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Item Comparison of Two Language Assessments in Children with Autism Spectrum Disorder

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ITEM COMPARISON OF TWO LANGUAGE ASSESSMENTS IN CHILDREN WITH
AUTISM SPECTRUM DISORDER

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ABSTRACT

The language skills of children with ASD vary across the population and prove challenging to assess for many reasons. The current study was designed to compare two language assessments for children with ASD to gain understanding in determining the best method for assessment. The Preschool Language Scale-5 (PLS-5) is a standardized language assessment commonly used in the field of Speech-Language Pathology, while the Verbal Behavioral Milestones Assessment and Placement Program (VB-MAPP) is commonly used in Applied Behavior Analysis. Scores from children with ASD (N=17) on a total of 64 functionally equivalent items from both assessments were analyzed to determine the relationship between the two assessments and if the difference in scores between the two assessments was significant.

Results indicated that the VB-MAPP and the PLS-5 were correlated, in terms of both receptive and expressive measures. The expressive portions between the two assessments were indicated to have a stronger correlation than the receptive portions. The median raw VB-MAPP expressive scores were significantly higher than the median raw PLS-5 Expressive scores. There was no significant difference found between the median raw VB-MAPP receptive scores and the median raw PLS-5 receptive scores.

These findings suggest that the VB-MAPP showed more expressive language skills in the children with ASD than the PLS-5. However, results from receptive portions suggest that both the VB-MAPP and PLS-5 showed similar receptive language profiles for the participants of this study. Results from this study may not generalize to all children with ASD, however, if replicated, they may help professionals who use these tools better understand their overlap (and/or lack of overlap). Further investigation should seek a larger sample size and additional standardized assessments.

CHAPTER 1.
INTRODUCTION

Impairments of language commonly coexist with a diagnosis of Autism Spectrum

Disorder (ASD) but the language skills of individual children with ASD can be extremely

diverse. Consequently, language capabilities can prove challenging to assess. Traditional

approaches to language assessment encompass formal domains of language such as vocabulary

usage, knowledge of syntax, pragmatic use, etc. and are usually administered in the form of

standardized, norm-referenced tests, such as the *Preschool Language Scale-5th Edition* (PLS-5;

Zimmerman, Steiner & Pond, 2011). Communicative behavior is assessed in terms of an

individual's expressive as well as receptive use of language (Sundberg, 2001). There are,

however, alternative methodologies that can lead to a holistic representation of the

communicative behavior of children with autism (Esch, LaLonde & Esch, 2010). Looking at

language from the field of verbal behavior is one such approach. This approach is based on an

alternative understanding of what language is, thereby how it should be assessed. Initially

attributed to B. F. Skinner, this approach views language within the context of its functional

situation. In contrast to the traditional idea of language, verbal behavior has less to do with the

verbal utterance being spoken and more to do with the function that the utterance serves and the

controlling variables surrounding the communication (Skinner, 1957). The current study seeks to

compare a traditional approach to language assessment often used by Speech-Language

Pathologists via the *Preschool Language Scale -5th Edition* (PLS-5) and the verbal behavioral

approach often used by Board Certified Behavioral Analysts via the *Verbal Behavioral*

Milestones Assessment and Placement Program (VB-MAPP; Sundberg, 2008).

Theories of Language

A number of different theories explain the development of language. To clinicians and researchers who focus their work on disorders of communication and language, the understanding of what language is and how it develops is crucial. There are several theories about the way in which our human language system develops. Having knowledge about these different theoretical perspectives allows professionals to be able to shape and reshape their practices to better meet the needs of their clients. Though there are a number of theories of language development, we will focus briefly on the following three main theories: Social Learning Theory, Interactionist Viewpoint, and Operant Learning Theory (Fey, 1986). The viewpoint(s) that the clinician or researchers takes will ultimately shape their professional practices.

The Social Learning Theory (Bandura, 1977) is based on the idea that most human behaviors develop from the observation of events. Learning and performance of the learned behavior are in a constant relationship with internal, cognitive factors (i.e. attention, retention, motor reproduction and motivation). The individual plays an active role in the process of learning language, and using these cognitive factors, is able to select, organize, and transfer stimuli information from which language learning occurs. Clinicians who take this viewpoint would be less concerned with the productions the child is making, and more concerned with facilitating an environment that is conducive to learning and pre-requisite cognitive abilities that are needed for learning.

Bloom and Lahey (1978) presented an alternative theory of language known as the Interactionist viewpoint commonly assumed by many professionals in the field of Speech-Language Pathology. This perspective regards language as a complex system involving three

knowledge bases that are highly interdependent on each other. To be a competent language user, a child needs to have sufficient knowledge of language content, form and use. Knowledge of language content involves referential and relational knowledge, which means, having an understanding of what the words we use actually refer to and knowing the roles they can play in relation to actions, state of affair and to one another. The second knowledge base is knowledge of language form, which refers to the sounds, words, syntactic forms and morphological inflections that are used to represent the content of language. Finally, Bloom and Lahey discuss the knowledge of language use, or pragmatics, which is the social use of language that is influenced by social contexts.

The third theory of language is the Operant Learning Theory (Winokur, S., 1976). Operant learning, or behaviorism, has had a tremendous amount of impact on intervention practices since the early 1960s. Rather than viewing language in the context of abstract theoretical instruments, cognitive processes or linguistic categories, this theory views language as verbal behavior that is no different than any other nonverbal behavior. In his book *Verbal Behavior*, B. F. Skinner (1957) suggests that like all behaviors, it is controlled by a cause (antecedent) and a reinforcement. In other words, verbal productions are the result of a stimulus and should be viewed within the functional relationship that they occur in. He called these types of verbal behaviors "operants," (see Table 1) and they are defined and controlled by the stimuli that prelude them and reinforcements that follow them (Sundberg, 2001). In the simplest terms, this view of language is focused more on the function of language rather than the form (Esch et al., 2010).

Table 1. Skinner's Verbal Operants

Operant	Explanation
Mand	Requesting or asking for something that you want. (e.g., child says juice or points to glass of join to indicate they want it) Mands can also occur if the person wants an undesirable stimulus to be removed (e.g., stop it, pushing materials away).
Tact	Naming or identifying objects, actions, events, etc. (e.g., child says dog because they see an actual dog, pointing to the dog without receiving reinforcer)
Intraverbal	Answering questions or having a conversation where your words are controlled by another person's words (e.g., a child is asked what they want and they respond "bottle" or pointing to a bottle in response to the same question)
Listener	Following instructions or complying with the mands of others (e.g., a child picks up toys when the teacher says "play time is over, it's time to clean up"
Echoic	Repeating exactly what is heard (e.g., saying "ball" after someone else says "ball")
Imitation	Copying someone's motor movements (as they relate to manual sign language). Motor equivalent to echoic (e.g., signing ball, after someone signed ball)
Textual	Reading written words (e.g. a child saying "toys" because they see the written word "toys"
Copying-a-text	Writing a word from a written model (e.g. writing the word "toys" because someone else wrote the word "toys"
Transcription	Spelling words spoken to you (e.g., a child writing the word "toys" because they hear "toys" spoken)

Skinner argued that the same form of a word can take on any number of functions, and therefore a word is not the functional unit of verbal behavior. Rather it is the operant (Skinner, 1957). For example, a child may say the word ball to label a ball on the playground, request an adult to hand him a ball, answer "ball" when asked "What do you want?" or repeat the word "ball" when instructed to do so. The form of all of these verbalizations is the same, but the causing factors and the functions they serve are not. This example is especially true in children

with autism. Echolalia allows many children with ASD to produce appropriate forms for words, while they may still be unable to utilize the same form for different functions such as requesting. According to Skinner, this individual possesses in their verbal repertoire the echoic operant (imitation resulting from a verbal stimuli) but not the mand (resulting from a motivating variable). Additionally, Skinner steers away from classifying language as expressive or receptive (i.e. the ability to comprehend the meaning of language and verbally use that meaning), but instead suggests that they require separate operants (Sundberg, 2001), and that it is especially true in the roles of speaker and listener (Esch et al., 2010).

All these different theories of what constitutes language suggest different ways to assess language. While there is some overlap in the framework and tasks that should be completed as part of language assessment, the differing theoretical backgrounds dictate different applications. The current study seeks to investigate the extent to which the Operant Theory of language can be applied to the assessment of the autism population.

Autism Spectrum Disorder

Autism Spectrum Disorder, or ASD, according to the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) is a developmental disorder characterized by symptoms involving persistent deficits in two main areas: 1) social communication and social interaction across multiple contexts and 2) restrictive/repetitive behaviors (American Psychiatric Association, 2013). Deficits categorized as social communication and interaction must be considered impaired behaviors of social-emotional reciprocity, nonverbal communication behaviors used for social interaction, and developing, maintaining and understanding relationships. Symptoms falling into the second criteria of repetitive and restrictive patterns of behavior, interests, or activities must include at least two of the following categories: stereotyped or repetitive motor

movement, use of objects, or speech; difficulty with changes in routines, inflexible adherence to schedules or ritualized patterns of verbal nonverbal behavior; fixated and abnormally restricted interests; hyper- or hyporeactivity to sensory stimuli or unusual concern with sensory input from the environment. These symptoms, however, may manifest themselves differently in each individual with ASD and subsequently assign differing severities of the disorder. In order for an ASD diagnosis to be made, the individuals' impairment must significantly impact current daily functioning and cannot be better explained by intellectual disability or global developmental delay (American Psychiatric Association, pg. 50, 2013).

Children with ASD are a population of children that as of late have been receiving increased attention across multiple disciplines (Charman & Baird, 2002). This is partly due to advances in early identification of ASD. With optimized methods, individuals can be identified earlier than in previous years (Baird, Charman, Cox, Baron-Cohen, Swettenham, Wheelwright & Drew, 2001). As the identifying characteristics of this population have become more well-defined and broadly known, referrals to specialists are being made at younger ages (Howlin & Asgharian, 1999). Awareness is further brought to ASD with increased media attention and public knowledge that has raised parental concerns (Charman et al., 2002). It is the general consensus that earlier, rather than later intervention is most beneficial for children with ASD (Charman et al. 2002). Accordingly, the prevalence of ASD in the United States is estimated to be 1 in 59 children aged 8 years old. (Baio, Wiggins, Christensen et al., 2014).

The DSM's discussion of the language of children with ASD has seen revisions. Now, this category has been combined with social impairment to form the "persistent deficits in social communication/interaction" category. Additionally, the most recent edition excludes the diagnostic criteria regarding the presence of a delay or lack of spoken language. Simply put, the

fifth edition now allows for the descriptive term "with or without language impairment" to accompany an ASD diagnosis. However, comorbidity of language impairment and ASD is prevalent (Bishop, 2010; see also Bishop, 2000; Bishop, 2003; Bishop & Norbury, 2002).

Regardless of the presence or absence of clinically diagnosed language impairment, due to the pervasive component of pragmatic deficits seen across the spectrum, all children with ASD, according to the American Speech-Language-Hearing Association, are eligible to receive speech-language services (Autism Spectrum Disorder: Overview, n.d.). Because of the responsibility to provide services to a population with such a broad variety of characteristics and severity of symptoms as this, there have been numerous attempts by researchers and clinicians to better understand, not only the language capabilities exhibited from children with ASD, but also the processes by which they emerge and continue to develop (Tager-Flusberg et al., 2009; Capps, Kehres, & Sigman, 1998; Charman, Drew, Baird, & Baird, 2003; Luyster, Kadlec, Carter & Tager-Flusberg, 2008; Kanner,1943; Tager-Flusberg, 1996). It is this same responsibility that drives efforts to determine how best to assess this dynamic population, as exhibited in the current study. The current study aims to provide useful information to guide language assessments for children with ASD.

Language Skills in Children with Autism

One of the key characteristics that draws caregivers' attention to the possibility of an ASD diagnosis can be a delay or lack of development of first words in young children (Wetherby, Woods, Allen, Cleary, Dickinson, & Lord, 2004). While some individuals with ASD do develop some form of expressive language, it is estimated that approximately 25% of the population will not develop functional speech and remain nonverbal (Lord, Risi, & Pickles, 2004). In the other three quarters of the population, however, development of expressive language presents itself in

various ways and usually at a slower rate (Le Couteur, Bailey, Rutter, & Gottesman, 1989). In early years of development, characteristics that would be typically expected from a 12-month-old, i.e. engaging in vocal play and babbling, responding to their name or mother's voice, are often times lacking in children with ASD (Tager-Flusberg, 2013; Lord, 1995; Osterling & Dawson, 1994; Klin, 1991).

Presumably, the most common aspect of language thought to be impaired in an individual with ASD is that of socio-communication, or pragmatics. Deficits in pragmatics can include, but are not limited to reduced use of gesture, lack of eye contact, difficulty understanding and expressing emotions, understanding rules of interactions, comprehension of figurative language and lack of theory of mind. Deviant suprasegmental aspects of language (i.e. intonation, vocal quality, etc.) are frequently noted among individuals with ASD and contribute to their pragmatic impairment (Tager-Flusberg et. al, 2013).

Receptive language abilities of an individual with ASD are of additional concern in the assessment of language. However, even though response to language is a very strong indicator of language in young children, the majority of research involving the language profiles of children with ASD is geared towards investigating their expressive language (Tager-Flusberg et. al, 2013). Furthermore, as one might expect, getting a clear picture of receptive language, especially in minimally verbal children with ASD, presents with significant challenges. Assessment of receptive language generally involves inter-personal interactions with an administrator, an area that has shown to present significant difficulty for these children. Additionally, these children may lack the pointing response many tests rely on to assess receptive language or exhibit perseverations of their responses (Tager-Flusberg, 2000).

It has been reported that toddlers with ASD exhibit greater deficits in receptive language than expressive (Weismer, Lord & Esler, 2010; Barbaro & Dissanayake, 2012; Davidson & Weismer, 2017). This receptive-expressive discrepancy in young children with ASD has been noted throughout the literature, and was even found to be a clinical marker in distinguishing young toddlers with ASD from late talkers without ASD in at least one study (e.g., Davidson et al., 2017). A selection of research articles discussing this phenomenon is listed in Table 2.

Table 2. Subset of Studies Involving Receptive-Expressive Gap

Authors	Article Title	Participants	Assessments	Results
Weismer, Lord, & Esler (2010)	Early language patterns of toddlers on the autism spectrum compared to toddlers with developmental delay.	179 Toddlers with ASD ranging in age from 24-36 mo.	Mullens	Greater deficits in receptive language
Loucas, Charman, Pickles, Simonoff, Chandler, Meldrum & Baird (2008)	Autistic symptomatology and language ability in autism spectrum disorder and specific language impairment	41 children with ASD and language impairment (ALI), 31 children with ASD but not language impairment, 25 children with SLI only, ages 9-14	British Picture Vocabulary Scale 2nd Edition; Clinical Evaluation of Language Fundamental- 3rd Edition UK, Children's Communication Checklist	ALI: equal deficits in receptive and expressive SLI: greater deficits in expressive
Kover, McDuffie, Hagerman & Abbeduto (2013)	Receptive vocabulary in boys with autism spectrum Disorder: cross-sectional developmental	49 boys with ASD, ages 4-11;80 TD boys, ages 2-11	Peabody Picture Vocabulary Test; Expressive Vocabulary Test	63% of participants greater deficits in receptive vocabulary

trajectories

(table cont'd.)

Authors	Article Title	Participants	Assessments	Results
Luyster, Kadlec, Carter & Tager-Flusberg (2008)	Language assessment and development in toddlers with autism spectrum disorders.	164 toddlers ages 18-33 months	Mullen; Vineland; MCDI	Varied by assessment. Mullen: greater deficits in receptive; Vineland: greater deficits in expressive; MCDI:

		greater deficits in receptive
Manolitsi & Botting (2011)	Language abilities in children with autism and language impairment: Using narrative as a additional source of clinical information.	26 Greek children with either ASD or SLI	Narrative production task; The Test of Pragmatic Language; Clinical Evaluations of Language Fundamentals-Revised; Clinical Evaluations of Language Fundamentals-Preschool	Standardized: greater deficits in receptive. Narrative production: greater deficits in expressive

The Importance of Assessment

Because language impairment often coincides with an ASD diagnosis, language assessments are commonly used. Valid and reliable methods of assessment are imperative to clinicians and researchers (Condouris & Tager-Flusberg, 2003). Assessments provide a baseline of current skills of the patient. Results aid in deriving long and short-term goals and determine progression following intervention. Additionally, language assessments are utilized in defining characteristic aspects of language in a given population.

The knowledge that comes from assessments can lead to the identification of certain child characteristics that could ultimately lead to more beneficial early intervention strategies, and in turn, to a greater chance of a favorable prognosis. Identifying an impairment of language with

the use of language assessments is the first step in the process of early intervention. The importance of early intervention was supported in one study that found that when 2-year-old children with ASD were re-evaluated at age 4, the number of hours of speech/language intervention, along with motor imitation ability, were the two most significant predictors of spoken language (Stone et al., 2001).

It is now evident that children with ASD show tremendous variability in their skills over time. Researchers have used assessment of language skills in children with autism to predict later language outcomes (Luyster et al., 2008; Thurm, Lord, Lee & Newschaffer, 2007; Charman, Taylor, Drew, Cockerill, Brown & Baird, 2005; Tager-Flusberg et al., 2013; Weismer et al., 2010; Stone & Yoder, 2001). In fact, it has been stated "language ability is a key prognostic factor for long-term outcomes among children and adults with ASD" (Lord & Ventner, 1992). The study by Luyster et al. (2008) examined language development in 167 toddlers, aged 18-33 months, with ASD and revealed strong predictors of receptive language to include use of gestures, non-verbal cognition, and response to joint attention. These results were concurrent with findings from Weismer et al. (2010) and Thurm et al. (2007) who also found non-verbal cognition to have predictive value. Luyster et al. (2008) also found that along with non-verbal cognition and gestures, imitation is a predictor of later expressive language abilities. Language comprehension in high-functioning individuals with ASD, when compared to individuals with only expressive and receptive language impairment, was shown to be strongly correlated with adult social functioning (Rutter, Mawhood & Howlin, 1992). Getting a clearer picture of the profiles of individuals in this population through assessments not only helps to fulfill the responsibility previously mentioned placed on professionals to provide services (Autism

Spectrum Disorder: Overview, n.d.), but also allows clinicians to better serve children with ASD and their families.

Standardized Language Assessment in Children with ASD

While clinicians and researchers utilize a variety of assessment measures for collecting data of language skills in children with autism, the most broadly used is the standardized, norm-referenced assessment. They typically cover both expressive and receptive capabilities. Standardized assessments are designed to be given in a standardized and consistent way for every individual they assess, allowing for the comparison of scores across different groups of individuals. These assessments are referred to as norm-referenced because the norms that are used for comparisons of scores are based on the scores of a sample, normed to represent a particular population. Of obvious benefit to the use of these assessments is the relatively minimal time requirement necessary for them to be administered (Condouris et al., 2003).

The PLS-5 is the standardized assessment of language that will be used in the current study. It offers norms for children ages birth to seven years; eleven months, taken from a sample of 1,400 children found to be representative of the US population based on 2008 census figures. The test developers state that a statistical analysis of bias was conducted including children from minority groups, and that it was reviewed by experts of such issues, making it appropriate for use with "a wide range of children in a diverse U.S. population" (Screen or Assess Emerging Communication Skills in English and Spanish, n.d.). Including children up to age 7 in test norms allows for older children, who may exhibit skills far below their chronological age to be assessed with this tool, for example older children with ASD and language impairments. Additional benefit of this edition is the Growth Scale Values that provide the clinician a way of tracking progress up until the recommended age. Diagnostic accuracy of this test is demonstrated though

sensitivity of .83 and specificity of .80, at a cut score of one standard deviation below the mean. The PLS-5 assesses both receptive and expressive language through the Auditory Comprehension and Expressive Communication scales in the areas of Attention, Play, Gesture, Vocal Development, Social Communication, Semantics, Language Structure, Integrative Language Skills and Emergent Literacy Skills (Zimmerman, Steiner & Pond, 2011)

The standard error of measure and provided confidence intervals "indicate the degree of confidence that the child's true score on a test is represented by the actual score of the child received" (Betz, Eickhoff & Sullivan, 2013). This takes into consideration possible factors that can contribute to a child's test performance on any given day. The PLS-5 gives confidence intervals for Auditory Comprehension, Expressive Communication, and Total Language scores at the 90% and 95% confidence level (Zimmerman et al., 2011).

There are, however, obvious complications that arise when using norm-referenced, standardized assessments on children with ASD. Children consistent with an ASD profile have difficulty remaining engaged for a set period of time. It is possible that they lack the pragmatic knowledge to fully comprehend the testing situation and the motivation to interact with the clinician (Condouris et al., 2003). New and out-of-routine environments, (i.e., one-on-one interactions in a quiet secluded room with an unfamiliar clinician) may be troublesome, adding to their distractibility and may result in a lack of responsiveness of a child, even though he or she may actually possess the skills being assessed. Especially regarding the minimally verbal subgroup, echolalic or perseverative responses (i.e. choosing the same answer repeatedly but having knowledge of the correct one) may impede their performance. Behavior and compliance issues are also obstacles in those who engage in self-injurious behavior and are more aggressive (Tager-Flusberg, 2000). Conversely, in a population who appreciates structured routine tasks,

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standardized assessments may inflate their performance (Bishop, 1998). Nonetheless, researchers and clinician continue to use them.

Additional Measures of Language in Children with ASD

Created from the work of B.F. Skinner on verbal behavior analysis, the *Verbal Behavioral Milestones Assessment and Placement Program* (VB-MAPP, Sundberg, 2008) is a common tool used to assess children with ASD. In the same study that identified the PLS-4 as being one of two assessments that test for the mand operant (Esch, LaLonde & Esch, 2010), the VB-MAPP was also discussed as offering substantial benefit for assessing language skills in terms of their function contexts. It states that function-based assessments "offer immediate clinical benefit over non-functional speech-language tests because they allow clinicians to identify speaker-listener deficits according to developmental norms in a curricular sequence and, at the same time, they pinpoint the environmental variables that currently control these responses errors" (Esch et al., 2010, p.184). The VB-MAPP does not categorize language into expressive and receptive skills (Sundberg, 2014). Expressive language is represented in measuring the echoic, mand, tact, intraverbal, textual and transcriptive operants. Additionally, the operants of listener discriminations, audience participation, mediator reinforcement, and emotional responder measure receptive language (Sundberg, 2014).

The VB-MAPP is a criterion-referenced assessment that, rather than comparing an individual's scores to a normative sample, that presents challenges in and of itself as previously discussed, it measures an individual's mastery of skills in a specific domain and provides information about what they can or cannot do (Sundberg, 2014). This ability to directly identify an individual's areas of skill or weakness acts as a guide for professionals in designing intervention strategies and placement programs. This is clearly and conveniently given within the

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assessment in the Placement and IEP Goals component, one of five that makeup the assessment. In the Milestones Assessment component, 170 language, learning and social milestones are assessed across 16 domains and three developmental levels: birth to eighteen months, eighteen to thirty months, and thirty to forty-eight months. It also contains the Barriers Assessment, the Transition Assessment, and the Supporting Skills and Task Analysis components. All five components collectively provide descriptive information crucial in the assessment, progress tracking and placement of children with autism that few other assessments offer.

In their study, Gould, Dixon, Najdowski, Smith, and Tarbox (2011) review a number of assessments for their functionality in designing early intensive behavioral intervention (EIBI) programs in individuals with ASD. The effectiveness and relevance of EIBI to this population has been demonstrated through the literature (Cohen, Amerine-Dickens, & Smith, 2006; Sallows & Graupner, 2005; Eldevik et al., 2009; Peters-Scheffer, Didden, Korzilius, & Sturmey, 2011). The review concluded that the VB-MAPP was the most appropriate for structuring EIBI programs for children with ASD in terms of speech and language/communication assessments as compared to eight other language assessments. One of these eight in particular was the PLS-4. The benefits of the VB-MAPP in regards to EIBI programs include defining test items by operant and function, easily obtainable and interpretable results that guide curriculum and tracking charts for visualization of progress.

Because operants can only be defined, and therefore analyzed, in the context of specific circumstances (i.e., antecedent and reinforcement) and the fact that children with ASD may have more difficulty generalizing forms to fulfill different functions, it would be beneficial to this population for their language repertoire to be assessed in these most basic components of verbal behavior. However, most language assessments do not take into consideration the function that a

child's verbalization serves, and instead focuses on correct or incorrect form. In typically developing children, one would expect that after learning the word for a particular object (tact operant, i.e. labeling), that they would be capable of using that word for different functions without explicit training. As mentioned previously, this cannot be assumed for children with ASD (Shafer, 1995). In a population that has limited communication to begin with, it would be most beneficial for assessments to looks at each function of communication independently, and then be used to develop an intervention plan to target each one. When operants are seen as building blocks for developing more advanced language repertoires, the assessment results serve as a starting point for intervention that is specifically aimed at what is lacking, and achieving progress that cannot be met without identifying and mastering prerequisite operants (Sundberg, 2001). If the end goal of speech-language intervention is effective communication, and if effective communication is defined as a functional interaction between two speaking partners, there should be more of an emphasis placed on the identification, and if necessary alteration, of the function that the communication serves (Esch et al., 2010).

The PLS-5 was chosen for the current study to compare the analysis of verbal behavior to a standardized language test. Providing support for the selection of the PLS-5 is the work of Esch, LaLonde, and Esch. Their study (2010) looked at standardized speech and language assessment in terms of their function in verbal behavior analysis. Twenty-eight standardized tests were analyzed according to Skinner's five most basic verbal operants: mand, echoic, tact, intraverbal, and textual (Skinner, 1957). Esch and colleagues (2010) stated that out of seven tests that assess receptive and expressive language, only two tested for the mand operant, one of them being the fourth edition of the PLS. This test was said to include operants of echoic, tact, intraverbal and nonverbal listener in the Auditory Comprehension score, as well as mand, echoic, tact and

intraverbal in the Expressive Communication score. This evidence is however, of particular concern from the field of applied behavioral analysis, from which many children with autism receive services, as the mand is commonly regarded as the earliest established and most beneficial to speakers (Skinner, 1957; Sundberg, 2008). And moreover, though they were included, mands were only indirectly assessment on both test, (e.g. through caregiver report; Esch et al., 2010).

The current study seeks to compare a standardized language assessment via the Preschool Language Scale -5th Edition (PLS-5) and a criterion-referenced assessment often used by Board Certified Behavioral Analysts via the Verbal Behavioral Milestones Assessment and Placement Program (VB-MAPP). The understanding and analysis of any aspect of the complex individual with ASD can be extremely challenging due to the amount of heterogeneity among the population, and therefore, a lack of consensus across disciplines and principles. The assessment of language proves to be no different. However, with the prevalence of ASD on the rise and the population growing in number, it is crucial that there begin to be more agreement for best practice, which includes evaluation. A greater amount of empirical research in this area is imperative for the ability of clinicians and researchers alike to better serve this unique population, from which there is so much still to learn.

Research Questions

In an effort to gain such knowledge, the current study seeks to use the PLS-5 and the VB-MAPP in a comparison of functionality and efficiency in assessing the expressive and receptive language skills in children with autism to address the following research questions:

1) What is the relationship between functionally equivalent items from two language assessments (i.e. PLS-5 and VB-MAPP) for young children with ASD?

2) Is there a significant difference in the performance of these children on functionally equivalent items across assessments?

We hypothesize there to be a correlation between functionally equivalent items on the PLS-5 and the VB-MAPP, and that children with ASD will show more expressive and receptive skills on the VB-MAPP compared to the standardized language assessment, PLS-5.

Participants

For the purpose of this study, participants were recruited from The Emerge Center, in

Baton Rouge, Louisiana. The Emerge Center is a nonprofit organization that provides services to

children with ASD and individuals with other communication difficulties in the surrounding area.

Children considered eligible for the study included children with a diagnosis of ASD, who were

between the ages of 2 years, 0 months and 6 years, 11 months. Children were excluded from the

study if they did not have a diagnosis of ASD, had uncorrected hearing or visual impairments,

and/or who were not between the ages of 2 years, 0 months and 6 years, 11 months. This

included both verbal and nonverbal children.

Two participants were obtained through a chart review at Emerge Center, and their

assessment protocols were provided by Emerge Center staff. Six participants were tested by the

researcher, and the remaining 9 participants were obtained from pre-existing projects. There

were a total of 17 participants in this study, 4 females and 13 males. The participants ranged in

age from 33 months to 79 months, with a mean of 58.82 months and a standard deviation of

13.02.

Table 3. Participant Demographics

Participants (N=17)	
Gender	
Male	$n = 13$
Female	$n = 4$
Age in Months (mean, range, SD)	58.82 (33-79) SD 13.03
Ethnicity	
Caucasian	$n = 10$
African American	$n = 2$
Asian American	$n = 2$
Unknown	$n = 3$

Instrumentation

This study aimed to investigate how similar items on two language assessments for children, the Preschool Language Scale -5th Edition (PLS-5, Zimmerman, 2011) and the Verbal Behavioral Milestones Assessment and Placement Program (VB-MAPP, Sundberg, M. L., 2008), reflect the language skills of a child with ASD. The PLS-5, published in 2011, is a play-based interactive standardized assessment of language that assesses both receptive and expressive language through the Auditory Comprehension (AC) and Expressive Communication (EC) scales in the areas of Attention, Play, Gesture, Vocal Development, Social Communication, Semantics, Language Structure, and. Integrative Language Skills. A Total Language Score is the standard score found by totaling the EC and AC. However, for the purposes of comparison, this study will look at specific items from the AC and EC category that are functionally equivalent to items on the VB-MAPP (see Tables 5 and 6).

According to test developers, reliability of the PLS-5 was obtained by examining the test-retest stability, internal consistency, and interrater and interscorer reliability methods. Test-retest stability was determined by re-administering the test to 195 children, ranging in age from birth to 7 years, 11 months. The average corrected stability coefficients found when comparing scores on Auditory Comprehension, Expressive Language, and Total Language, from each administration range from .86 to .95, indicating good to excellent reliability. For internal consistency, split-half reliability coefficients averaged by age range for Auditory Comprehension, Expressive Communication and Total Language were found to be .90, .93, and .93 respectively. Interrater coefficients for all three subtests across age ranges of birth to 7 years, 11 months, ranged from .95 to .98. Interscorer reliability was calculated for tests items that required scoring judgments (i.e. these items having room for interpretation). Items that did not demonstrate high

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levels of interscorer reliability (i.e. greater than 95% agreement) were scored and rescored.

Results suggest that clear scoring instruction allows for high interscorer reliability.

The VB-MAPP (Sundberg, 2008) is a language assessment program that is behaviorally

based and designed to assess children with autism and other developmental disabilities. This

assessment is based on the Verbal Behavioral Theory of Language (Skinner, B.F., 1957), and

combines this approach with the field of applied behavioral analysis, rooted in Skinner's work on

behavioral psychology. The five components of the VB-MAPP include: *Milestones Assessment,*

Barriers Assessment, Transition Assessment, Task Analysis and Supporting Skills, and *Placement*

and IEP Goals. Details of each component can be found in Table 4.

Table 4. Components of the VB-MAPP

Milestones Assessment	Provides a representative of the child's existing verbal and related skills; composted of 170 learning and language milestone, sequenced and balanced across three language development age levels
Barriers Assessment	Provides an assessment of barriers faced by children with autism or other developmental disabilities, to facilitate development of specific strategies to overcome them; composed of 24 common learning and language acquisition barriers
Transition Assessment	Provides information regarding a child's progress and skills that would allow them to transition to a less restrictive educational environment; composed of 18 assessment areas
Task Analysis and Supporting Skills	Provides a further breakdown of skills and serves as a more complete and ongoing learning and langue skills curriculum guide; composed of approximately 750 skills and covering 14 domain of the assessment
Placement and IEP Goals	Provides specific direction for each 170 milestones, as well as suggestions for IEP goals

The milestones assessment was the main focus for the purpose of this study. As part of

the Emerge Center's Applied Behavioral Analysis program, each child who receives ABA

services is administered the VB-MAPP every six months. Participants' VB-MAPP scores were

obtained from the Emerge Center's Board Certified Behavior Analysts (BCBA), who is certified in administering this assessment.

The Milestones Assessment of the VB-MAPP assesses a child's language skills in regards to units of communicative function, referred to as operants. It is divided into Levels 1-3 based on age at which skills would appear in typically developing children (0-18 months, 18-30 months, and 30-48 months) and assesses all nine verbal operants (see Table 1). Scores of 0, ½, and 1 are given for each item in a domain. Each participant's raw score from the *Milestones Assessment* will be used for data analysis, to be detailed in a later section.

Procedure

Administration of the PLS-5 took place at the Emerge Center, following the participants typical hours of attending the center. The assessment was administered by a speech-language pathology graduate clinician from Louisiana State University (LSU), who was trained to reliably administer and score the assessment according to standardized procedures. Most testing sessions occurred in the Emerge Center conference room, with dividers used to create a smaller space to aide in decreasing distractions. Testing environment was quiet and well-lit. For two participants the assessment was administered in smaller observation room at the Emerge Center, with similar accommodations for decreased distractibility. Participants were either seated at a table in a chair next to the clinician or on the floor seated across from or adjacent to the clinician. Seating arrangements were subject to the individual participant's age and preference to optimize their potential performance. After performing a preference assessment at the beginning of the session, preferred reinforcers were used throughout the administration of the PLS-5.

Each session was recorded via a video camera or iPad. Test administration time averaged 60 minutes per session, with five participants requiring an additional session to complete

administration. Entry points were determined by using the suggested start points in the PLS-5

Administration and Scoring Manual, taking into consideration those suggested for children with

mild to moderate or severe to profound language impairments.

Data Analysis

To address the research question of this study regarding the relationship between the

items from the PLS-5 and items from the VB-MAPP *Milestones Assessment*, a Pearson

Correlation Coefficient was used to analyze their comparison. The PLS-5 is organized into

expressive (EC) and receptive (AC) language skills. For the purpose of comparison, the VB-

MAPP was likewise categorized in this way. Items from the two assessments were matched

according to the functionally equivalent skills they assess. Scores from the selected items on the

VB-MAPP were compared to the scores from the functionally equivalent items on the PLS-5. An

item analysis from the two assessments is presented in Tables 5 and 6.

Table 5. Functionally Equivalent Item Analysis Assessing Receptive Language

VB-MAPP	PLS-5
Listener 1: Attends to speakers voice by making eye contact with speaker 5 times	AC 1: Glances momentarily at a person who talks to him or her. AC 2: Enjoys caregiver's attention.
Listener 2: Responds to hearing his own name 5 times	AC 12: Interrupts activity when you call his or her name
Listener 3: Looks at or points to correct family member; pet or other reinforcer	AC 13: Looks at objects or people the caregiver points to and names AC 20: Identifies familiar objects from a group of objects without gestural cues *complete if 2/4 are correct AC 21: Identifies photographs of familiar objects *complete if 4/6 are correct

(table cont'd.)

VB-MAPP	PLS-5
Listener 5: Selects the correct item from an array of different objects or pictures	AC 23: Identifies basic body parts on a toy *complete if 4/5 are correct AC 24: Identifies things you wear from a verbal prompt. *complete if 3/4 are correct AC 37: Identifies colors *complete if 4 are correct
Play 6: Searches for a missing corresponding toy or part of set	AC 17: Demonstrates relational play by using two objects together in play
Play 7: Independently demonstrates the use of toys objects according to their function	AC 16: Demonstrates functional play by using objects appropriately
Play 10: Assembles toys that have multiple parts for 5 different set of materials	AC 18: Demonstrates self-directed play *uses object toward self
Listener 9: Follows two-component noun-verb instructions	AC 19: AC 30: Recognizing action in pictures *complete if 4/6 are correct
LRFFC 9: Selects an item given 3 different verbal statements about each item when independently presented	AC 31: Understands use of objects given a verbal description of their function. *complete if 3/4 are correct
Listener 11: Selects items by color and shape from an array of similar stimuli	AC 37: Identifies colors of crayons *complete if 4/6 are correct
Listener 12: Follows two instructions involving 6 different prepositions and pronouns	AC 27: Understands pronouns *complete if 2/3 are correct AC 39: Understands spatial concepts *complete if 3/4 are correct
Listener 14: Follows 3-step directions	AC 60: Follows multistep direction
Play 11: Spontaneously engages in pretend or imaginary play	AC 26: Engages in pretend play AC 29: Engages in symbolic play

Table 6. Functionally Equivalent Item Analysis Assessing Expressive Language

VB-MAPP	PLS-5
Mand 1: Emits 2 words, signs or icon selections	EC 24: Uses gestures and vocalization to request objects
Tact 1: Tacts (labels) 2 items echoic or imitative prompts	EC 26: Names objects in photographs *complete if 5/10 are correct
Tact 3: Tacts (labels) 6 non-reinforcing items	EC 26: Names objects in photographs *complete if 5/10 are correct EC 30: Names a variety of pictured objects *complete if 5/8 are correct

(table cont'd.)

VB-MAPP	PLS-5
Vocal 2: Spontaneously emits 5 different sounds	EC 21: Produces 3 different types of consonant-vowel (C-V) combinations
Vocal 4: Spontaneously emits 5 different whole word approximations	EC 23: Uses at least five words
Vocal 5: Spontaneously vocalizes 15 whole words or phrases	EC 32: Uses a variety of nouns, verbs, modifiers, and pronouns in spontaneous speech
IV 9: Answers 25 different what questions	EC 36: Answer what and where questions *complete if 3/4 are correct EC 37: Names described object *complete if 2/3 are correct EC 38: Answers questions logically
Linguistic 8: Emits 10 different 2-word utterances	EC 29: Uses different word combinations *complete if 3/5 are correct
Tact 12: Tacts (labels) 4 different prepositions and 4 different pronouns	EC 42: Uses prepositions *complete if 3/3 are correct EC 43: Uses possessive pronouns *complete if 2/2 are correct
Tact 13: Tacts (labels) 4 different adjectives excluding colors and shapes	EC 47: Uses qualitative concepts (long/short) *complete if 2/3 are correct
Tact 14: Tacts (labels) with complete sentences containing 4 or more words	EC 33: Produces one four- or five- word sentence
Linguistic 11: Emits noun inflections with suffixes for plurals	EC 35: Uses plurals *complete if 2/3 are correct
Linguistic 12: Emits verb inflections with affixes for regular past tense	EC 64: Uses past tense form

CHAPTER 3.
RESULTS

First Research Question

To assess the relationship between the two assessments, a Pearson Correlation was

performed using the mean raw score from the VB-MAPP and the PLS, obtained from scores on

their functionally equivalent items. Correlations were categorized by measures of receptive and

expressive language skills. The correlation found between scores from the receptive portions of

the VB-MAPP and the PLS-5 resulted in Pearson $r = .602$, $p < 0.05$. The correlation found

between scores from the expressive portions of the VB-MAPP and the PLS-5 resulted in Pearson

$r = .827$, $p < 0.01$. Both expressive and receptive portions of the VB-MAPP were found to be

correlated with portions on the PLS-5; the expressive portions of both assessments being

strongly correlated.

Table 7. Correlations Between Raw Scores of the VB-MAPP and PLS-5

	Pearson Correlation	Level of Significance
Receptive Portions of the VB-MAPP and PLS-5	.602	< 0.05
Expressive Portions of the VB-MAPP and PLS-5	.827	< 0.01

Second Research Question

A Wilcoxon Signed Ranks Tests was used in this study to further examine the

significance of the differences in scores between the two assessments, categorized by receptive

and expressive portions. The nonparametric statistical analysis was used due to the small sample

size. For the 17 participants, the mean raw score from the VB-MAPP Receptive portion was M

$=7.88$ with a standard deviation of $SD =3.97$. The mean raw score from the PLS-5 Receptive

portion was $M =7.22$ with a standard deviation of $SD =3.25$. Statistical analysis of scores did not

indicate a statistically significant difference between the receptive portions of both tests. A

second analysis was performed with scores from the expressive portions of both tests. The mean

raw score from the VB-MAPP Expressive portion was M = 7.56 with a standard deviation of SD

= 3.79. The mean raw score from the PLS-5 Expressive portion was M = 5.78 with a standard

deviation of SD = 3.98. Analysis indicated these scores to be statistically significantly different,

Z = -2.513, p = .012.

Table 8. Descriptive Statistics of Raw Scores from the VB-MAPP and PLS-5

		Mean (M)	Std. Deviation (SD)	Minimum	Maximum
Receptive	VB-MAPP	7.88	3.97	2.00	13.00
	PLS-5	7.22	3.25	1.00	12.00
Expressive	VB-MAPP	7.56	3.79	.50	13.50
	PLS-5	5.78	3.98	.00	11.50

Table 9. Statistical Analysis of Difference Between Mean Raw Scores

Receptive Portions of the VB-MAPP and PLS-5	
Z =	-.85
Asymp. Significance =	.394
Expressive Portions of the VB-MAPP and PLS-5	
Z =	-2.51
Asymp. Significance =	.012

CHAPTER 4.
DISCUSSION

The purpose of the current study was to compare the relationship between two language assessments for young children with ASD and to describe the efficiency to which they measure their language skills. Both assessments used in the study are commonly utilized with this population, in different professional fields. The study sought to investigate the relationship between the two assessments and how the child with autism's performance on a traditional norm-referenced, standardized assessment differed from their performance on an assessment that is criterion-referenced and assesses language in terms of verbal behavior. The following research questions guided the study: 1) What is the relationship between functionally equivalent items from two language assessments (i.e. PLS-5 and VB-MAPP) for young children with ASD? 2) Is there a significant difference in the performance of these children on functionally equivalent items across assessments?

First Research Question

The study looked at 26 items from the VB-MAPP and matched them with 38 items from the PLS-5. The correlation was found to be significant between these functionally equivalent items from both assessments, with expressive items being more strongly correlated. That is to say that there is a relationship between the items compared. This significant relationship suggests that scores from the items of one assessment can then be used to predict scores on items of the other. This is essential for the purpose of the current study, since it allows for the meaningful comparison of scores from one assessment to the functionally equivalent scores of the other. Without this correlation, scores could not be meaningfully compared. It also suggests that the two professionals would get a similar picture of the child if they each administered each assessment.

Second Research Question

To answer the second research question, a Wilcoxon Signed Ranks Test was used for data analysis. It was found that the significance of the difference in performance between the assessments differed among the receptive and expressive portions. Results indicated that the median Raw VB-MAPP Expressive scores ($M = 7.55$, $SD = 3.79$) were statistically significantly higher than the median Raw PLS-5 Expressive scores ($M = 5.78$, $SD = 3.98$). Otherwise speaking, the VB-MAPP showed more expressive language skills in a child than the PLS-5 showed. However, it was also found that the median Raw VB-MPP Receptive scores ($M = 7.88$, $SD = 3.97$) were not significantly different than the median Raw PLS-5 Receptive scores ($M = 7.22$, $SD = 3.25$). Both assessments showed similar results when assessing the child's receptive skills.

Interpretations

The findings from the current study suggest that both the VB-MAPP and the PLS-5 are equally efficient means of assessing receptive language in young children with ASD, whereas the VB-MAPP shows that children scored higher for the expressive portion as compared to the PLS-5. Based on previous research (Condouris et al., 2003; Tager-Flusberg, 2000; Bishop, 1998), we anticipated that children with ASD would perform worse on the standardized assessment (i.e. PLS-5) compared to the VB-MAPP. However, this was only the case for the expressive portion and not for the receptive language skills. Therefore, confining the expressive language skills of a child with ASD to outcomes collected in a one-time session may not be sufficient in understanding and measuring their true expressive language abilities. The core language deficits of ASD include deficits in expressive language. They may become enhanced in a stressful, structured environment, with an unfamiliar clinician, leading to a misrepresentation of the expressive skills they exhibit in more naturalistic settings and over longer periods of time. The

VB-MAPP collects data over an extended period of time. This may explain why the VB-MAPP showed more expressive language skills; skills that may not have been observed and accounted for during a one-time session.

If it is true that standardized assessments lack the ability to give a true representation of a child with ASD's language, we should see this trend across expressive and receptive measures. However, this was not the case. There was not a significant difference found between the receptive language scores of each test. To this finding, it is important to note that all children included in the study who were administered the VB-MAPP, also receive Applied Behavior Analysis services (ABA) at the Emerge Center. ABA uses a technique known as Discrete Trial Training, in which specific behaviors are individually and systematically taught. Often, these behaviors include skills like the pointing response and following commands. Lacking these skills would hinder a child's performance on a standardized assessment, whereas being explicitly trained in such skills could increase their performance. This Discrete Trial Training may explain why results from both assessments were not significantly different for receptive language.

Clinical Implications

While these results only represent a small sample of children with ASD and only two types of assessments, some clinical implication may be gathered. Results from this study should guide the clinical practice of professionals working with children with ASD. It is clear that relying on a "snapshot" of a child's abilities obtained through standardized assessment may not be sufficient in truly measuring their strengths and weaknesses, especially regarding expressive language. In general, the current study provides two important clinical implications:

1) Clinicians would benefit from using a holistic approach to language assessment and being open to interdisciplinary assessments and evaluations. Gathering the most

information possible is ideal in assessment, as well as the development of future

treatment directions.

2) Clinicians should take into consideration that children with ASD will show varying

levels of skills in different situations and communicative environments.

Understanding the variability across this population and within individuals is crucial

for a clinician to best serve his or her clients.

Limitations

There were several limitations in the way the current study was conducted. First, the

small sample size ($N = 17$) did not allow for a strong statistical analysis of the data. A

nonparametric test was used in the data analysis due to the small sample size. A larger sample

would increase statistical power and possibly lead to stronger results from which better clinical

applications could be extrapolated. Another limitation is the variability between the participants.

The range of ages for the 17 participants was 46 months ($M= 58.82$, $SD = 13.03$). Such diversity

does not control for the possibility that the performance of different age groups may vary by

assessment and/or skills. A more homogenous sample, either with a narrower age group or

narrower inclusion criteria might yield different results. A third limitation is the time span

between administrations of both assessments. Although the study only included participants

whose VB-MAPP's had been administered within six months of the PLS-5 administration,

language skills can progress significantly in this time. In which case, comparing the two

assessments would be inappropriate.

Future Directions

The study of language assessments in children with ASD could take a number of different

future directions. The current study could be improved by increasing the number of participants,

thereby decreasing variability and increasing the statistical strength of its results. Additionally, researchers could categorize participants by age range or level of verbal expression, to investigate the relationship between different groups and their performance on the VB-MAPP verses the PLS-5. It was also be interestingly to look at other domains of the VB-MAPP, e.g. the Barriers Assessment, and their relationship to a child's language scores of the PLS-5. Researchers also have the option to explore other standardized language assessments, e.g. the Clinical Evaluation of Language Fundamentals- Preschool-2 (CELF-P-2; Wiig, Secord, & Semel, 2004) and their relationship to the VB-MAPP.

Conclusion

In conclusion, the current study found that both the expressive and receptive portions of the VB-MAPP are correlated with the PLS-5, when administered to young child with ASD. We hypothesized that children with ASD would show more expressive and receptive skills on the VB-MAPP compared to the standardized language assessment, PLS-5. The difference between the mean raw scores measuring expressive language was found to be significant different, with the VB-MAPP showing higher expressive language scores. However, contrary to our hypothesis, there was no significant difference between the mean raw scores measuring receptive language. Given the results of the current study, clinicians should be aware of the benefits of an interdisciplinary approach to clinical practice in children with ASD and the variability within this population and its individuals. Due to limitations of this study, further research is needed to expand our understanding of these children and the most accurate method to assess them.

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