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Clinical Assessment of Pragmatics (CAPs): A Validation Study of a Video-Based Test of Pragmatic Language in Adolescent Students

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Abstract

The purpose of this study was to examine the validity and reliability of a novel new video-based approach to assessing pragmatic language, namely the Clinical Assessment of Pragmatics (CAPs). This study included students with Language Impairment (LI), High-Functioning Autism (ASD) and non-disabled students. Thirty participants, ages 14 to 16 years old, were administered 3 pragmatic judgment and 3 pragmatic performance subtests comprised of 10 items each for a total of 60 test items. Expert opinion was solicited for the purpose of obtaining content validity. Study results revealed that this instrument provides a valid and reliable comprehensive measure of pragmatic language skills. Both test-retest and interrater reliability were found to be strong. Experts rated the CAPs highly for both content and clarity. Concurrent validity was obtained on three of the CAPs subtests and was found to correlate to three existing pragmatic language instruments and measures (the Clinical Assessment of Spoken Language – Pragmatic Judgment subtest, the Test of Pragmatic Language and the Social Language Development Test, adolescent). CAPs is a tool which is both valid and reliable and can be used as a means of determining whether school-aged students present with deficits in pragmatic language skills, specifically, high-functioning autism or specific language impairment.

Keywords: Pragmatic language; Assessment; High functioning autism; Specific language delay

Introduction

Pragmatic language and pragmatic language impairment

Social pragmatic communication impairments related to Autism (ASD) and Specific Language Impairment (SLI) are becoming an academic and social reality for an increasing number of children in the United States and around the world. According to the US Department of Education's census summary statistics for 2003, there was a 600% increase in the number of students found eligible under the category of Autism. Prior to the 1990s, one in 2000 children was diagnosed with ASD; however, in the mid-2000s the number had increased to one in 150 children [1]. Current Center for Disease Control (CDC) findings report prevalence rates of one in 110 females and one in 70 males or about 1% [1].

The ability to communicate effectively and develop appropriate receptive-expressive pragmatic language skills is an overarching goal for all children with ASD and SLI. Speech language pathologists (SLPs) play a critical and direct role in the development of effective communication in children and adolescents with pragmatic language impairments. Because speech language pathologists work most directly with this target population (SLI and ASD), they are best qualified to remediate the difficulties these children exhibit in their pragmatic abilities. It is the SLPs' job to ensure that the individuals served have the social pragmatic language foundation that will allow effective communication to develop, as it is the basis for success in school [2].

Pragmatic language binds together semantics, morphology, syntax, overall language comprehension and oral expression to make effective communication occur. It is the final element needed for appropriate and effective communication to take place. Any deficit in pragmatics results in significant disruption in the communication process [2]. Hymes simply defines pragmatics as a student knowing when to say what to whom and how much [3]. This may seem somewhat simplistic, but others offer more elaborate descriptions. Prutting and Kurchner define pragmatic language as the ability to use language in specific contexts and for specific purposes [4]. Grice, Mundy and Mascus make a useful contribution in pointing out that it is impossible to declare what pragmatic language is without using culture as a context [5,6]. It is a student's very subjective experience with social language that informs him or her when a speaker is being sarcastic, making an attempt at humor, or is unnecessarily formal, polite or even hostile.

A broad array of linguistic skills works cohesively to produce pragmatic language. These include appropriate turn-taking, politeness, proper introduction of a topic, stylistic variations to be adjusted for different listeners, and topic maintenance and changes in direction or intention. In addition, proper eye-contact and gaze, body language, micro expressions of the face, gestures and other forms of non-verbal language are all integral components of pragmatic language [4]. Nicolosi, Harryman and Kresheck agree as well, that without context, any attempt at effective pragmatic language is virtually useless [7,8]. The environment that generates the language gives context to what is communicated and is invaluable. The intention of the speaker and the sensory-motor actions used to deliver what is said are pivotal.

Knowledge shared in a communication dyad is to be considered by speaker and listener alike, but the context changes and shifts even further if we move from a dyad to a speaker in a group setting. The authors see meaning to be as important as the context since they are the result of well-intentioned and creative combinations of utterances and social settings. Therefore, meanings and contexts are considered inseparable. Loukusa et al. suggests that the context can be taken as far as knowing the identity of the speaker and listener in addition to determining the speaker's intention in his or her selection of sentences used to convey meaning [8]. Pragmatic language deficits translate into difficulty correctly comprehending and expressively responding to situations in a social context. Individuals with deficits in pragmatics primarily struggle during conversation with others both receptively and expressively.

High functioning autism

Individuals with Autism Spectrum Disorder (ASD) demonstrate a number of deficits relating to speech and language, ranging from nonverbal to those with high verbal ability who demonstrate weaknesses in pragmatic language skills [9]. These deficits are prevalent in individuals across the spectrum, including those with high functioning autism and Asperger's Syndrome. ASD is a pervasive developmental disorder that occurs across all socioeconomic groups. Although a definite cause is unknown, individuals with autism are characterized largely by three attributes: impairments in social interaction, behavior, and communication.

The DSM - V defines ASD symptomatology as manifesting difficulties in social communication and social interaction, restrictive, repetitive patterns of behavior, interests or activity that are present in the developmental period. It also causes significant impairment in the social, occupational, or other important domains. These characteristics cannot be attributed to an intellectual disability or developmental disorder. Those with high functioning autism (HFA) share similarities with those with classic autism; both groups have delays in language acquisition and impairments in communication, social interaction, and have restricted and stereotyped patterns of behavior [10]. A major difference between those with HFA and classic autism is cognitive ability. Those with HFA have average to superior intellectual ability, however, difficulty with pragmatic or language in a social context continues to be an area of weakness. Statements are often taken literally and abstract language can be difficult to comprehend. Additionally, difficulty changing topics and dominating a conversation are often observed. Because these individuals have difficulty understanding other's perspectives, they may fixate on an area of interest which could progress into an inability to take turns in a conversation ultimately impacting the ability to relate to others [11].

Another distinctive characteristic of autism, difficulty understanding others' perspective, also known as Theory of Mind (ToM) is also evident in an HFA profile [12]. Scheeren et al. describe ToM as the ability to attribute various mental states or feelings to others as well as offer an explanation as to why a person may behave in a particular way as a result of that mental state [12]. They assert that children with ASD tend to have limited ability in understanding others thoughts and behaviors. Whyte et al. purport that ToM abilities are assessed by basic aspects of language development that is often delayed in individuals with ASD [13]. Happe found that individuals with ASD who failed all ToM tasks possess the ability to explain similes on a literal or surface level [14]. They were lacking in the ability comprehend metaphors or irony, or non-literal language.

Research shows that a typical developing three to five year old possess basic pragmatic skills such as directing their attention to the speaker, taking turns in conversation, making requests, asking and answering questions, and are beginning to understand more abstract language [15]. Children with HFA are less able to initiate conversation, take turns during conversation, speak on others' interests, ask relevant questions, and appropriately end a conversation. Bauminger-Zviely et al. found that children with HFA had less pragmatic abilities in many realms than the typically developing group [15]. More specifically, those with HFA had more difficulty with verbal behaviors such as turn taking, prosody, and inability to respond to cues. Also demonstrated were weaknesses in nonverbal social-gestures behaviors such as facial affect and eye contact.

Asperger's syndrome

Individuals with Asperger's Syndrome (AS) function at the higher end of the autism spectrum. Incidence rates are not as well established. The Genetics Home Reference estimates prevalence to range from 1 in 250 to 1 in 5,000, occurring three to four times more frequently in males than females (http://ghr.nlm.nih.gov/condition/asperger-syndrome). These individuals also have deficits in pragmatic language, impaired social interaction, restricted and repetitive patterns of behavior and interests, and sometimes include impaired gross motor skills. A difference between those with AS and autism is that there is no delay in cognitive or speech development and later onset of symptoms [16,17]. These individuals often have average to superior verbal ability; however the use of their language in conversation tends to be awkward or involve extraneous language. Additionally, HFA involves the left hemisphere of the brain; on the contrary, AS involves the right hemisphere [17]. Martin and McDonald (citation) note that individuals with AS have the verbal skills to engage in conversation, nevertheless still have difficulty engaging in cohesive social communication. Typical difficulties for individuals with AS include verbosity, specific and peculiar use of language, fixation on certain topics, and difficulty comprehending others' perspectives and abstract language. Individuals with AS had more difficulty with pragmatically problematic responses and social-emotional questions than with factual questions when compared to the control group.

Like individuals with HFA, individuals with AS have difficulties with Theory of Mind (ToM) and central coherence. Deficits in ToM, can in turn, result in insensitivity to feelings of others, also a social skills deficit [17].

Along with high structure and accommodations and/or modifications in academics, individuals with AS need systematic social skills and pragmatic training coupled with social mentoring in order to be successful. Martin and McDonald (year) stress the importance of social communication skills in order to benefit in contemporary society. They further emphasize that not only does understand the nature of the impairment necessary, but also the causes so that appropriate intervention and therapy can be developed. Norbury et al. developed the Children's Communication Checklist (CCC), a measure that assesses pragmatic language skills. The checklist is categorized into five scales, (1) assessing inappropriate initiation, (2) coherence, (3) stereotyped language, (4) use of context, and (5) rapport which scores comprise the Pragmatic Composite [2]. Individuals with AS had an intermediate Pragmatic Composite score which were aligned with those who presented with symptoms of autism and had scores within the low range. Additionally, a separate study found that in a comparison between individuals with AS and HFA, those with AS used

more unclear references in conversation as opposed to individuals with HFA who made unexpected or unrelated and fewer references [18].

Specific language impairment

A Specific Language Impairment (SLI) is characterized by a delay in language skills that cannot be attributed to intellectual disability, neurological disorders, chromosomal syndromes, or hearing impairment [19]. The National Institute on Deafness and Other Communication Disorders (NIDCD) estimates SLI occurrence to be seven to eight percent of children in kindergarten (http://www.nidcd.nih.gov/health/voice/pages/specific-language-impairment.aspx). According to the DSM-V, SLI falls under the broad umbrella of mixed receptive-expressive language disorder or expressive language disorder. Deficits in receptive language translate to inability to accurately comprehend what is being said and understanding social situations. Expressive language disorders are characterized by difficulties with language output, appropriately expressing oneself in a social situation. Similar to those with AS, these individuals may have high cognitive as well as verbal abilities. Individuals with SLI may have difficulty with vocabulary, grammar, conversational skills, and with the acquisition of particular morphemes, and complex language skills such as narrative organization and discourse comprehension. Amongst individuals identified with Speech and Language Impairment is a subgroup of individuals with pragmatic language deficits. The DSM-V, now categorizes this as a Social Communication Disorder. These deficits translate into difficulty correctly comprehending and expressively responding to situations in a social context. Individuals with deficits in pragmatics primarily struggle during conversation with others both receptively and expressively. Common difficulties include providing inappropriate responses, asking or not asking appropriate questions, taking turns during conversation, making eye contact and making appropriate facial expressions or gestures, and smoothly transitioning from one topic to another.

Ryder and Leinonen questioned children on a storybook with pictures and short verbal scenarios; both in which answers required the children to make inferences [20]. Results indicated that all groups, those with SLI including a subgroup of pragmatic language deficits and typically developing children correctly answered more items when presented the storybook with pictures. Overall, on both the storybook and short scenario task, those with pragmatic language deficits provided irrelevant answers, thereby answering more questions incorrectly. The authors noted that providing irrelevant answers implies that the children with pragmatic language deficits demonstrated an inability to integrate contextual information to a meaningful overview. In addition, children with SLI and pragmatic language deficits also face difficulties in peer relations. Mok, Pickles, Durkin, and Conti-Ramsden conducted a study to examine the developmental trajectories of children with SLI over a nine year period. Results indicated that individuals with SLI and deficits in pragmatic language were at a higher risk for having poor peer relations [21].

Current pragmatic assessments tools

Several studies focus on the treatment of pragmatic language impairments. However, few reflect research which is based on the assessment of pragmatic deficits [22,23]. Reasons for this divergence are partly due to there being few pragmatic tools to measure these deficits. Few formal assessment tools for speech-language pathologists are available that can be regarded as standardized measures of social-pragmatic communication deficits. Some practitioners have gone on record as saying that an effective, standardized instrument may never be developed [24]. The pessimism is palpable for several reasons. First, a number of variables would need to be measured by any instrument alleging to accurately measure the full gamut of pragmatic language. The prosody of students with Asperger's Syndrome alone is typically odd [25]. These students interpret implied meanings literally [25]. There are non-verbal cues missed and communication problems that arise from a limited or inappropriate use of gestures, clumsy body language, inappropriate facial expressions and difficulty reading physical expressions [25]. With such a long list of variables that must be measured, normed, and standardized, the exercise of creating a useful instrument to measure pragmatic language is a deemed a daunting task.

On the other hand, there are few instruments that attest to providing some type of assessment of pragmatic language skills. Current assessments utilize pictorial contexts to assess pragmatic language skills and subsequently use these results to develop strategies to assist with these deficits [25]. Presently, assessments incorporating real life video role plays pertaining to real life contexts as opposed to picture scenarios are non-existent.

A commonly used instrument by speech language pathologists is the Test of Pragmatic Language (TOPL) [26]. The TOPL uses pictures of various social situations requiring students to demonstrate pragmatic judgment by giving an appropriate response. The response pattern is a dichotomous one in which the child's response is scored as correct or incorrect.

Volden and Phillip found multiple shortcomings of the assessment in measuring pragmatic language skills in individuals with autism spectrum disorders (ASD) [27]. The authors note that a standardized test such as the TOPL, because of the rigidity in which it is administered, does not reflect the individual's ability to adjust to different contexts. The administration of a test captures only one snapshot of the individual's abilities; the deficit may or may not be observed during this period. In a study conducted by Young et al. results indicated that the TOPL was not always successful in distinguishing individuals with ASD from the control group [28]. In general, those with ASD performed lower than their typical developing peers, however, because variation among their scores was so great, it was concluded that the TOPL might not always succeed in identifying individuals with HFA or pragmatic language deficits from their typical developing peers. The authors note that because the TOPL focuses more on measuring pragmatic language skills that develop during the course of typical development, it fails to identify impairments associated with ASD. Additionally, because the TOPL is scored as either a "correct" or "incorrect" answer, the quality of the individual's response is not taken into account. Young et al. also suggests that the dichotomous scoring system is limiting in that the quality of a student's response does not factor in the scoring [28]. The test is also narrow in scope and not comprehensive enough to measure a wide range of social pragmatic skills other than pragmatic judgment. Finally, the TOPL is not sensitive enough to differentiate higher level skills which are typical of more sophisticated learners. The test is more effective when students function on the lower end of the pragmatic scale but is unable to detect subtle differences on the higher end of the spectrum [28]. The TOPL, in summary, does not always accurately measure deficits in high functioning individuals, which in turn, does not allow for proper intervention.

Similarly, another measure of pragmatic language is the Clinical Assessment of Spoken Language (CASL) [29]. The CASL includes a

subtest called Pragmatic Judgment that assesses the individual's knowledge and use of pragmatic language rules and judgment of their appropriate application. After a short vignette is read aloud, the subject is required to judge the appropriateness of the language used and also to provide the appropriate language for the situation. Subtests are not expressive in nature; rather students are assessed mainly in receptive areas. Researchers' observation and experience regarding the administration of this subtest has shown that high functioning students with autism are unlikely to have much differentiation in performance from their non-disabled peers and score consistently high on this subtest [29]. This is an indication that the instrument is not sensitive enough to identify pragmatic deficits in children with HFA.

Pragmatic checklists and profiles

Questionnaires, checklists and profiles also measure pragmatic skills. What follows is not an exhaustive list of these instruments however, none of them provide a point of reference that allows a clinician to determine whether scores are indicative of deficits or strengths in pragmatic areas (Table 1).

Name	Author, Year
Communication Effectiveness Profile	Warner , 2007
Dore's Conversational Acts	Stickler, 1987
Tough's Functions of Language	Tough, 1977
Fey's Pragmatic Patterns	Fey, 1986
Prutting Pragmatic Protocol	Prutting and Kirchner, 1983
Communicative Partner Profile	Anderson-Wood & Smith, 2000
Muir's Informal Assessment for Social Communication Skills	Muir, Tanner, & France, 1992
Halliday's Functions of Language	Miller, 1981
Pragmatic Rating Scale	Anderson-Wood & Smith, 2000
Interaction Record	Anderson-Wood & Smith, 2000

Table 1: Questionnaires, checklists, and profiles which measure pragmatic skills.

Instrumentation

Pragmatic judgment versus pragmatic performance

To this date, pragmatic judgment has been broadly defined as general pragmatic language skills. This study aims to redefine pragmatic judgment and thereby create two broad constructs under the realm of pragmatic language skills: Pragmatic Judgment (PJ) and Pragmatic Performance (PP). The definition as well as the importance of both PJ and PP will be discussed. Furthermore, new constructs are developed in efforts to measure both PJ and PP skills in a comprehensive assessment. Pragmatic Judgment is a broad construct used to measure pragmatic language skills. Pragmatic judgment is measured by the ability of an individual to appropriately understand and use appropriate language (citation). This requires the individual to form appropriate social language responses such as saying the appropriate response at the right time in a given social context. Developing skills in this area is critical as it involves being able to engage in relevant topics during conversation, providing relevant information when asked questions, appropriately taking turns in conversation, and responding appropriately to other individuals in regard to gender, status, age, and using the appropriate language that corresponds to specific feelings such as gratitude, excitement, and sorrow [30]. Receptively, this can mean identifying correct and incorrect responses in a social context. Expressively, this involves verbally providing appropriate responses in a given situation.

For the purposes of this study, PJ will be related to receptive pragmatic skills. Defining PJ as equivalent to receptive pragmatic skills and distinguishing it from a broad definition of pragmatic language skills will allow a more detailed grasp of an individual's ability to understand social situations. This is measured by how the individual perceives what correct and incorrect responses in various social contexts are. For example, the individual will be presented a social situation with a response that is made; the individual will then identify whether the response made was a "right" or "wrong" response given the context. PJ can also be measured by having individuals identify an appropriate response when given several choices.

Pragmatic performance: Assessing appropriate responses is necessary as it pertains to daily life skills. Additionally, assessment can aid in the identification of strengths and weaknesses in students with pragmatic disabilities which often include those with HFA, AS, or SLI. Pragmatic Performance (PP) is defined as congruent to an individual's expressive pragmatic skills. This is measured through the response given in social situations. Responses vary to include appropriate answers to questions or statements and appropriate responses to expressed emotions. The purpose of this study is to measure both PJ and PP skills in individuals with HFA, AS, and SLI. Aside from the CASL and TOPL, which can be vague in distinguishing between PJ and PP skills, assessments that measure and distinguish between both types are skills are relatively scarce. Assessment of both skills is important as each individual with HFA, AS, and SLI has different language profiles; one may have more developed judgment skills than performance skills or vice versa. Measuring both skills can a more detailed approach to understanding the pragmatic profiles of these individuals, which in turn results in a more individualized and effective intervention plan.

Instrumental versus non-instrumental communicative intent: In addition to assessing PJ and PP skills, this study will differentiate

pragmatic language skills as either instrumental or affective, non-instrumental communication. In instrumental communication (IC), the primary goal is to relay information effectively and where communication is used as a means to an end. Focus is heavily emphasized on what is being said as opposed to affective or emotional functions [31]. Because difficulty understanding others' emotions and perspective is a highlighted characteristic in individuals with ASD and SLI, instrumental communication is often used. This study analyzes how individuals with HFA, AS, and SLI use instrumental communication and how it pertains to pragmatic language skills.

Non-Instrumental Communication (NIC) or affective communication involves higher level communication skills such as expressing emotions such as joy or sorrow to another person. NIC is a key component of nonverbal communication and also requires higher level thought processing. It differs from IC in that it is not used merely as a means to an end [31]. NIC can be viewed as a pertinent construct in assessing pragmatic language skills as its use demonstrates aptitude in both PJ and PP skills.

Clinical Assessment of Pragmatics (CAPs)

The CAPs is a diagnostic tool designed to assess pragmatic language skills in students, ages 14 to 16 years old. It includes a total of 6 subtests which assess the following:

Pragmatic Judgement

Instrumental performance appraisal: It examines the ability to judge appropriateness of introductions, farewells, politeness, making requests, responding to gratitude, requesting help, answering phone calls, requesting information (e.g., directions), and asking for permission, given a specific scenario. In other words, can an individual discern the difference between appropriate and inappropriate language when used in means-end or basic communication processes. This includes, but is not limited to introductions, farewells, politeness, making requests, responding to gratitude, and requesting information. These skills are necessary to satisfy an individual's basic needs and behave appropriately in social situations and can be measured through the subject's ability to choose correct responses to basic or functional communication processes. For example, a student is shown multiple video clips and is asked to choose the one that correctly demonstrates what should be said when asking for a drink.

Learning to distinguish correct behaviors from the incorrect will consequently result in acting out the correct behaviors. Research using Picture Exchange Communication Systems (PECS) as a means to teaching functional communication has produced effective results in the acquisition and improvement of function skills [32,33]. Acar and Diken reviewed studies where video modeling was used as a teaching method for students with autism [34]. Results conclusively found that videos were also effective in teaching social skills, play skills, language and communication skills, functional skills, self-care skills, and daily life skills to children with autism. This study will branch out further, assessing multiple constructs of pragmatic language using video role plays.

Social context appraisal: It assesses 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.

Communicative partners: It relates to understanding personal intent as well as the ability to infer what others are thinking or the intent of others. This also includes interpreting components of language that are not taken for face value that those with ASD struggle with: irony, sarcasm, idioms, and at times humor. Understanding the intent of others or the receptive aspect of social context will in turn result in the appropriate behavior or expressive response.

Physical context variables: It involves interpreting social situations, settings, changes in settings, disruptions of routines, and flexibility in disruption of routines. The ability to correctly assess social situations, similar to communicative partners, will again aid in the appropriate behavior given the circumstance.

Paralinguistic decoding: It is a form of non-instrumental communication which measures the subject's ability to read micro-expressions and nonverbal language. Nonverbal communication can be just as meaningful as spoken words. It can suggest what a person is feeling and thinking without the use of words. Often, it can also reveal how a person truly feels although their verbal communication may be contradictory. An appropriate understanding of nonverbal language is critical in understanding another person, and in turn, it leads to an appropriate verbal response.

Previous research has shown that individuals with ASD show impairment in pragmatic language that requires attention to social cues such as facial expressions in a social context. Colich et al. found that ASD individuals struggled to use facial cues when inferring the intent of others [35]. Philofsky et al. noted that a failure to understand gestures and body language can result in use of uninhibited, socially inappropriate comments, an overuse of stereotyped utterances and tangential language, and increased use of made up words [36].

Pragmatic performance

Instrumental performance: It assesses the ability to adequately and appropriately use introductions, farewells, politeness, make requests, respond to gratitude, request help, answer phone calls, request information (e.g., directions), ask for permission, etc. Instrumental performance is defined in the same manner as instrumental performance appraisal; however instead of understanding, it assesses one's ability to adequately and appropriately express or use verbal means-end processes. Means-end or essential communication skills are necessary as they are the building blocks to more complex language processes such as taking turns in conversation, expressing appropriate emotion, and more generally speaking, social communication. Luczynski and Hanley conducted a study in which preschool students were taught to request teacher attention, teacher assistance, and preferred materials [37]. These strategies were delivered through teacher instruction, modeling, role play, and differential reinforcement. The taught strategies produced effective results; students were able to improve their pragmatic language skills as well as maintain and continue to apply them in the classroom. In addition, these skills aided in the prevention of problematic behavior [37]. In a previous study which had similar aims to the present study, Luczynski and Hanley used role playing and modeling as opposed to pictures to achieve their desired use of communication and ultimately behavior [37].

Affective expression: It is a non-instrumental form of communication which examines the ability to appropriate express polite refusal, regret, support peers, give compliments, use humor, express empathy, gratitude, and encouragement. This requires higher

level thinking because its purpose is not designed to fulfill basic needs. Children who more often make reference to emotional states do so because they possess a deeper understanding of mind and emotion. This skill crucially affects the flow of conversation, the ability to understand others point of view, and is essential in relationship building. Individuals with autism not only struggle with the understanding emotional cues, but also with affective expression. Studies have found that children with autism are less likely to show positive emotion and more likely to demonstrate a flat affect [38].

Affective expression also encompasses or can mutually affect conversational techniques such as topic selection, maintenance, introduction, transition, and closure. 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 nonverbal language is a significant factor that may impact a speaker's use of language. These expressions are often noted in facial expressions, body posture, tone of voice, and eye contact.

These expressions, in turn, portray positive and negative reactions that may result in change of topic, conversation contingency and repair. Buekeboom studied the effects of a conversational partner's affective expression on a speaker's language use. They reported that listeners' affective expressions change a given speaker's language use. Void of language, affective expression can impact the flow of a conversation because it is can be viewed as a sign of understanding, or on the contrary, disapproval. Affective expression can be attributed to conversational adaptations because it requires the speaker to be flexible and responsive to the flow of the conversation.

Paralinguistic signals: It is also a non-instrumental form of communication which assesses one's ability to appropriately use micro-expressions, gestures, and prosody. As opposed to paralinguistic decoding, paralinguistic signals are the acting out of the micro-expressions and gestures. Similar to affective expression, paralinguistic signals impact the speaker's choice of language and consequently the flow of the conversation. Assessing for such a construct is critical as it helps target specific pragmatic deficits in an individual who we may already know has general difficulty in pragmatic language.

Multiple studies have examined the topic of prosody [39,40]. Prosody is defined as the rhythm, stress or intonation of speech [41]. In regards to pragmatics, a speaker's tone can reveal information regarding a speaker's intent. However, studies have revealed that individuals with ASD have deficits in speech prosody, prosodic comprehension, and therefore the ability to draw inferences from a speaker's rate or tone of voice [31,42]. This makes the understanding of idioms, metaphors, and irony, and sarcasm even more difficult to understand, as the inferred meaning differs from its literal meaning [35].

For the purposes of this study, pragmatic language consists of two broad constructs: pragmatic judgment and pragmatic performance. Under each of these constructs are sub-constructs that consists of specific components, both receptive and expressive, that define pragmatic language.

Previous studies have been instrumental in the development of a novel tool, the Clinical Assessment of Pragmatics. This is a comprehensive pragmatic language assessment which defines specific strengths and weaknesses in students who present with HFA and SLI. Quantitative data derived from this assessment may be effective in developing more appropriate student interventions. The goal of this study is to examine the validity and reliability of this instrument based on the test administration and results on adolescent subjects who have been diagnosed with HFA, SLI, and a neuro-typical control group.

Methodology

Participants

Participants were 10 non-disabled students, 10 students with high functioning autism, and 10 students with Language Impairment (LI), ages 14 to 16 years old. Non-disabled students included in the study met the following criteria: 1) exhibited hearing sensitivity within normal limits; 2) presented with age-appropriate speech and language skills; 3) successfully completed each school year with no academic failures; and 4) attended public school and placed in general education classrooms. Inclusion criteria for the high functioning autism group was: 1) having a current diagnosis within the high functioning autism spectrum or Asperger's Syndrome (based on medical records and special education eligibility criteria); and 2) currently attending a local public school, and enrolled in the general education classroom for at least 4 hours per day. Exclusion criteria included comorbid conditions as defined by a DSM- V diagnosis of mental health problems such as clinical disorders, personality disorders and general medical conditions. Finally, the inclusion criteria for the LI group were: 1) having a current diagnosis of Expressive Language delay and Pragmatic Language Impairment (scoring below the 7th percentile on two standardized expressive language tests) or having a current diagnosis of Global Language delay (scoring below the 7th percentile on two standardized receptive and expressive language tests) and having a diagnosis of Pragmatic Language Impairment based on the California Department of Education eligibility code; 2) currently attending a local public school, and 3) being enrolled in the general education classroom. Students from the LI group were excluded from the study if the following were identified: 1) intellectual disability, learning disability, emotional disturbance; 2) comorbid conditions where the student has a DSM- IV diagnosis of mental health problems including clinical disorders, personality disorders and general medical conditions. Additionally, all participants were expected to reside in the Inland Empire region of Southern California. Students were recruited through a licensed speech language pathology nonpublic agency, namely Hill Rehabilitation Services, LLC.

Instrumentation

The Clinical Assessment of Pragmatics (CAPs) test measures both pragmatic judgment and pragmatic performance has a total of six subtests. Each subtest is a collection of 10 video-based role-playing scenarios which presents a target social situation which reflects the pragmatic domains 'pragmatic judgment' and 'pragmatic performance', for a total of 60 short videos. These videos were livestreamed and presented to participants on personal computers. A description of each subtest is presented in Figure 1.

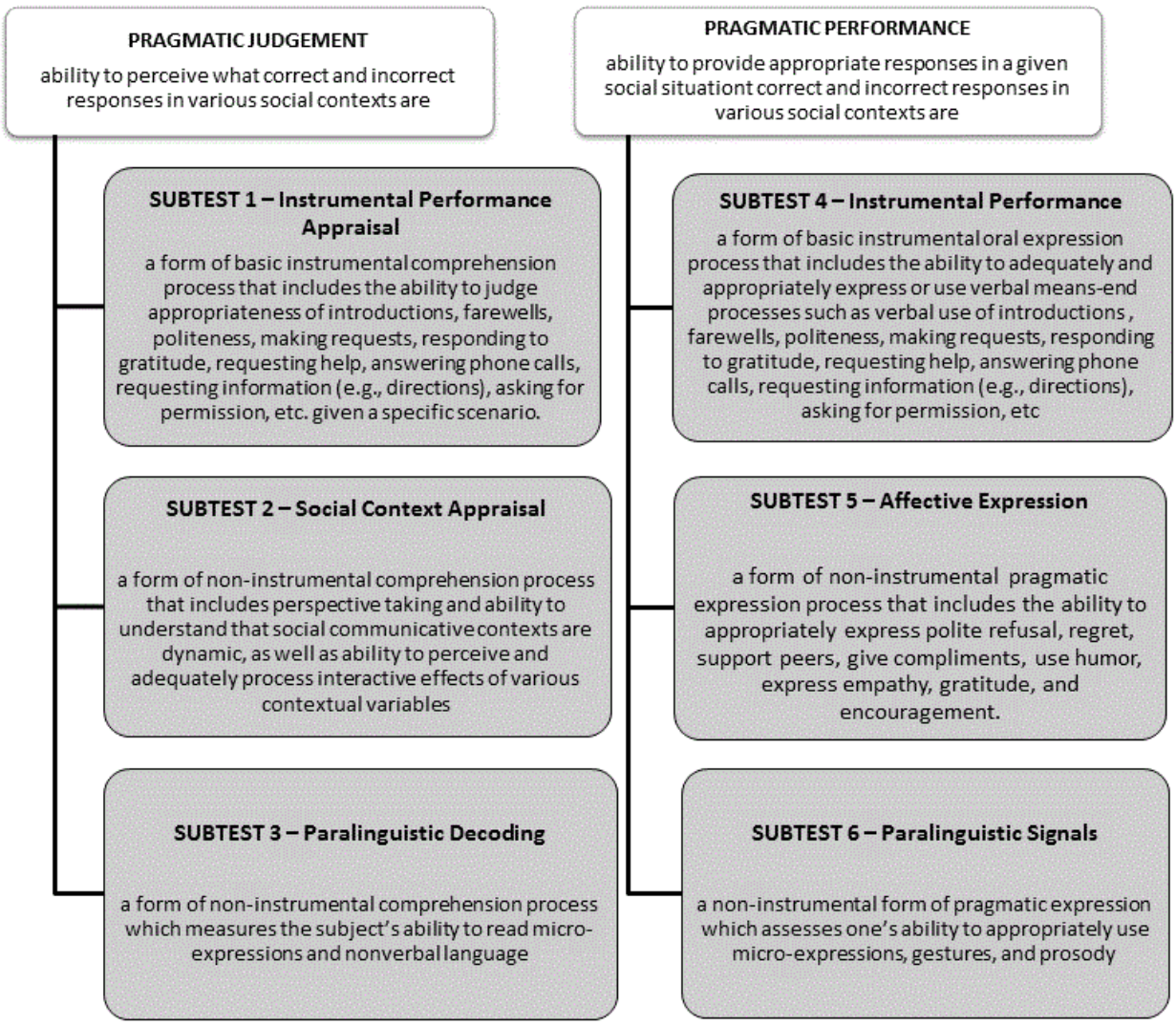

Figure 1: Description of the Clinical Assessment of Pragmatics subtests.

Procedures

All participants received the Clinical Assessment of Pragmatics (CAPs). Individual administration took approximately 45 to 55 minutes. California licensed speech language pathologists (with training in the present protocol) administered this test to participants in quiet rooms in their homes free from distractions.

Before test administration, each participant received two practice videos. The practice videos familiarized the participant with the test requirements and sought to ensure that each participant had a firm understanding of tasks involved. Individual participant testing followed a standardized administration format. This format involved a visual-auditory presentation of each of the video role-plays, at a normal conversational rate of speech using normal patterns of intonation. In addition, the content of the videos contained age-appropriate vocabulary.

Prior to watching individual video role-plays, the participants were given the following instructions for the different pragmatic domains:

Pragmatic judgment subtests

The participants were required to watch individual video role-plays and respond in the following manner: "We're going to look at some short videos of social situations. You'll have to listen carefully because you can only see them once. After watching the video, you will be asked if anything went wrong in the video."

Pragmatic performance subtests

The participants were required to watch individual video role-plays and respond in the following manner: "We're going to look at some short videos of social situations. You'll have to listen carefully because

you can only see them once. After watching the video, you will be asked what you would do in this situation."

Following, the participants were required to answer one of the following questions: "Did anything go wrong in this situation?" or "What would you say or do in this situation?"

Interrater Reliability measures the extent to which consistency is demonstrated between different raters with regard to their scoring of participants on the same instrument. For the inter- rater reliability study, data was examined by two California-licensed speech language pathologists (the first author who has ten years of experience and the second rater without experience scoring the CAPs test) who independently evaluated 15 test administrations that were selected in a random manner. The second rater had one training session during which the item-by-item scoring rules and the procedures of the study were presented before being asked to score the same verbatim responses of the 15 randomly selected participants.

Test-retest reliability. This is a factor determined by the variation between scores or different evaluative measurements of the same subject taking the same test during a given period of time. If the test is a strong instrument, this variation would be expected to be low. The Clinical Assessment of Pragmatics was administered to randomly selected participants during two periods. The interval between the two periods ranged from 16 to 20 days. To reduce recall bias, the examiner did not inform the participants at the time of the first administration that they would be tested again. All retesting was done by the same examiner who administrated the test the first time.

Validity

The validity of a test determines how well the test measures what it purports to measure. Validity can take various forms, both theoretical and empirical. This can often compare the instrument with other measures or criteria which are known to be valid [43].

For the content validity of the test, expert opinion was solicited. Seventeen speech language pathologists were contacted, all of whom were licensed in the state of California and held the Clinical Certificate of Competence from the Clinical Assessment of Pragmatics and had at least 3 years of experience working with children with Autism and Pragmatic Language Impairment reviewed the test. Each of these experts was presented with a comprehensive overview of each of the 6 subtest descriptions, as well as rules for standardized administration and scoring. They all watched 2 videos of a full length administration process of all 6 subtests. Following this briefing, they were asked 5 questions on how each of the subtests (total of 30 questions) related to the content of the test and whether they believed the test to be an adequate measure of pragmatic language skills. For instance, their opinion was solicited regarding whether the questions and student responses properly evaluated their ability to understand and use social language appropriately.

Criterion validity

In assessing criterion validity, a correlation analysis was not possible for all CAPs subtests when compared to the current body of pragmatic language tests. This was not viable because three of the CAPs six subtests, specifically, the Affective Expression, Paralinguistic Decoding, and Paralinguistic Signals, are unique in their content and design. (Figure 2). These subtests cannot be compared to the existing body of pragmatic language tests because of their unique focus. For the concurrent validity of the remaining CAPs tests, we were able to correlate three of our subtests (Figure 2).

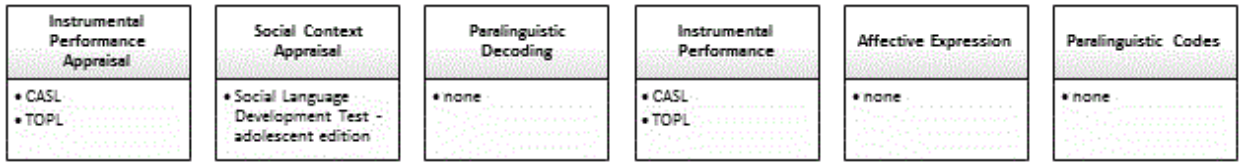

Figure 2: The Clinical Assessment of Pragmatics (CAPs) subtests

To examine criterion validity, correlations of the Instrumental Performance Appraisal and Instrumental Performance subsets with two other measures of pragmatic language tests , i.e., CASL and TOLD, were conducted. The CASL is an individually-administered oral language assessment for students with ages 3 to 21 years which. The test measures lexical, semantic, syntactic, and pragmatic language categories. The Pragmatic Judgment subtest of CASL measures pragmatic competence and use of rules of social language. The Instrumental Performance Appraisal and Instrumental Performance subtests of the CAPs and the Pragmatic Judgement subtest of the CASL were administered to all 30 participants in counterbalanced order. Time between test administrations ranged from the same day to 5 days.

The TOPL is an evaluation of contextual social communication which is based on the determination of students' ability to choose appropriate content as well as make requests and express themselves with language. The Instrumental Performance Appraisal and Instrumental Performance subtests of the CAPs and the TOPL were administered to all 30 participants in a counterbalanced order. Time between test administrations ranged from the same day to 5 days.

The Social Context Appraisal subtest of the CAPS was compared to the Social Development Test – adolescent edition. The Social Language Development Test (for adolescents) is a standardized examination of different language skills which has a strong focus on social interpretation and the ability of the adolescent subject to interact with their peers using skills such as idioms and sarcasm. The Social Context Appraisal and the Social Development Test were administered to all 30 participants in a counterbalanced order. Time between test administrations ranged from the same day to 5 days.

Data Analysis

Data was analyzed using the Statistical Package for the Social Sciences (SPSS) version 23.0. The general characteristics of the

participants were summarized using frequencies and relative frequencies (%). The normality of the quantitative variables was examined using Kolmogorov-Smirnov and Shapiro-Wilk tests. For test retest reliability and inter rater reliability, intraclass correlation coefficients (ICCs) and corresponding 95% confidence intervals (CIs) were calculated. ICCs that were less than 0.40 were considered poor, 0.4-0.7 considered moderate, 0.7 to 0.9 considered substantial, while ICCs above 0.9 were regarded as being excellent. The concurrent validity was assessed using Pearson's correlation among CAPS, CASL, TOPL and the Social Language Development tests. Correlation coefficients of ≥ 0.7 are recommended for same-construct instruments while moderate correlations of ≥ 0.4 to ≤0.70 are acceptable. The level of significance was set at $p \leq 0.05$.

Results

Thirty participants enrolled in the study. The characteristics of the participants by group is displayed in Table 2. Sixty percent of the participants in the control and the high functioning autism groups were males. The majority of the participants in each group were white. Languages spoken at home included English, Spanish, Cantonese, Tagalog, and Russian. The language mainly spoken at home was English (50-60%).

	Control (n=10)		SLI (n=10)		Autism(n=10)	
	Frequency	%	Frequency	%	Frequency	%
Gender						
Male	6	60	7	70	6	60
Female	4	40	3	30	4	40
Ethnicity						
White	4	40	5	50	4	40
African American	3	30	1	10	2	20
Hispanic	1	10	4	40	3	30
Asian	2	20	-	-	1	10
Languages at home						
Spanish	1	10	4	40	3	30
Cantonese	1	10	-	-	1	10
Russian	1	10	-	-	1	10
Tagalog	1	10	-	-	-	-

SLI: specific language impairment. **Table 2:** Characteristics of participants by group (N=30).

The test retest reliability of the various subtests was excellent. The individual ICC values for the various subtests ranged between 0.91 and 0.98 (Table 3).

	ICC	Lower 95% CI	Upper 95% CI
IPA	0.97	0.92	0.99
SCA	0.95	0.91	0.97
PD	0.91	0.82	0.94
IP	0.98	0.96	0.99
AE	0.93	0.87	0.96
PC	0.92	0.9	0.94

IPA, Instrumental Performance Appraisal; SCA, Social Context Appraisal; PD, Paralinguistic Decoding; IP, Instrumental Performance; AE, Affective Expression; PC, Paralinguistic Codes. **Table 3:** Test-retest reliability of the CAPs subtests (n=30)

Similarly, the inter rater reliability of the various subtests was excellent. The individual ICC values for the various subtests ranged between 0.82 and 0.94 (Table 4).

	ICC	Lower 95% CI	Upper 95% CI
IPA	0.9	0.74	0.96
SCA	0.95	0.91	0.97
PD	0.92	0.85	0.97
IP	0.95	0.92	0.98
AE	0.84	0.71	0.93
PC	0.82	0.75	0.91

IPA, Instrumental Performance Appraisal; SCA, Social Context Appraisal; PD, Paralinguistic Decoding; IP, Instrumental Performance; AE, Affective Expression; PC, Paralinguistic Codes. **Table 4:** Inter- rater reliability of the CAPs subtests (n=30).

When assessing validity, the CAPS was significantly correlated with the CASL Pragmatic Judgment subtest, the TOPL and the Social Language Development test. The correlation between the Instrumental Performance Appraisal subtest of the CAPs and the CASL, the TOPL and the Social Language Development test were 0.96, 0.95 and 0.81 respectively, $p < 0.001$). Similarly, the correlation between the Instrumental Performance subtest of the CAPs and the CASL, the TOPL and the Social Language Development were 0.87, 0.88 and 0.84 respectively, $p < 0.001$) (Table 5).

	CASL (PJ)	TOPL	SLDT
IPA†	0.96	0.95	0.81
IP†	0.87	0.88	0.84

Abbreviations: IPA, Instrumental Performance Appraisal; IP, Instrumental Performance; CASL (PJ), the Clinical Assessment of Spoken Language (Pragmatic Judgement); TOPL, the Test of Pragmatic Language; SLDT, the Social Language Development Test. † significant at an alpha of 0.001 level of significance. **Table 5:** Pearson's correlations between CAPs subtests and the (n=30).

For the content validity, the 17 reviewers rated each CAPs subtest on a decimal scale, having to rate 5 questions per subtest with a total possible score of 50. All reviewers agreed that CAPs is a valid measure for assessing pragmatics in students who are ages 14 to 16 years. The mean rating for the Instrumental Performance Appraisal, Social Context Appraisal, Paralinguistic Decoding, Instrumental

Performance, Affective Expression and Paralinguistic Codes subtests were 47.7 ± 0.9, 47.1 ± 0.8, 47.0 ± 1.0, 48.4 ± 0.7, 47.2 ± 0.6, 47.9 ± 1.3 respectively. The following were some of the comments provided by the reviewers: "This is quite an innovative way of testing pragmatic language"," It appears to be an accurate measure of students' pragmatic skills and I am glad to see a separate focus on comprehension versus performance", " The new terminology that you're attempting to introduce is excellent, however the subtest names might be difficult to remember", "Although the presentation of the videos was clear and age-appropriate, I am concerned that the number of the videos in the test might cause fatigue and affect student scores", "I appreciate the ethnic diversity of student actors. Also, the idea of using videos of everyday social situations should definitely become a new standard in testing pragmatics".

Discussion

The basis for developing this test, and the impetus for its use in practice, lies in the frustrations expressed by speech language pathologists with regard to the scarce availability of comprehensive standardized measures of social-pragmatic communication deficits. Some practitioners have gone on record as saying that an effective, standardized instrument may never be developed [24]. Researchers and practitioners have long argued of the need to develop pragmatic language assessments that target the unique social language characteristics of students with high functioning autism and pragmatic language impairment such as higher level language comprehension, inferential thinking and understanding the mind of others [28]. Current means of assessing students who fall into this complex 'gray area' of higher level pragmatic language ability have long relied on careful dynamic and informal observations and documentation. This comes at a major cost of time and labor to identify evidence to indicate that these students qualify for special services through the public schools or specifically, communication intervention. However, even with careful dynamic observations and assessment, it is difficult to determine that these students have the deficits with which their caregivers and educators may suspect they present. Routine observations without a close understanding of the criteria which determines these students' larger deficits in social interaction and socialization may not be insufficient. The present presents a viable testing method: a comprehensive test of pragmatic language ability, one which is not only able to evaluate students' instrumental and "surface" conversational skills, but can be sensitive to the higher level pragmatic skills such as understanding and expression of body language, facial micro-expressions or ability to appropriately express consolation, affection or humor.

In this study, we found that the test-retest reliability for all six subtests was excellent (ICC > 0.90), and the interrater reliability was high (ICC > 0.80). This is indicative of strong test reliability.

A correlation analysis was not run on all subtests of this test (as compared to the current body of pragmatic language tests), because three of the CAPs six subtests, namely the Affective Expression, Paralinguistic Decoding, and Paralinguistic Signals, are unique. These subtests cannot be compared to the current body of pragmatic language tests because of their unique design and focus. In addressing the concurrent validity of the remaining CAPs tests, we were able to correlate three of our subtests. These subtests were correlated to the existing measures (the CASL, TOPL and the Social Development Test) and found to be comparable. Significant correlations were found between two CAPs subtests, i.e., Instrumental Performance Appraisal and Instrumental Performance subtests, and the CASL Pragmatic Judgement subtest and the TOPL. In addition, we correlated the Affective Expression subtest to the adolescent edition of the Social Development Test, because both of these tests assess higher-level abilities in pragmatic language, and are not limited to basic instrumental performance and skills in social situations. Both of these tests examined subjects' abilities in complicated social situations, such as skills in inferencing or in expression of support. We found significant correlations which showed that the Affective Expression subtest is clinically-comparable to existing tools which test for pragmatic language skills.

We asked a body of experts to help in assessing the content validity of CAPs subtests, particularly the ones which are of unique design. They agreed that these subtests are unique, effective and appropriate way to assess the more sophisticated pragmatic skills.. In particular, these subtests were judged to be effective in detecting deficiencies in subjects' decoding of facial micro-expressions or other expressions which were based on intonation or inflection. These experts agreed that these tests were effective means of obtaining an accurate sense of comprehensive pragmatic language profiles not just limited to expression of basic social skills within instrumental social situations. In addition, these subtests were judged to be of strong ability to evaluate for students' capacity for understanding complicated social situations when presented with video based real-life social situations and by judging of students' actual facial expressions and affective language. In addition, by evaluating students' ability to respond with their own facial expressions (as well as their reactions, verbal and not), students' pragmatic language performance was judged to be a more dynamic means of evaluating affective abilities as compared to tests with static pictorial stimuli.

Clinical validity was also determined through a study performed with a sample of 120 children. This study shows that our novel subtests for Paralinguistic Signals / Decoding and Affective Expression were strong and effective means of identifying whether participants presented with pragmatic language deficits. In addition, this tool was determined to be a highly-effective means of differentiating between pragmatic language deficits reflective of high-functioning autism symptomatology versus specific language impairment.

Strengths

Strengths of this study include the ethnic diversity and cultural background of the study participants. However, the most notable benefit of the study was the unique test design consisting of videos which were true to life interactions. The videos were presented in a relevant, life-like content, and the actors in the videos came from a wide variety of ethnic and cultural backgrounds. Verbal dialogue in the videos easy to listen to and understand and was presented at a rate that was controlled for speed without being unnaturally slow. Vocabulary used in the videos was appropriate to the ages of the study participants, and the real-life situations were those which might be expected to occur in environments with which the participants could be expected to be familiar.

The CAPs test can be administered with relative ease, and evaluates both participants' relative level of pragmatic judgment (meaning their ability to comprehend social situations), and their ability to express themselves in an appropriate manner within various social situations. The pragmatic performance aspect of this test identifies the crucial differences which is a unique feature of our test, because it affords the

examiner an opportunity to consider the participants' responses (verbal, as well as micro-expressively and with body language). This test is notably strong for its test-retest and interrater reliability, and for both face and content validity. A forthcoming study will show its clinical reliability.

Limitations

Notable limitations are demographic in nature: more male students participated in the autism group study, due to an inability to secure a strong number of female participants. However, this can be considered reflective of the increased likelihood of male students to present with autism based on current incidence rates. We were unable to secure a large number of Asian students for either the language impairment or autism groups.

Clinical Implications

There is a major need for a comprehensive standardized measure of pragmatic language skills. This is an area well-known as difficult to test because it consists of a gamut of high level intangible and intricate language skills that are challenging to elicit and objectively measure. For this reason, there is a major need for evidence-based tools which can provide accuracy in the diagnosis of students who present with pragmatic language impairment.

This study allowed for validation to be observed in the use of the CAPs. This is a tool which is both valid and reliable and can be used as a means of determining whether school-aged students present with deficits in pragmatic language skills functionally indicative of high-functioning autism or specific language impairment. In addition, this battery of subtests provides significant insight into other characteristics presented by these students, and indicates directions in which future therapies might focus.

Beginning with 'superficial' layers of instrumental social situations, this test delves into every level of pragmatics, and assesses 'intricate' high-level skills such as students' ability to express sadness, affection, displeasure, support, and surprise in an appropriate manner. A key area which may have been overlooked by traditional testing is higher level pragmatic language comprehension and performance. Even students for whom the traditional testing (which for example evaluate instrumental socialization such as answering the phone) find no deficiency, an intangible disability often remains noticeable to parents or teachers. Such areas often do not include an inability to initiate or maintain conversational speech, or to maintain eye contact, or other such obvious areas of deficiency more easily tested by conventional manners of assessment. However, something is lacking in these students' abilities which must be determined if these students are to be served by educators and hope to gain confident roles in society in the future. These children often have difficulties in inferential thinking, such as that which is determined by facial expressions but also by the body language and more subtle implications presented by others in the course of conversation. In addition, while these students, many of whom have Asperger's Syndrome, have difficulties in responding to or processing micro-expressions, they also have difficulty in expressing common emotions: these students often cannot properly express consolation, affection, or sarcasm or other forms of complicated humor. As a result, these subjects who might score high on common measures of linguistic aptitude may present with difficulty in social interaction, and tend to have low rates of social and academic success.

The CAPs is an effective means by which speech language pathologists, as well as other related practitioners, can obtain greater understanding of their students' needs, as well as areas of strength and weakness. We recommend conducting future studies on younger children (ages 7 to 12) or older (ages 17 to 21). Further studies on student performance and the effect of poor linguistic comprehension on pragmatic ability could be significantly beneficial in better understanding pragmatic language deficits. Finally, understanding differences along cultural lines may help in understanding whether there are differences among students who do not speak English as compared to their English-speaking counterparts.

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References:

1. http://www.cdc.gov/ncbddd/autism/index.html
2. Norbury CF (2014) Practitioner review: Social (pragmatic) communication disorder conceptualization, evidence and clinical implications. J Child Psychol Psychiatry 55: 204-216.
3. Hymes D (1971) On communicative competence. Sociolinguistics, Penguin.
4. Prutting CA and Kirchner DM (1987) A clinical appraisal on the pragmatic aspects of language. Journal of Speech and Hearing Disorders 52: 105-119.
5. Grice HP (1975) Logic and conversation. Studies in Syntax and Semantics III: Speech Acts, Academic Press.
6. Mundy P, Markus J (1997) On the nature of communication and language impairment. Mental Retardation and Developmental Disabilities Research Reviews 3: 343-349.
7. Nicolosi L, Harryman E, Kresheck J (2006) Terminology of communication Disorders. Williams and Wilkins.
8. Loukusa S, Leinonen E, Ryder N (2006) Development of answers and explanations to contextually demanding questions: A study of three- to nine-year-old Finnish children.
9. Murdock LC, Cost HC, Tieso C (2007) Focus on autism and other developmental disabilities. SAGE.
10. Seung HK, Ashwell S, Elder JH, Valcante G (2006) Verbal communication outcomes in children with autism after in-home father training. J Intellect Disabil Res 50: 139-150.
11. Reed T (1996) Analogical reasoning in subjects with autism, retardation, and normal development. Journal of Developmental and Physical Disabilities 8: 61-76.
12. Scheeren AM, de Rosnay M, Koot HM, Begeer S (2013) Rethinking theory of mind in high-functioning autism spectrum disorder. J Child Psychol Psychiatry 54: 628-635.
13. Whyte EM, Nelson KE, Scherf KS (2014) Idiom, syntax, and advanced theory of mind abilities in children with autism spectrum disorders. J Speech Lang Hear Res 57: 120-130.
14. Happe F (1993) Communicative competence and theory of mind in autism: A test of Relevance Theory. Cognition 48: 101-119.

15. Bauminger-Zviely N, Karin E, Kimhi Y, Agam-Ben-Artzi G (2014) Spontaneous peer conversation in preschoolers with high-functioning autism spectrum disorder versus typical development. J Child Psychol Psychiatry 55: 363-373.
16. Sattler JM, Hoge RD (2006) Assessment of Children: Behavioral, Social, and Clinical Foundations. Sattler Publisher Inc.
17. Polirstock SR, Houghteling L (2006) Asperger Syndrome: A primer for behavioral interventionists. Journal of Early and Intensive Behavior Intervention, 3: 187-195.
18. Bartlett SC, Armstrong E, Roberts J (2005) Linguistic resources of individuals with Asperger syndrome. Clin Linguist Phon 19: 203-213.
19. Pearce WM, James DG, McCormack PF (2010) A comparison of oral narratives in children with specific language and non-specific language impairment. Clin Linguist Phon 24: 622-645.
20. Ryder N, Leinonen E (2014) Pragmatic language development in language impaired and typically developing children: incorrect answers in context. J Psycholinguist Res 43: 45-58.
21. Mok PL, Pickles A, Durkin K, Conti-Ramsden G (2014) Longitudinal trajectories of peer relations in children with specific language impairment. J Child Psychol Psychiatry 55: 516-527.
22. Green BC, Johnson KA, Bretherton L (2014) Pragmatic language difficulties in children with hyperactivity and attention problems: an integrated review. International Journal of Language and Communication Disorders 49: 15-29.
23. Schoen Simmons E, Paul R, Volkmar F (2014) Assessing pragmatic language in autism spectrum disorder: the Yale in vivo Pragmatic Protocol. J Speech Lang Hear Res 57: 2162-2173.
24. Vicker B (2003) Disability information for someone who has an Autism Spectrum Disorder. Indiana Resource Center for Autism.
25. Gilberg C (2002) A Guide to Asperger Syndrome. Cambridge University Press.
26. Phelps-Terasaki D, Phelps-Gunn T (1992) Test of pragmatic language. Pro-Ed.
27. Volden J, Phillips L (2010) Measuring pragmatic language in speakers with autism spectrum disorders: Comparing the children's communication checklist--2 and the test of pragmatic language. American Journal of Speech-Language Pathology 19: 204-212.
28. Young E, Diehl J, Morris D, Hyman S, Bennetto L (2005) The use of two language tests to identify pragmatic language problems in children with autism spectrum disorders. Language, Speech, and Hearing Services in Schools 36: 62–72.
29. Carrow-Woolfolk E (1999) Comprehensive Assessment of Spoken Language. American Guidance Service.
30. Ryder N, Leinonen E, Schulz J (2008) Cognitive approach to assessing pragmatic language comprehension in children with specific language impairment. International Journal of Language & Communication Disorders 43: 427-447.
31. Chandler D, Munday R (2011) A Dictionary of Media and Communication. Oxford University Press.
32. Bondy AS, Frost LA (1998) The picture exchange communication system. Semin Speech Lang 19: 373-388.
33. Gilberg C (2002) A Guide to Asperger Syndrome. Cambridge University Press.
34. Tien KC (2008) Effectiveness of the Picture Exchange Communication System as a Functional Communication Intervention for Individuals with Autism Spectrum Disorders: A Practice-Based Research Synthesis. Education and Training in Developmental Disabilities 43: 61-76.
35. Acar C, Diken IH (2012) Reviewing instructional studies conducted using video modeling to children with autism. Educational Sciences Theory and Practice 12: 2731-2735
36. Colich NL, Wang AT, Rudie JD, Hernandez LM, Bookheimer SY, et al. (2012) Atypical Neural Processing of Ironic and Sincere Remarks in Children and Adolescents with Autism Spectrum Disorders. Metaphor Symb 27: 70-92.
37. Philofsky A, Fidler DJ, Hepburn S (2007) Pragmatic language profiles of school-age children with autism spectrum disorders and Williams syndrome. Am J Speech Lang Pathol 16: 368-380.
38. Luczynski KC, Hanley GP (2013) Prevention of problem behavior by teaching functional communication and self-control skills to preschoolers. J Appl Behav Anal 46: 355-368.
39. Bieberich AA, Morgan SB (1998) Brief report: affective expression in children with autism or Down syndrome. J Autism Dev Disord 28: 333-338.
40. Fox A (2000) Prosodic Features and Prosodic Structure : The Phonology of 'Suprasegmentals': The Phonology of 'Suprasegmentals'. Oxford University Press.
41. Carter P (2014) Prosodic marking, pitch and intensity in spontaneous phonological self-repair in Dutch. From the Proceedings of the 10th International Seminar on Speech Production. 10th International Seminar on Speech Production.
42. Nguyen NT, Trawinski B, Jung J (2011) New Challenges for Intelligent Information and Database Systems, Springer.
43. McCann J, Peppe S (2003) Prosody in Autism Spectrum Disorders: A Critical Review. International Journal of Language & Communication Disorders 38: 325-350.