Additionally, children with ASD often perceived ambiguous stimuli as negative and misinterpreted anger. Emotion recognition based on the eye region appeared to improve significantly in individuals with ASD suggesting that emotional recognition skills improve over a longer period of time than in typically developing individuals. Previous studies have also shown improvement of facial emotion recognition with practice with adults with ASD [25,26]. The current study will address how students with ASD, AS, PLI, and typically developing students interpret and use facial expressions at different ages across the child to adult lifespan.

Affective Expression

Affective expression refers to the ability to understand and the ability to respond to emotion during conversation. It is crucial that individuals are able to identify and respond to other individual's emotional states in order to live and to thrive in social groups. The ability to recognize affective expressions and other emotions in oneself and in others is described as emotion recognition [27]. Individuals with ASD have difficulties understanding the emotional component of human actions [28]. Additionally, individuals with ASD may have difficulty understanding and using affective expressions such as gestures, eye contact, and other nonverbal language [29]. Loveland and Tunali-Kotoski suggest that children with HFA and AS demonstrate less affective expressions and are believed to be indifferent to other people's feelings [30]. Further, when comparing younger children with HFA/AS to adolescents with HFA/AS, younger children are found to have increased difficulty recognizing basic facial expressions, affect, and complex emotions [24]. The current study will address how students with ASD, AS, PLI, and typically develop students interpret and use affective expression at different ages across the child to adult lifespan.

Social Context Appraisal

Social context appraisal refers to an individual's ability to interpret and process the various components of a social situation (e.g. Physical setting/environment, Communication partners, Communicative intent, etc). An individual must possess higher-level thinking and socio-emotional skills that help them understand another person's point of view and engage in perspective taking in order to be successful in social context appraisal. For example individuals must demonstrate theory of mind. Theory of mind is the ability to attribute mental states – desires, intentions, knowledge, emotions, and beliefs – to oneself and to others, and to understand that other people's mental or inner states may be different from their own [31,32]. Theory of mind is critical for social interactions beginning in early childhood and expanding until adulthood [33]. Theory of mind and emotional skills have also been linked to the development of perspective taking [34,35].

Perspective taking refers to when an individual is able to recognize that the emotional state of another individual differs from his/her own emotional state, and infer that person's own thoughts, beliefs, feelings, and/or emotions [36]. The ability to reflect on the emotional states of other people is crucial to social interactions across the lifespan [37]. Research conducted by Wellman, Phillips, and Rodriguez found that children at two and a half years of age were able to identify whether another child has received a desirable or undesirable object based solely on the emotional state of that child [38]. Additionally, children aged two to three years old were found to be able to discern emotional responses in a given situation, even when it differed from what they expected [39]. Moreover, Harwood and Farrar, found that children between the ages of three and five years of age were able to understand and think about conflicting mental states, which is critical to affective perspective taking [35]. Furthermore, Meerum Terwogt and Stegge suggest that children who demonstrate both theory of mind and emotional intelligence will combine different aspects of emotional knowledge of a social situation to further their understanding of a person's point of view (i.e., perspective taking) [40]. An individual's social context skills may also include understanding parts of nonliteral language such as: sarcasm, idioms, and humor.

When an individual can receptively understand a person's intent in a message, the individual can appropriately respond to that message. In order for an individual to successfully navigate social contexts, they must be able to interpret social settings, routines, changes, and/or disruptions. In order for an individual to be able to interpret non-literal or "figurative" language and also to infer the intentions of the speaker, the individual must have an advanced understanding and use of perspective taking [41].

Glenwright and Pexman explored the development of ironic remarks (sarcasm) directed at targets and ironic remarks directed at specific targets [42]. The study revealed that children between the age of five and six years were at the stage where they started to distinguish non-literal meanings of sarcastic speakers and ironic speakers, however, where not able to decipher the intentions of the speakers. Children between 9 and 10 years old were more likely to distinguish intentions, and able to rate sarcastic criticisms as "more mean" than ironic criticisms. Glenwright and Pexam's study revealed that children are able to interpret non-literal meanings as early as 5 to 6 years-old, however, they are unable to distinguish intentions until later on [42]. Children with ASD have deficits in perspective taking abilities, which makes it more difficult for them to understand irony [43,44]. Kaland et al. looked at adolescents with AS and their ability to infer physical and mental states from short stories that included sarcasm and figurative language [45]. When compared to typically developing children, children with AS had difficulty inferring mental states. Rajendran, Mitchell, and Rickards highlight the importance of non-literal language in everyday social situations [46]. For example, if Charlotte is shooting a basketball and misses, and Matt says, "Wow, can you show me how that does?" it is important Charlotte understands Matt is teasing her and being sarcastic.

Laughter, an expression of humor, emerges between two to six months of age and is considered to be the first social vocalizations used by infants [47,48]. Humor and laughter can provide important information as to an individual's ability to engage and communicate with others [49]. Humor involves joint attention and the sharing of affect. Previous research has demonstrated that individuals with ASD are found to engage in less pretend play and demonstrate a lack of joint attention [4,50]. Hudenko, Stone, and Bachorowski examined vocal expressions of laughter in children with ASD [51]. When compared to typically developing peers, children with ASD only engaged in one type of laughter whereas typically developing peers produced two types of laughter. Hudenko, Stone, and Bachorowski concluded that children with ASD laugh in response to internal positive states, whereas typically developing children also use laughter to negotiate social scenarios [51]. Gagi, Japunda-Milisavljevi, and uri-Zdravkovi suggested that when prompting students with ASD, students may engage in and enhance their humorous activity [52]. The purpose of the current study is to explore how paralinguistic cues (i.e., facial expressions, intonation/prosody), affective expression, and social context skills develop across the lifetime in students who are typically developing and students with ASD, AS, or pragmatic language disorder (PLI).

MATERIALS

Measures

The Clinical Assessment of Pragmatics (CAPs): Students who present as typically developing, present with HFA, and present with PLI were comparatively analyzed by age using the Clinical Assessment of Pragmatics (CAPs) tool [53]. The CAPs is a pragmatic video-based language assessment that is made up of six subtests. The six pragmatic language constructs include: affective expression, paralinguistic decoding, paralinguistic signals, social context appraisal, instrumental performance and instrumental performance appraisal. For the purpose of this study, four of these constructs were analyzed. Figure 1 contains a more detailed description of each subtest. The CAPs uses sixty short videos, ten per construct. A sample of a video based scenario can be found in Figure 2. The current study aimed to examine how paralinguistic decoding, paralinguistic signals, affective expression, and social context is interpreted and used across the lifespan in students who present as: typically developing, present with pragmatic language impairment, and present with high functioning autism.

Paralinguistic decoding refers to an individual's ability to understand and comprehend nonverbal language. Nonverbal language is used alongside verbal language every day during social interactions, and sometimes it can be described as just as important as verbal language, if not, more important. Typically, we can interpret what a person may be thinking and/or feeling by observing their body language or responses in a given situation. Additionally, a person's nonverbal language may not always agree with their verbal language (e.g., a person may be saying one thing, but their body language is saying something else). In order to build strong relationships and better understand our peers, friends, teachers, and family we must be able to comprehend nonverbal language. A known area of difficulty for children with autism is the interpretation and use of facial expressions [22,54]. Moreover, students with PLI have also been observed to miss or ignore important non-verbal cues during conversation with peers [55,56].

Paralinguistic Signals refers to the utilization of nonverbal language such as gestures, facial expressions, body language (e.g., crossed arms, posture), eye contact, and use of intonation/prosody. Just as interpreting paralinguistic cues is important to successful communication, so is using paralinguistic signals. These signals give our conversational partners vital information as to what we are feeling and thinking, and thus, direct the course of conversation. Geurts and Embrechts express that students with PLI often use inappropriate or "exaggerated" intonation and prosody [57]. Additionally, Bishop and Leonard found that children with PLI exhibit less nonverbal responses (e.g., head nodding) than typically developing children [58]. The Diagnostic and Statistical Manual of Mental Health Disorders – Fifth Edition (DSM-V) uses the following criteria in the diagnosis of Autism, "abnormalities in eye contact, body language, and use of gestures to a total lack of facial expressions and non-verbal communication" [59].

Affective expression refers to an individual's ability to use emotion in communicative situations. Affective expressions may include the use of compliments, humor, sorrow, empathy, or expressions of gratitude. Because affective expression goes beyond our basic wants and needs, it is considered higher order language. Beukeboom suggests that affective expression changes the direction and course of a conversation [60]. For example, if one speaker is not receiving the affective expressions they expect or desire, that speak may in turn change the path of conversation from what they were originally trying to express. Affective expression allows for adaptability and flexibility [60]. Individuals with HFA and PLI may have difficulty with affective expression, which ultimately may impact the quality and strength of a relationship with a peer, friend, teacher, or family member. Individuals with affective expression impairment may have difficulty transitioning from one topic to the next or knowing how to end a conversation.
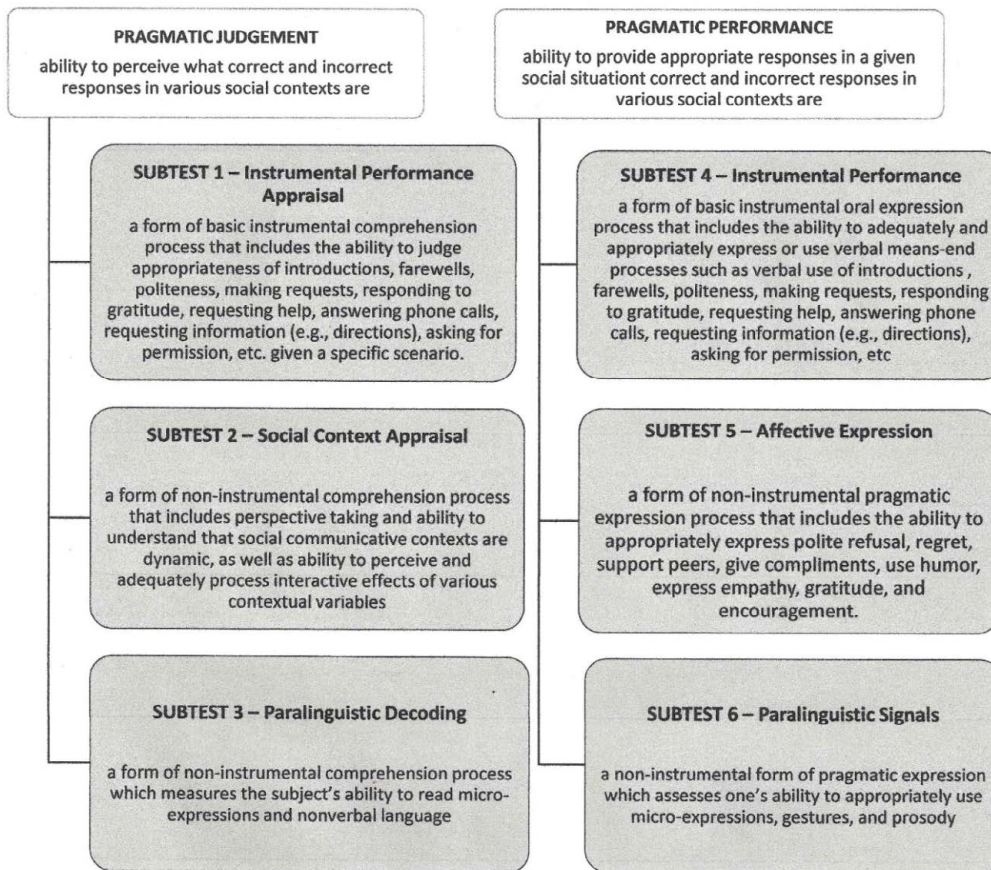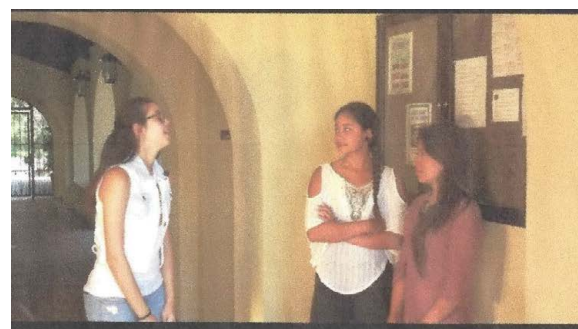
PRAGMATIC JUDGEMENT
ability to perceive what correct and incorrect responses in various social contexts are

PRAGMATIC PERFORMANCE
ability to provide appropriate responses in a given social situation correct and incorrect responses in various social contexts are

SUBTEST 1 – Instrumental Performance Appraisal

a form of basic instrumental comprehension process that includes the ability to judge appropriateness of introductions, farewells, politeness, making requests, responding to gratitude, requesting help, answering phone calls, requesting information (e.g., directions), asking for permission, etc. given a specific scenario.

SUBTEST 4 – Instrumental Performance

a form of basic instrumental oral expression process that includes the ability to adequately and appropriately express or use verbal means-end processes such as verbal use of introductions , farewells, politeness, making requests, responding to gratitude, requesting help, answering phone calls, requesting information (e.g., directions), asking for permission, etc

SUBTEST 2 – Social Context Appraisal

a form of non-instrumental comprehension process that includes perspective taking and ability to understand that social communicative contexts are dynamic, as well as ability to perceive and adequately process interactive effects of various contextual variables

SUBTEST 5 – Affective Expression

a form of non-instrumental pragmatic expression process that includes the ability to appropriately express polite refusal, regret, support peers, give compliments, use humor, express empathy, gratitude, and encouragement.

SUBTEST 3 – Paralinguistic Decoding

a form of non-instrumental comprehension process which measures the subject's ability to read micro-expressions and nonverbal language

SUBTEST 6 – Paralinguistic Signals

a non-instrumental form of pragmatic expression which assesses one's ability to appropriately use micro-expressions, gestures, and prosody

Figure 1: Description of the Clinical Assessment of Pragmatics Subtests.

Lisa goes up to a popular girl and says: Hi! Hey, How are you? Can we hang out sometime?
Popular girl: *Eye brow raised- arrogant look, begins to laugh out loud with her girlfriend*

Travis: Hey, so how was your math exam?
Marc: It was a piece of cake!
Travis: What? Not your lunch, the exam?
Marc: Yes, I said it was easy. It was a piece of cake.
Travis: Confused look on Travis' face

Figure 2: Image of One of the Subtests' Videos Accompanied by the Social Scenario Narrative Presented in the Illustrated Video.

Social Context Appraisal (SCA) refers to an individual's ability to understand another individual's perspective or point of view. In order to be successful communicators, it is critical that we understand that situations change and that all contextual information is valuable. When an individual is able to observe that other individuals have different emotional states, thoughts, feelings, and/or emotions than their own, they engage in true perspective taking [61]. It is important to be able to interpret social settings, routines, and flexibility or disruptions of routines. Hughes and Dunn indicate that reflecting on others' emotional state is critical for successful social interactions [37]. Children with HFA have a difficult time with perspective taking and social context appraisal [62]. The DSM-V does not yet consider perspective taking in the criteria for diagnosing autism; however, Happé found that students with HFA often have severe impairments in theory of mind development [63].

METHODOLOGY

Participants

A total of ninety-seven participants (57 male and 40 female) were recruited for the present study. Participants were between the ages of 7:0 and 15:11. Three performance groups were established: "typically developing students," "students who present with high functioning autism (HFA) and students who present with pragmatic language impairment (PLI)." Each group consisted of 35, 30 and 32 students, respectively. In order to meet criteria to be classified as a typically developing student, participants were required to exhibit hearing sensitivity that was within normal limits, have age appropriate language skills, attend general education classrooms, and demonstrate academic success (no failures). Additionally, students who presented with co-morbid disorders as defined by the DSM-V such as personality disorders, mental health disorders, or general medical conditions were excluded from the typically developing group. In order to meet criteria to be classified as a student presenting with HFA, participants were required to have a current diagnosis of HFA or Asperger's Syndrome (based on medical records and California department of education, special education eligibility criteria) and attend general education classrooms for at least 4 hours per day. Lastly, in order to meet criteria to be classified as a student presenting with PLI, participants were required to have a current diagnosis of PLI (scoring below the 7th percentile on two standardized pragmatic language tests) based on the California Department of Education eligibility code and also attend general education classrooms. Participants were excluded from the PLI group if they presented with intellectual disability, learning disability, and/or emotional disturbance. Additionally, students who presented with co-morbid disorders as defined by the DSM-V such as autism, personality disorders, mental health disorders, and/or general medical conditions were excluded from the PLI group.

PROCEDURE

Participants in this study were assessed using the Clinical Assessment of Pragmatics (CAPs) [53]. This test includes six constructs that look at an individual's pragmatic language (i.e., social functioning). California state licensed speech-language pathologists were trained in the administration of the CAPs tool. Assessments were completed by the SLP team in distraction free rooms, in the comfort of the participants' homes. The length of administration time took between 45 to 55 minutes. The CAPs tool utilizes visual-auditory presentations including videos that are

followed with role-play scenarios. All videos are presented with a normal rate of speech and intonation. Additionally, all vocabulary used in the CAPs assessment is age appropriate. Prior to each subtest, participants were briefed and given specific instructions regarding subtests that looked at pragmatic judgment and subtests that looked at pragmatic performance. For example, before administering a pragmatic judgment subtest, the clinician would read the following to the participant, "We're going to look at some short videos of social situations. You'll have to listen carefully because you can only see the videos once. After watching each video, you will be asked if anything went wrong in the video." The participants would then describe what went wrong (if anything) after viewing each video. The pragmatic performance subtests directions followed similar directions but instead asked questions such as, "What you would do in this situation?", "Did anything go wrong in this situation?", "What would you say or do in this situation?".

RESULTS

The overall goal of this study was to assess social language acquisition differences across the lifespan. The independent variable was group (control, HFA, and PLI). In each case, the dependent variables were the subtests (affective expression, paralinguistic decoding, paralinguistic signals, and social context appraisal). The Statistical Package for the Social Sciences (SPSS) version 23.0 was used to analyze data. Frequencies and relative frequencies (%) were outlined to describe general characteristics of each participant (Table 1). Kolmogorov-Smirnov and the Shapiro-Wilk test were used to examine the normality of the quantitative variables. The mean for the outcome variables (Social Context Appraisal, Paralinguistic Decoding, Affective Expression, Paralinguistic Signals subtests) were compared among the three participant groups using Kruskal Wallis analysis of variance (ANOVA) (Table 2). Further comparisons in mean scores between the groups were examined using Mann-Whitney U test. The level of significance was set at $p \leq 0.05$. Additionally, mixed-model analyses of covariance (ANCOVAs) were conducted on four dependent variables (Social Context Appraisal, Paralinguistic Decoding, Affective Expression, Paralinguistic Signals subtests) within groups. The alpha level for this analysis was set at 0.1 to increase power [64]. Preliminary tests of the homogeneity for the four dependent variables were all non-significant. This suggests that the data met the critical assumptions of ANCOVA. Two pairwise comparisons (A vs. B and B vs. C) were used to analyze age 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 [65].

Table 3 presents unadjusted group means and standard deviations for four dependent measures. Additionally, group main effects from mixed-model ANCOVAs on nonverbal language and social language competence 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

Table 1: Characteristics of participants by performance group (N=97).

	Control (n=35)		PLI (n=30)		HFA (n=32)	
	Frequency	%	Frequency	%	Frequency	%
Gender						
Male	18	51.43	19	63.33	22	68.75
Female	17	48.57	11	36.67	10	31.25
Ethnicity						
White	19	54.28	16	53.33	13	40.62
African American	4	11.42	6	20	8	25
Hispanic	9	25.71	5	16.66	8	25
Asian	3	8.57	3	10	3	9.37
Abbreviations: PLI, pragmatic language impairment; HFA, high functioning autism						

Table 2: Mean (SD) of Social Context Appraisal, Paralinguistic Decoding, Affective Expression, Paralinguistic Signals subtests (N= 97) across three performance groups.

	HFA group (n=32)	PLI group (n=30)	Control group (n=35)	p–value[*]
7:0-9:11 yrs				
SCA [a,b,c]	7.8 ± 2.3	11.6 ± 1.3	15.6 ± 0.8	<.001
PD [a,b,c]	8.1 ± 2.4	10.5 ± 1.2	15.2 ± 0.6	<.001
AE [a,b,c]	2.3 ± 2.2	3.9 ± 1.7	7.9 ± 0.8	<.001
PS [a,b,c]	3.2 ± 1.3	4.2 ± 1.3	9.2 ± 0.5	<.001
10:0-12:11 yrs				
SCA [a,b,c]	10.8 ± 2.4	12.3 ± 1.6	17.4 ± 0.7	<.001
PD [a,b,c]	8.8 ± 2.3	12.1 ± 1.8	16.2 ± 1.0	<.001
AE [a,b,c]	3.3 ± 2.4	4.9 ± 2.5	8.4 ± 0.5	<.001
PS [a,b,c]	3.7 ± 1.6	6.5 ± 1.9	10.4 ± 0.7	<.001
13:0-15:11 yrs				
SCA [a,b,c]	11.8 ± 2.5	14.2 ± 1.1	17.5 ± 0.4	<.001
PD [a,b,c]	9.1 ± 1.2	13.5 ± 1.3	16.8 ± 0.8	<.001
AE [a,b,c]	5.3 ± 2.1	6.1 ± 1.7	9.4 ± 0.6	<.001
PS [a,b,c]	3.9 ± 1.3	8.2 ± 1.2	12.2 ± 0.8	<.001
Abbreviation: SD: Standard Deviation; PLI: Pragmatic Language Impairment; HFA: High Functioning Autism; SCA: Social Context Appraisal; PD: Paralinguistic Decoding; AE: Affective Expression; PS: Paralinguistic Signals.				
[*]Kruskal-Wallis Analysis of Variance test.				
[A]significant difference between HFA group and control.				
[B]significant difference between PLI group and control.				
[C]significant difference between PLI group and HFA groups.				

measures (Social Context Appraisal, Pragmatic Language, Idiomatic Language and Nonliteral Language) within the control and the PLI groups. However, there were negligible group main effects for each of the nonverbal language measures (Paralinguistic Decoding and Paralinguistic Signals) within the HFA group.

Nonverbal Language

An analysis of post hoc pairwise comparisons for each of the nonverbal language measures clearly revealed a pattern of growth with age within the control and the PLI groups. There were significant differences between the younger and the older groups for the Paralinguistic Decoding and Paralinguistic Signals scores within the control and the PLI groups. However, there were negligent differences between the younger and the older groups for the Paralinguistic Decoding and Paralinguistic Signals scores within the HFA group. Additionally, the effect-size analyses revealed a similar pattern of results. On Paralinguistic Decoding,

there was a significant effect size for the difference between the younger and older groups within the control group (d=2.21; d=2.14) and a moderate effect size within the PLI group (d =0.55; d=0.45), and a negligible effect size (d=0.04) for the difference between the younger and older groups within the HFA group. On the Paralinguistic Signals measure, the effect sizes of the age groups' differences were large within the control group (d=2.52; d=1.84), moderately significant within the PLI group (d = .54; d = .69) and negligent within the HFA group (d=0.24; d=0.26).

Social Language Competence

An analysis of post hoc pairwise comparisons for each of the social language comprehension measures revealed that the younger group's scores were larger than the older group's scores within all groups. Similarly, the effect-size analyses revealed a pattern of growth within all groups. On the Social Context Appraisal measure, there was a significant effect size (d=0.91; d=1.08 and

Table 3: Unadjusted means and standard deviations for dependent measures for three age groups with post hoc pairwise least significant difference comparison p values and estimated Cohen's d effect sizes across three performance groups.

Control Group	Age Group (N=35)			Comparisons	
	7:0-9:11 yrs A (n=12)	10:0-12:11 yrs B (n=12)	13:0-15:11 yrs C (n=11)	A *vs.* B	B *vs.* C
Nonverbal Language					
CAPs Paralinguistic Decoding F(2,24)=6.21; p=0.008; hp²=0.412	15.2 (0.61)	16.2 (1.04)	16.8 (0.81)	0.003 (d=2.21)	0.004 (d=2.14)
CAPs Paralinguistic Signals F (2,24)=6.54; p=0.007; hp²=0.476	9.2 (0.53)	10.4 (0.74)	12.2 (0.84)	0.014 (d=2.52)	0.022 (d=1.84)
Social Language Competence					
CAPs Social Context Appraisal F (2,24)=5.65; p=0.015; hp²=0.389	15.6 (0.84)	17.4 (0.7)	17.5 (0.43)	0.15 (d=0.91)	0.008 (d=1.08)
CAPs Affective Expression F (2,24)=6.45; p=0.007; hp²=0.424	7.9 (0.82)	8.4 (0.51)	9.4 (0.61)	0.003 (d=1.24)	0.017 (d=1.04)
PLI Group	Age Group (N=30)			Comparisons	
Nonverbal Language					
CAPs Paralinguistic Decoding F (2,24)=2.25; p=0.125; hp²=0.185	10.5 (1.24)	12.1 (1.81)	13.5 (1.39)	0.368 (d=0.55)	260 (d=0.45)
CAPs Paralinguistic Signals F (2,24)=2.54; p=0.195; hp²=0.175	4.2 (1.32)	6.5 (1.94)	8.2 (1.22)	0.247 (d=0.24)	0.322 (d=0.30)
Social Language Competence					
CAPs Social Context Appraisal F (2,24)=2.55; p=0.165; hp²=0.170	11.6 (1.34)	12.3 (1.61)	14.2 (1.14)	263 (d=0.71)	318 (d=0.64)
CAPs Affective Expression F (2,24)=2.45; p=0.175; hp²=0.175	3.9 (1.74)	4.9 (2.53)	6.1 (1.71)	0.217 (d=0.35)	0.242 (d=0.34)
HFA Group	Age Group (N=30)			Comparisons	
Nonverbal Language					
CAPs Paralinguistic Decoding F (2,24)=1.85; p=0.195; hp²=0.171	8.1 (2.42)	8.8 (2.32)	9.1 (1.23)	0.257 (d=0.04)	0.261 (d=0.04)
CAPs Paralinguistic Signals F (2,24)=2.15; p=0.185; hp²=0.195	3.2 (1.32)	3.7 (1.64)	3.9 (1.33)	0.525 (d=0.24)	0.532 (d=0.26)
Social Language Competence					
CAPs Social Context Appraisal F (2,24)=2.35; p=0.185; hp²=0.225	7.8 (2.31)	10.8 (2.42)	11.8 (2.51)	0.27 (d=0.45)	265 (d=0.38)
CAPs Affective Expression F (2,24)=3.15; p=0.225; hp²=0.205	2.3 (2.24)	3.3 (2.41)	5.3 (2.14)	0.265 (d=0.43)	0.247 (d=0.45)

d=0.71; d=0.64) for the difference between the younger and older groups within the control and PLI groups, and a small effect size (d=0.45 and d=0.38) for the difference between the younger and older groups within the HFA group, respectively.

DISCUSSION

The purpose of the current study was to explore how paralinguistic cues (i.e., facial expressions, intonation/prosody), affective expression, and social context appraisal skills develop across the lifetime in typically developing children and children with varying diagnoses that may impact social language functioning. The Clinical Assessment of Pragmatics (CAPs) was administered to children across the ages of 7:0 and 15:11 who presented as typically developing, presented with HFA, and PLI. Six constructs of language were assessed (instrumental performance, social context appraisal, paralinguistic decoding, instrumental performance, affective expression, and paralinguistic signals), and for the purpose of this study, four of these constructs were analyzed: paralinguistic decoding, paralinguistic signals, affective expression, and social context appraisal. There is an abundance of literature that focuses on social language abilities or lack of abilities of children who have

ASD, AS, and PLI, however, there is a dearth of research that focuses on how social language is acquired and learned across the lifespan in children who have ASD, AS, or PLI. Understanding how social language develops in typically developing and not-typically developing children is critical in our comprehension, assessment, and treatment of pragmatic language disorders. Additionally, previous literature has focused on pragmatic language skills that are more instrumental in nature such as greetings (i.e., introductions, farewells), topic maintenance, turn taking, response to questions, add-on comments, and asking for clarification. While all of these instrumental areas of social language development are very important, non-instrumental areas of social language development are just as, if not, more important. For example, the current study looked at how a child's ability to decode paralinguistic cues, understand another person's perspective, or interpret small but crucial social contextual cues develops across the lifespan.

The results of the current study revealed that typically developing students and students who present with a pragmatic language impairment demonstrate significant differences in age ability for nonverbal language (paralinguistic decoding and paralinguistic

signals) and social language comprehension (social context appraisal, idiomatic language and nonliteral language). On both the paralinguistic decoding and paralinguistic signals subtests, there was a significant difference between younger and older typically developing students, a moderate difference between younger and older students within the PLI group, and a negligible difference between the younger and older HFA participants. The results of the current study suggest that typically developing students show differences in performance across all ages, and patterns of growth can be observed as students get older. Similarly, the PLI group followed a comparable pattern to the typically developing group, however, delayed. Lastly, the HFA group showed almost no differences in their pragmatic judgment and pragmatic performance across all ages and patterns of growth were minimally observed. All HFA participants, regardless of age, showed difficulties reading facial expressions, interpreting inflections, and tone of voice. Additionally, all participants with HFA had difficulty utilizing/demonstrating appropriate affect, tone of voice, and facial expressions. Participants with HFA demonstrated improvement with age when considering the understanding and use of content pragmatics (i.e., saying the right thing), however, there were only small, non-significant improvements in regards to nonverbal language with age.

STRENGTHS

Strengths of the current study include the use of a newly standardized pragmatic language assessment tool (i.e., CAPs) [53]. This tool was given to all participants across different ages and disorders. The CAPs utilizes real-life scenarios, which makes it more practical when assessing participants' social language abilities. Additionally, all actors in the CAPs assessment tool come from a wide variety of ethnic and cultural backgrounds. Furthermore, the study included a large number of participants as well as a control group to compare typical social language development to. Lastly, the participants in this study came from ethnically diverse and cultural backgrounds.

LIMITATIONS

Limitations of the current study include demographics. For example, the HFA participant group contained more males, however, this may be reflective of the incident rate of the disorder as males are more likely to present with autism. An additional limitation is that all participants in this study lived in the state of California and there were a limited number of Asian participants in both the HFA and PLI groups. Future studies can expand on our data and findings by gathering participants from different states, races, socio-economic statuses, and educational backgrounds.

CONCLUSION

The clinical implications of this study hinge on the finding that students with PLI develop social language skills similarly to their typically developing peers, however, at a delayed speed. Additionally, students with HFA do not acquire/grow social language skills in the same way that their typically developing peers do. For these reasons, assessment and treatment need to be targeted to fit the needs of each individual student and their disorder. For example, a student with HFA may require a different approach in therapy than a student with PLI. Additionally, early intervention for social language deficits is necessary. Furthermore, it is important for clinicians to target the deeper levels of pragmatics, alongside

the more surface level components of pragmatics early on it a child's development. Moreover, the findings of the current study revealed the need to differentiate between pragmatic judgment and pragmatic performance, instrumental and non-instrumental communication, as well as the six constructs identified in the CAPs tool. As we can see, there were significant differences in the acquisition and utilization of non-instrumental language skills, specifically nonverbal language (paralinguistic decoding and paralinguistic signals) and social competence (affective expression and social context appraisal). There is a need to break down pragmatics in order for clinicians to appropriately assess, qualify students for services, and treat students who present with social language deficits.

Future studies could replicate this study by looking at students' pragmatic language skill development before the age of 7:0 and after the age 15:11 to expand on the development of social language skills across the lifespan. Additionally, the relationship between social language skills and academic success should be explored. Lastly, a longitudinal study could follow individuals throughout their lives and examine social language acquisition and use.

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