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## **Evaluating efficacy of parent/toddler language playgroups: Implementing a researcher-practitioner partnership**

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NORTHERN ILLINOIS UNIVERSITY

*Evaluating efficacy of parent/toddler language playgroups:  
Implementing a researcher-practitioner partnership.*

A Thesis Submitted to the

University Honors Program

In Partial Fulfillment of the

Requirements of the Baccalaureate Degree

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Department of

Communicative Disorders

By

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## ABSTRACT

This project developed guidelines for speech-language pathologists to use when making data-driven decisions on whether to keep a child in services or to dismiss the child from direct therapy. The purpose was to develop an action plan to guide the clinician in decision-making. Three questions were posed: 1. What should be evaluated? 2. Which tools should be used and how often? 3. How could these results be interpreted to inform clinical decision-making? To do this, a literature review was conducted and recommendations were discussed with a speech-language pathologist and a clinical researcher working at this university. Proposed guidelines focused on total vocabulary, verb lexicon, word combinations, and three longest sentences. Recommended tools include the Communicative Development Inventory and a measure of unique syntactic types. Recommendations for interpreting growth on these measures at three-month intervals are provided. The viability of these measures can be evaluated in future research.

Following every comprehensive evaluation of late-talking children, speech-language pathologists are faced with the same clinical pressures and decisions. The first pressure felt is that of the tension between early identification versus using resources judiciously. There is an overwhelming feeling of many clinicians to "catch" as many children as possible in the hopes of properly identifying these children with early language impairments. However, a number of children resolve their early delays and appear to catch-up (Paul 2000). Therefore, there is concern about the appropriate use of finite financial resources. Limited resources require service providers to think critically about when services are truly necessary and what types of services are required to bring about change. Paul (1996) has argued that monitoring language growth may be appropriate until a certain age because the majority of children do grow out of it. In 2000, Paul suggested parent training as another viable alternative. Yet, in both cases the justification for more direct and/or intensive services should be based upon evidence that children are not making adequate progress in language development. Furthermore, Paul is concerned that unnecessary treatment may alter a child's own view of himself. The child may wonder why they are different for having to receive services when his or her peers do not. They may start to develop a sense that there is something wrong with him or her, or they are not on the same level as other children. Spontaneous recovery is the end result for the majority of late-talking children. Paul (1996) encourages the clinician to err on the side of underidentifying children rather than overidentifying, with the intention of continuing to monitor the child, with no immediate action. Although many children do spontaneously recover, Olswang et al. argues that clinicians can make a more informed choice for the percentage of children who do not spontaneously recover.

Through data-driven decision-making, it should be possible to determine when treatment is warranted for a particular child or not. And when receiving services, data-driven decision making can help clinicians determine what next decision to make, that is, whether to dismiss, continue, or increase the type or intensity of the treatment. A decision making matrix is shown in Table I. The decision to dismiss or keep enrolled and the "true" needs of the child create four possible scenarios.

<b>Table I</b>	Keep enrolled (ideal)	Dismiss (ideal)
Keep enrolled (actual)	Right decision, child needed services and received them. ++	Wrong decision, child did not need services, but still received them (overidentification). +-
Dismiss (actual)	Wrong decision, child needed services, but did not receive them ("missed"). -+	Right decision, child did not need services and was not given any. --

As Table I shows, the first scenario is that the child truly does need services and receives them, making it the right clinical decision. The second scenario is the child did not really need services, but was still enrolled and received services. This wrong decision is known as overidentification. The third scenario is withholding services in the hopes of a spontaneous recovery when, in fact, the child needed services. This child has now lost the early intervention he or she needed and was "missed." The final scenario is to not recommend services and the child spontaneously does recover and did not need services at all. Data are available to guide data-driven decision-making. Rescorla, Mirak, and Singh (2000) build on this idea by showing that a child's growth between 2;0 and 2;6 is more important than deciding by looking at a child's ability at a single point in time (e.g. 24 months). Rather, Rescorla (2000) looks at the progress a child is making. Furthermore, Hadley (2005) also encourages clinicians to make decisions based upon

growth over time. Rescorla et al. demonstrate that vocabulary is necessary to evaluate, but it is not sufficient to see the whole picture of a child's growth over time. This is true too when evaluating a child's grammar growth. It must be evaluated over time, especially since grammar (more so even than vocabulary) builds on previously acquired skills. This growth isn't seen in anyone single score, but rather patterns of growth over time. Table II lays out empirical information behind such evaluation for vocabulary and grammar.

**Table II**

Source	Measure	Empirical Findings
Rescorla, Mirak, Singh 2000	Vocabulary total	This longitudinal study documented the nature of vocabulary growth in late talking children between the ages of 2 and 3 and the relationship of rapid versus slow vocabulary growth to language outcomes on other variables at age 3. Examination of individual growth trajectories for total vocabulary size on the Language Development Survey indicated that some late talking children demonstrated accelerated growth 2;0 and 2;6 with their total vocabulary exceeding 100 words at 2;6 (Group 1) whereas other children continued to demonstrate a slow pattern of vocabulary growth during this period (Group 2). G1's linear slope was about double that of G2's. Importantly, children's rapid vs. slow growth trajectories were identifiable between 2;2 to 2;4 (308). Although the vocabulary spurt occurred later than average for these children, if the spurt occurred shortly after the second birthday, vocabulary outcomes were average by 3;0. However, children with small expressive vocabularies at 2;6 and only gradual growth trajectories were very likely to have significant expressive language delays at age 3;0. The authors concluded that when vocabulary delays persisted until 2;6, focused intervention was warranted (310). It was only by looking at the progress made over time that these trajectories became identifiable.
Bates, Marchman, Thal, Fenson, Dale,	Vocabulary total and Verb Lexicon	The purpose of this study was to show that all children go through the same basic sequence that activates a common set of structures and processes with small variations in the onset for specific language milestones. The methodology was to compare results from Part I and Part II of the

<p>Reznick, Reilly, Hartung 1994</p>		<p>Communicative Development Inventory for toddlers. This data is based upon the cross-sectional data obtained from parents completing the Communicative Development Inventory. There was an increase in nouns at a mean of 55.2% in (typical) children with vocabularies between 101 and 200 words and drops to a mean of 41.9%. Nouns have a linear growth component (F (1, 381) for weighted linear term = 260.04, p &lt; 0.00001). Nouns accelerated early and leveled off around 200 words, but predicates started off slowly but showed a constant linear expansion up to the checklist baseline. Nouns and predicates show a sharp drop in rate of growth after a child hits 50 words (101). Common nouns have a steep and constant deceleration in rate of growth across all vocabulary levels after the 50-word point. Predicates show steady decline in rate of growth across the period from 100 to 600 words, but are still growing faster than nouns between 50 and 400 words (102).</p>
<p>Olswang, Long, Fletcher 1997</p>	<p>Verb Lexicon</p>	<p>The purpose of this study was to determine the role of lexical development in children with Specific Expressive Language Impairment in the emergence of word combinations and growth in Mean Length of Utterance. The relationship between lexicon size and composition and the subsequent production of word combinations was analyzed. There was a moderately high correlation between the overall size of verb lexicon during the baseline phase and the number of word combinations containing verbs during treatment and withdrawal phases. "Changers" (children who demonstrated the greatest increases in WC) evidenced single-word productions of intransitive and ditransitive verbs and had no relation with transitive. Vocabulary size and lexical diversity were predictors in utterance length. Larger numbers and the variety of verbs that function as intransitive or ditransitive facilitate word combinations.</p>
<p>Hadley 1999</p>	<p>Word Combinations</p>	<p>The purpose of this study was to introduce and validate an adaptation of unique syntactic types in order to provide a more time-efficient measurement strategy for monitoring early grammatical development in children with disabilities. The methodology used was to evaluate the child's abilities using the LDS, the CDI, the Index of Productive Syntax, and MLU and then comparing the data across all of them with Unique Syntactic Type. Language samples collected at 3 month intervals at approximately 27</p>

		<p>months, 30 months and 33 months were analyzed. The purpose of this study is to demonstrate that UST is a valid alternative for children with MLUs between 1.00 and 2.00. UST is correlated with MLU and IPSyn, and is more stable than MLU and is a more time-efficient measure for documenting progress than IPSyn. When average USTs per 12-minute sample were considered, stability increased (from all <math>r &gt; .37</math>) to (Times 1 to 2, <math>r = .66, p &lt; .001</math>; Times 2 to 3, <math>r = .42, p &lt; .05</math>; Times 1 to 3, <math>r = .62, p &lt; .01</math>), demonstrating UST's stability across consecutive samples as well as over the longer 6-month period of time. UST was related to subsequent performance over about 3 to 6 months.</p>
Lyytinen, Lyytinen 2000	Mean Three Longest (M3L)	<p>The purpose of this study was to identify early precursors of later reading disabilities in children with dyslexic parents. Several measures of language ability were compared for the offspring of parents with and without a history of dyslexia. The CDI measure of maximum sentence length was the only measure which differentiated children with and without familial risk for dyslexia, <math>F(1, 195) = 4.72, p &lt; .05</math>, at 2 years.</p>

A second clinical decision faces practitioners that have enrolled late-talking children into immediate intervention. Clinicians must decide when children have made sufficient progress to dismiss them from treatment or not. Again, the clinician is faced with four possible scenarios: to keep enrolled when the child needs the continued services, to keep him or her enrolled when they do not need continued services, to dismiss too soon when the child still needs services, or to dismiss a child and the he or she no longer requires services. The task of this capstone is to provide recommendations drawn from existing literature to guide data-driven decision-making. These pressing questions from clinical practice provide the framework for this capstone to develop an action-plan for clinicians. The purpose of this action-plan is to ask three questions: 1. What should we evaluate? 2. Which tools should be used and how often? and 3. How could these results be interpreted

to inform clinical decision-making? To aid clinicians with data-driven guidelines for increasing/monitoring/reducing services, this literature is reviewed and guidelines for clinical practice are provided.

With all the different aspects of communication growth that can be evaluated in children, this capstone identifies total vocabulary, the verb lexicon within the vocabulary, and word combinations as three important aspects to evaluate. Table II shows empirical findings used to answer the question of what does science tell us about these three measures? Vocabulary is first evaluated as the first means of clinical measurement of a child's language development. Total vocabulary size becomes the starting point because without it there is no verb lexicon, word combinations, or any of the other forms of measurement for a child's oral communication progress. Rescorla et al. (2000) looks at two groups (01 and 02) of late-talking children. 01 being the late talking children who easily caught up and 02 being the late talking children who faced a tougher road to normalizing. Their progress is measured using parent reports (LDS) of the total vocabulary between the ages of 2;0 and 3;0. What differentiated the groups was whether there was a word spurt by age 2;6 of at least 100 words (Rescorla 301). Children in late-talker group two (0 2) showed a different pattern of nominal percentage over time than children in the late-talker group that did show a word spurt between 2;2 and 2;8 (01). 01's total vocabulary showed a linear slope that was about double that of 02's. 01 and 02 both started with small intake vocabularies, but by 2;6 01 had reached a vocabulary size typically found at 2;0 in normally developing children. Furthermore, 02 did not reach this until 3;0. Therefore, there was a six-month time-lag between normally developing kids and 01, and a six-month time-lag between 01 and 02 in terms of

reaching a reported 100+ word vocabulary on the LDS (Rescorla 304). Empirically, Rescorla's article shows how progress in vocabulary size for late-talkers made between the ages of 2;0 and 3;0 was actually predictable before 2;6 by comparing rapid versus slow trajectories. These results were identifiable in the 2;2 to 2;4 period (Rescorla 308). If there was a spurt shortly after the child's second birthday, the child looked normal by 3;0. If there was still a small vocabulary at 2;6 with only gradual growth, the child was likely to have a significant expressive language delays at age 3;0 (Rescorla 310). Thus differentiating G1 (the former) and G2 (the latter). Gland. G2 children easily relate to the study at hand. G1 would be the children that could possibly be dismissed direct services and monitored, while G2 would probably be recommended to continue at or above current intensity levels of intervention. It is that curve and growth pattern noted by Rescorla that will be given specific attention. Bates et al. (1994) also discusses patterns of growth within the total vocabulary. In this cross-sectional data Bates also argues the importance of looking at growth over time. Using the CDI parent report, Bates et al. looked at typically developing children's vocabulary growth. In fact, Bates broke down the total vocabulary into subgroups to show further analysis of patterns of growth within the total. Like the Rescorla article, Bates discusses the importance of a word spurt in order for typical development to occur. With the much larger CDI (as opposed to the LDS), 400 words appears to be the point at which this vocabulary explosion takes place. From this late increase, a significant linear component appears ( $F(1, 381)$  weighted linear term =  $260.04, p < 0.00001$ ), with no significant deviation from linearity ( $F(1, 381) = 0.89, p > 0.65$ ). Bates suggests that this "take-off point" for vocabulary to properly develop, a critical mass of nouns, verbs, and other content words (i.e. the total

vocabulary) all need to be present (Bates 97-98). Bates et al. looks at distinct patterns of growth for nouns, verbs, adjectives, and closed-class words as a function of the total vocabulary size (Bates 98). Again, a spurt or take-off point is being looked for to make the clinical decision for this action plan. Therefore, it is not only vocabulary size, but also its composition. Bates looks at the total vocabulary growth in the following way: "Changes in the composition of the lexicon across this developmental range (1;4 to 2;6) reflect a shift in emphasis from REFERENCE, to PREDICATION, to GRAMMAR (Bates 98)." Thus, further breakdown of the content of the vocabulary needs to be examined in addition to examining the vocabulary as a whole.

With the total vocabulary developing, the verb lexicon needs specific attention in order to fully evaluate a child's progress. Continuing from the Bates et al. study, predicates (verbs and adjectives) have a different growth pattern than that of nouns within the total vocabulary. Predicates are looked at as a particular subgroup within the make up of the total vocabulary. Predicates show a steady decline in their rate of growth across the period from 100 to 600 words, but still grow faster than nouns between the 50 and 400 words stage of growth (Bates 102). This is contrast to the growth rate of nouns which accelerates early and levels off around 200 words. Predicates start off slowly but show a constant linear expansion up to the checklist baseline (Bates 98). The main effect of the vocabulary size is ( $F(7, 1122) = 7068.7, p, 0.0001$ ) (Bates 101). Common nouns have a steep and constant deceleration in rate of growth across all vocabulary levels after the 50-word point. The science from this can be interpreted as saying that simply looking at total vocabulary growth does not show the entire picture of a child's growth. For Bates, there absolutely must be a growth in verbs and adjectives, as well. Olswang et al. (1997)

brings to attention the empirical difference between transitive versus intransitive and ditransitive verbs. Transitive verbs are verbs that require a direct object and were not found to be predictive of a child's growth. Intransitive verbs do not require a direct object and ditransitive verbs that may optionally take a direct object depending on the discourse were found to be predictive of a child's rate of growth of his or her verb lexicon over time. This finding was subsequently replicated by Brinkmeier (2000). Specifically late-talkers were looked at to determine this relationship between verb lexicon and total vocabulary growth. Olswang found that delayed children have more restricted verb lexicons than their language-matched counterparts (Brinkmeier 20). Olswang's study leads to the understanding that vocabulary size and lexical diversity might predict necessary growth in utterance length (Brinkmeier 19). What is shown is that categorizing the types of verbs as a function of transitivity may also be important when evaluating vocabulary and verb lexicon in particular. This is because vocabulary size and lexical diversity became predictors for utterance length. There was a larger number and variety of verbs that functioned as intransitive or ditransitive that went on to facilitate the combining of words (Brinkmeier 19). Olswang found that delayed children have more restricted verb lexicons than their language-matched counterparts (Brinkmeier 20). This further shows that while observing growth in a child's vocabulary, attention must be paid to the growth of verbs, specifically.

This brings the focus to the third area of evaluation, word combinations, as they pertain to children's language development. It is only after a child starts to build a vocabulary that combining words becomes possible. Word combinations show a child's progress as they begin to build and apply his or her vocabulary. This application is key to

language building. Again, progress over time is the only way to evaluate a child's true growth. A spurt in these new word combinations (Unique Syntactic Types were used) is, once again, being looked for in the child's development trajectory pattern. For typical children a spurt in word combinations is seen within the four to five month period after the initial word combination. Hadley (1999) found that UST was consistent over time as a predictor of child's growth over the following three to six months in high correlation to measures of MLU and IPSyn. To look at UST is not enough, however. One must look at what types of syntactic combinations are being made. As observed by clinician Janet Olsen, children with word combinations that contain verbs are far more likely to "have better outcomes". As seen in Lyytinen et al. (2004) measures of best performance may also be revealing at this age. Therefore, with word combinations, the mean of the three longest sentences (M3L) must be evaluated. Mean Three Longest displays the very best sentences that a particular child can produce. It is, essentially, the child's "cutting edge." Lyytinen et al. (2004), in a study of children with language disorders (specifically at risk for dyslexia), they found that the CDI data for maximum sentence length were the only measure which differentiated children with and without familial risk for dyslexia,  $F(1, 195) = 4.72, p < .05$ , at 2 years (Lyytinen, Lyytinen 404). M3L was the only single morphological measure to reliably differentiate the groups at age 2;0. While there is no evidence for a direct application to SLI, there are still expectations for growth in M3L from the CDI. Science makes it clear that word combinations, following total vocabulary and verb lexicon, should be included when documenting a child's progress over time.

## Methodology

It has been established that vocabulary, verb lexicon, and word combinations are to be measured to track a child's language growth trajectories and now the tools to make those measurements needs to be established. A variety of tools were evaluated with the goal in mind to select reliable and valid tools that were also clinically feasible for a clinician. Two vocabulary measurement tools were evaluated: The MacArthur Communicative Development Inventory: Words and Sentences (CDI) and the Language Development Survey (LDS). Both tools have been found to be reliable and valid, and used in the Rescorla et al. (2000) and Bates et al (1994) empirical studies respectively. Both tools are parent measures that can be filled out prior to evaluation, which again saves time and energy for the clinician and still allows him or her to obtain an accurate report of the child's progress in vocabulary acquisition. The CDI and LDS are both easy for parents to understand and use. The CDI only takes about an hour to fill out completely. With the input of a licensed speech-language pathology that runs a toddler group for late-talkers, the CDI was recommended over the LDS. The reason the CDI was chosen over the LDS was that the CDI has a total of 680 words whereas the LDS has only 308. The CDI gives a more complete view of the child's growth over time due to its larger size. Children do not hit the ceiling as quickly since there are more words being accounted for. The CDI also has normative data in monthly intervals from 16 to 30 months of age, creating a growth over time trajectory that a clinician can use. The CDI comes with tables and graphs showing norm-referenced patterns for 90<sup>th</sup>, 75<sup>th</sup>, 50<sup>th</sup>, 25<sup>th</sup>, and 10<sup>th</sup> percentiles. The CDI is recommended to be obtained at the child's initial entrance into the program. The clinician should then get the child on a regular schedule

of updating it as close to the 24, 27 and 30 months marks, as possible. Three data points would be essential for charting growth. Since the CDI has a larger total vocabulary than the LDS, it naturally follows that the CDI has a greater verb lexicon (103) than the LDS (46). To evaluate verb lexicon the CDI is recommended again due to all the previously stated reasons. In Brinkmeier's 2002 thesis, she compiled lists of the CDI's verbs and categorized them by transitive, ditransitive, or intransitive standing (Brinkmeier 67). This is seen in her Table A. Sections 14 (Action Words) and 15 (Descriptive Words) make up the predicates that the Bates et al. article researched. This table helps clinicians easily look up which verbs fall into which category in order to evaluate a child's progress of whether he or she is acquiring the necessary verbs to become what Olswang referred to as "changers." The verb lexicon will be evaluated at all of the times that the total vocabulary is evaluated. Next word combinations were measured, in part, by the CDI once again. The three longest sentences are averaged and norm-referenced by the CDI as M3L. Again, it is a parent report. M3L is recommended because it is the earliest means of combinatorial language that can be measured that differentiates children that are at risk for dyslexia from the control group in the Lyytinen and Lyytinen article. While this does not mean a direct application for all late-talking children, there are clear expectations of growth from the norm-referenced CDI data. Since M3L is once again part of the CDI, it will be evaluated as frequently as vocabulary and verb lexicon are evaluated. The other way to measure word combinations that is recommended is Unique Syntactic Types (UST). As found in the Hadley (1999) study, UST is a reliable and valid substitute for MLU 1.00-2.00, plus it works with the real-time demands of conversation for a clinician. UST is predictive over a 3-6 month interval. With the help of helping clinicians,

combined with the fact that these late-talking toddlers are not saying too much, a tally will be taken of all USTs within a session. These will all be collected and added to a list for each particular child, so that growth can be evaluated over time. Special note will be made of UST that contain verbs in particular as well. UST should be evaluated at the initial entrance to the program and then updated on the same schedule as the CDI.

**Table III**

Measure	How (choices)	Empirical findings	Why choose one over others?
Vocabulary	CDI (680) LDS (308)	Rescorla, Mirak, Singh 2000; Bates et al. 1994	CDI - parent completes, easy to understand! use - about an hour to fill out in entirety - add to existing form up to 30 mos
Verb Lexicon (vocabulary)	CDI (103) LDS (46)	Olswang et al. 1997; Brinkmeier Thesis; Bates et al. 1994	CDI - parent completes, easy to understand! use - about an hour to fill out in entirety - add to existing form up to 30 mos
Word Combinations	MLU UST IPSyn M3L	Wilcox, Hadley, Bacon 1998; Hadley 1999; Lyytinen, Lyytinen 2004	UST - works with real-time demands of conversation - predictive over 3-6 mos. Interval - appropriate for Brown Stage I (MLU 1.00-2.00)  M3L - parent reports - the only single morphological measure to reliably differentiate Lyytinen et al.

			delayed group from disordered group
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The final step for this action-plan is to propose application of all these tools and measurements based on the empirical findings to help the clinician make more informed clinical decisions. The basic decisions that are concerned with in this study are to continue services (with the possibility of increasing or decreasing the amount of services the child is receiving) or to consider a dismissal from therapy but while monitoring every three months. For vocabulary, the criteria will be to look at growth over time in order to assess what the trajectory looks like and to hypothesize what the trajectory could go on to look like. All of the following percentile rankings have been adapted according to the CDI progress chart. What is proposed is to continue services and possibly to increase the intensity or type of services if the child is growing more slowly than children at the 10<sup>th</sup> percentile because this indicates an impaired rate of growth. This is usually marked by very slow linear growth versus a more rapid and even curved acceleration over time. Services are still encouraged even when the trajectory is slower than children with a 25<sup>th</sup> percentile trajectory. Using these data collection tools and monitoring growth over time may improve the clinician's data driven decision making. By assessing a child's progress relative to expectation for growth a dismissal from services is proposed when accelerated growth is observed and when the trajectory is consistent with a 25<sup>th</sup> percentile growth trajectory or better. Of course, the child's progress should be monitored every three months to ensure future services are not needed.

For the verb lexicon, the criteria are based on intransitive and ditransitive predictors over time. If there is no change in two months, services are definitely

recommended to continue with the possibility of increasing or intensifying them.

Services should continue if there is only little change in intransitive and ditransitive growth over the course of two months. Dismissal with monitoring should be considered if there is significant growth in the intransitive and ditransitive categories in two months. Strong recommendations are not made here because there is a lack of empirical data to characterize the normal expectation.

Word combination criteria are as follows: MLU must be between 1.0 and 2.0 in order to use UST. Once word combinations have begun, accelerated growth should be observed within six months. Again, there is no a reference database to draw upon, so these recommendations are tentative. Either curvilinear or linear growth is being looked for six months after the child begins to combine words. Services should be continued if there is no word burst and the growth remains slow and linear. Dismissal with monitoring can be considered if a burst (curvilinear growth) can be observed within the six months post 1.5 MLU. This is because this type of growth would indicate a profile more consistent with delay than impairment.

For M3L, the clinician would again determine how the child is performing based on normalized percentile provided with CDI. Plotted data would be observed as to whether it followed a slower linear growth pattern or a faster curved trajectory. Services are proposed to be continued and possibly increased if the child is developing at or below the 10<sup>th</sup> percentile on the norm-referenced data provided with the CDI. Monitoring could be an option is the child if the child demonstrates growth consistent with a 25<sup>th</sup> percentile trajectory. Table IV organizes this information:

Table IV	Vocabulary	Verb Lexicon (vocabulary)	Word Combinations
Tool	CDI	CDI	UST, M3L (CDI)
Criteria	Must look at growth over time, cannot pick one instance in time to base decision on. What does trajectory look like?	Intransitive & ditransitive predictors overtime.	UST: must have MLU between 1.0 and 2.0. is there a curve or is it linear 6 mos after hit 1.5 MLU? M3L: have to determine whether there is rapid acceleration in # of different WCs w/in 6 mos or not
Decision	Continue services, continue services, consider dismissal while monitoring every 3 mos.	Continue, Consider dismissal with monitoring	Continue services, continue services, consider dismissal while monitoring every 3 mos.
Variable	Total vocabulary	Verbs	Word combinations in conversation, Three longest sentences
How measure it	Parent report	Parent report	Clinician Observation, Parent Report
Propose	Continue: at or below 10th % (impaired rate of growth) Continue: rate of growth (curve) not on track to 25th% Consider monitor: burst and trajectory "catching up" to 25th % and beyond.	Continue: no change in 2 mos Continue: little change in intransitive and ditransitive growth Consider monitor: Significant growth in 2mos	UST Continue if no word burst six mos after 1.5 MLU (linear) Consider monitor if word burst after 1.5 (curve), indicating only delayed. M3L Continue: if slower than 10th % Continue: 25th, 50th % Consider dismissal while monitoring every 3 mos.: if more rapid than average trajectory

Two case applications have been made using this action plan with two children from Dr. Hadley's research on children with Specific Language Impairment. The first child will be identified as 1122 and the second child will be identified as 2130. When their data is plotted onto the CDI vocabulary production form and the CDI three longest sentences form, it is clear that 1122 is benefiting from early intervention. Even though he

is just barely crossing over the 10<sup>th</sup> percentile by 30 months, his trajectory is showing a more curved line than the more linear 10<sup>th</sup> percentile line. This shows the benefit of services. While the vocabulary is improving, the child still isn't catching up. On the other hand, 2130 stays below the 10<sup>th</sup> percentile and her trajectory begins to flatten out even more than the 10<sup>th</sup> percentile line before hitting 30 months. This child was not receiving services. This pattern of growth indicates a clear need to initiate services. The M3L tells a similar story: 1122 stays stagnant in his M3L between the first and second evaluation and only grows along the 10<sup>th</sup> percentile line when he does improve. Thus, although vocabulary growth is improving his ability to combine words into sentences is not, 2130 starts off well below the 10<sup>th</sup> percentile in M3L which improves her relative standing by 27 months, but does not make any gains between 27 and 30 months. This further supports the recommendation for therapy. These are two real-life examples of how a clinician could have interpreted the child's progress to make a data-driven clinical decision.

The goal of this capstone was to create an action-plan for clinicians so they could make data-driven clinical decisions that answered the following three questions: 1. What should be evaluated? 2. Which tools should be used and how often? and 3. How could these results be interpreted to inform clinical decision-making? Through already existing empirical evidence it is proposed that the clinician evaluate vocabulary, the verb lexicon, and word combinations including the mean of the three longest sentences. These can be measured the MacArthur Communicative Development Inventory: Words and Sentences (CDI) for total vocabulary, verb lexicon, and M3L every two months, starting at 24 months until the child is 30 months of age. Unique Syntactic Types should also be used

to track word combinations and added to every two months starting at 24 months until the child 30 months old. Data provides guidelines that can therefore applied to what the outcome recommendation should be for treatment by looking at the progress over time the child is making in each of the areas of evaluation (see Table III). With these tools in place a clinician can reconcile both sides to the keep in services versus dismissal argument. On the one hand, data provides evidence of when the child needs and benefits from services to justify a clinician's desire to not miss any child that could need services. On the other, data also provides evidence to suggest when dismissal would be possible to save on a clinician's finite resources.

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