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Clinical Applications of a Multidimensional Approach For
The Assessment and Treatment of Stuttering

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Multidimensional Model of Stuttering

Abstract

This article describes a model and a process that involves a multidimensional assessment and treatment approach to persons who stutter. Because of the complexity of stuttering, the amount of information that needs to be considered when assessing and treating stuttering can be overwhelming. In this article, a model is proposed that focuses on five components believed to be central to the maintenance of stuttering. The model includes cognitive, affective, linguistic, motor, and social (CALMS) components, which form a basis assessment and treatment planning. Specifically, the model accounts for individual differences in the performance each client has in the five components and how changing demands influence a client's overall communicative abilities. Examples are given which demonstrate how ratings of performance in each component guide assessment. Specific applications of the information derived from the assessment for treatment are illustrated by a case study of a school-age child who stutters.

Key Words: models of stuttering, assessment, treatment, children who stutter

A Multidimensional Approach to Assessment and Treatment of Stuttering in School-Age Children Who Stutter

Over the past several decades, there has been general agreement that stuttering is best understood from a multidimensional perspective. This contrasts with previous views that stuttering is unidimensional and could be explained solely as physiological, psychological, linguistic, or learned behaviors that operated independently. Specifically, it was once thought that the primary reason for the development and maintenance of stuttering was related to the influence of one factor and that people who stutter were a homogenous group. By contrast, the more recent view of stuttering as a multifactorial speech disorder has facilitated a broader perspective for understanding the complexities of stuttering. Such a perspective embraces the importance of individual variability and unique differences among people who stutter. In fact, Starkweather (1999) suggested that one of the most prominent features of stuttering is its variability.

The purpose of this article is to describe a conceptual, multidimensional model of stuttering that was developed to enhance the collection, organization, and interpretation of clinical data associated with the assessment and treatment of stuttering. An attempt will be made to show how various forms of information and data obtained from a client who stutters fits within the framework of a model of stuttering developed by the authors. The model described in this article is derived from past multidimensional perspectives about stuttering. Therefore, we will begin with a discussion of some of the more recent multidimensional perspectives and models about stuttering.

Multidimensional Models of Stuttering

There have been several models that approach stuttering from a multidimensional perspective. The intent of this brief review is to provide the reader with an understanding about some of the more popular multidimensional perspectives that have been proposed in the last twenty years. A thorough discussion of each model is beyond the scope of this article, therefore, only the main features of each model will be provided. The reader can glean a greater understanding of each model from the original source. This section will conclude with a brief discussion of the major similarities among the models as well as show how many of these earlier models have led to the development of our multidimensional model of stuttering.

In 1980, Zimmermann published a ground breaking multidimensional model of stuttering. His model was the first to propose how stuttering could result from a disruption in the coordination of respiratory, phonatory, and articulatory processes for speech. He hypothesized that the people who stutter have variable motor abilities and/or have lowered thresholds of disruption in the motor control of speech. Important too was his focus on the interaction between motor speech behavior and a variety of emotional and environmental conditions. This complex model of stuttering served as the basis for future multidimensional models of stuttering.

Soon after Zimmermann's model appeared, Wall and Myers (1984) provided a slightly different multidimensional model of stuttering. They proposed that stuttering represented an interaction among psycholinguistic components (i.e., language issues), psychosocial components (i.e., discourse loads and interactions with parents and peers), and physiological components (genetics, muscle tension levels, sensorimotor coordinations, etc.). Although all three major components or factors interact in different ways for people who stutter, Wall and Myers pointed

out that the impact of one factor may function independently or supersede the impact of the other two factors. Moreover, they were one of the first group of researchers to emphasize the interaction among language use, social discourse and the emotions connected with communication and the physiological process of speaking.

Another popular multidimensional model was The Demands and Capacities Model (DCM) proposed by Starkweather, Gotwald, and Halfond (1990) and Adams (1990). The basic premise of the DCM is that the onset and development of stuttering is related to a mismatch between a child's capacities (motor, linguistic, cognitive and emotional) and the self-imposed or externally driven speech demands (time pressure, pragmatic issues, and situational influences). The DCM proposed that each child possesses a unique set of capacities and level of speech performance that evolves from those capacities. If a child's capacities match the speech demands of a particular speaking situation, fluency will result. On the other hand, if demands exceed the child's capacities, disfluencies will emerge. The popularity of this model stems from its relative simplicity and usefulness in explaining the onset and development of stuttering, particularly to parents. Although this model has received a lot of attention, it has been criticized by a number of experts in stuttering as lacking in testable hypotheses. Their comments about the DCM can be found in a special issue of the *Journal of Fluency Disorders* (Manning, 2000).

Most recently, models by Smith (1999) and De Nil (1999) have proposed multidimensional perspectives about stuttering, with particular attention being paid to the major contributions of disrupted speech physiological processes as they interact with emotional, social, and learned factors. Smith (1999) emphasized in her model that stuttering is dynamic disorder, in that varying levels of cognitive, linguistic, and emotional processes should have either a direct or indirect impact on a person's motor speech function. She also suggested that what is observed

as stuttering behavior is the end product of a number of antecedent events that occurred well before the observed disfluency appears. Smith also emphasized that a disfluent speaker's motor speech system functions along a continuum of stability, and the level of stability in motor speech output can be directly affected by a number of factors such as the length and complexity of the utterance. Thus, the dynamics of speech motor processes interact with a number of factors that determine the level of fluency each person produces. These factors can contribute to breakdowns in a person's fluency and will vary for each person who stutters and within individuals across time.

De Nil (1999) offered a similar explanation as Smith (1999) in that stuttering is related to physiological processing difficulties. De Nil's model focuses on the relationships among three processing levels: (1) central neurophysiological processing, (2) observable behavior (i.e., output) associated with motor, cognitive, linguistic, social, and emotional factors and, (3) a contextual level associated with environmental components. De Nil suggested the output components are not unidirectional because feedback through various sensory mechanisms sends information back to the central processes. Environmental variables that impact communication indirectly influence central neurophysiological processing. Because of the filtering of environmental information that takes place within an individual, central neurophysiological processing will be different for each individual who stutters and will change over time. According to De Nil (1999), this process explains why the reaction to stress or to a treatment program will vary considerably across individuals who stutter.

Most recently, Riley and Riley (2000) published a component model of stuttering in children, which was a revision of their earlier multidimensional model of stuttering. (Riley & Riley, 1979). The Revised Component Model included three main factors that contribute to

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stuttering and are found to be prevalent among children who stutter. The components were: 1) Physical Attributes, which included a child's attending disorder and difficulties in speech motor control, 2) Temperament Factors, including a child's excessive levels of anxiety, self blame, perfectionism, low threshold for frustration and being overly sensitive, and 3) Listener Reactions, in this component include disruptive listener reactions to the stuttering, secondary gains from stuttering, and the possibility of teasing and bullying of the child because of the stuttering. Riley and Riley (2000) acknowledge the interactions of other variables such as linguistic demands and parent expectations with the three main components. Their model of stuttering is used to assist the diagnosis and treatment of stuttering in children.

There are several common elements that emerge from these multidimensional models. First, all suggest that multiple dimensions form the foundation of this dynamic disorder. Second, a common theme among these models is that stuttering is related to a number of cognitive, linguistic, emotional, and neurophysiological speech variables that interact in complex ways across time and across individuals who stutter. These variables or capacities are unique to each person who stutters and are influenced by a number of environmental speech demands for fluent speech. A third common feature of each model is the variable influence of any one factor and because of the dynamic nature of the problem, the person who stutters reacts differently to different stimuli at different times in different ways.

All of the models are logical explanations for how stuttering might develop and/or is maintained, and all provide reasonable accounts for how stuttering develops and is maintained. Except for the Riley and Riley Revised Component Model, all of the models described above lack sufficient structure and organization that precludes clinical application when collecting and interpreting assessment and treatment data. The model we propose emphasizes how five

components of stuttering interact in a complex fashion and include additional as well as different components than those suggested by the Riley and Riley model.

C.A.L.M.S : An Integrated Multidimensional Model of Stuttering

We acknowledge the limitations in proposing our interactive model that includes many of the same key elements of previous models. The proposed multidimensional model of stuttering has specific components that can be defined and measured quantitatively and/or qualitatively. Our model quantifies specific components of performance rather than some mismatch between demands and capacities. Yaruss (2000) points out that clinicians tend to measure a client's performance rather than the individual's capacities. We limited the number of components to five primarily because this seems a reasonable number for a clinician to manage. It is recognized that many more components or factors could be included. Our model includes the cognitive, affective, linguistic, motor, and social performance areas (i.e., CALMS components) as five key components that contribute to and maintain stuttering.

Figure 1 is an illustration of the CALMS model and the interaction of each of the five components. The interconnection of the lines is deliberate and an important feature of the model as a way to show how each CALMS component is influenced directly by all other components. The complex interaction of components implies that one component does not and cannot function independently. In its most simple form, the model suggests the following. First, stuttering is influenced by not only motor issues but also how people think and feel about themselves and their stuttering. Second, those thoughts, perceptions, feelings and attitudes have a direct impact on how well the message will be formulated and produced physiologically while conversing with a variety of communicative partners in a variety of communicative situations. Third, the converse holds true such that the communicative motor, linguistic, and social

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messages of an individual will impact upon the thought, perceptions, feelings, and attitudes regarding the communicative experiences one engages. Fourth, all of the five components will uniquely combine in individuals to have variable degrees of influence on the frequency, type, and duration of stuttering. Fifth, these five components form the underlying “roots” of the disorder and any assessment of stuttering should include a thorough measurement of each component. Subsequent remediation of the stuttering should demonstrate changes in the performance level of components that were the focus of treatment as well as overall communicative functioning.

The model in Figure 1 also provides a brief description of elements associated with each component. The **Cognitive** component includes such things as thoughts, perceptions, awareness and understanding of stuttering. Thoughts, which are typically negative for people who stutter, and perceptions, which are associated with either negative views of their own stuttering or people’s reactions to their stuttering, are included in this component. Investigators have demonstrated that clients who developed thinking that was self directed, realistic, or positive had better outcomes and longer term resistance to relapse than those who failed to make these cognitive changes (Craig & Andrews, 1985; Madison, Budd & Itskowitz (1986). Additionally, self-perceptions not only affect one’s self concept but other’s concept of self to the denigration of full social functioning (Roessler & Bolton, 1978). Also, awareness of stuttering is placed within this domain but could be considered from two perspectives. One aspect of awareness of stuttering might be positive in that a child or adult who stutters can identify moments of stuttering and associated tension and proprioceptive feedback during a disfluent moment. On the other hand, awareness might be problematic in that increased awareness and sensitivity to stuttering could exacerbate the problem. In either case, a client’s awareness becomes an

important contributor to stuttering or the enhancement of fluency. An additional factor related to the cognitive component would be the knowledge and understanding people who stutter have about their stuttering. The greater their own knowledge about stuttering and awareness of their thinking as it relates to their communicative abilities, the more effective a communicator the individual can be overall.

The **Affective** component includes thoughts that are directly connected with feelings, emotions, and attitudes that accompany stuttering and communication in general. Van Riper (1982) placed a great deal of emphasis on having a person who stutters manage negative feelings, attitudes and emotional reactions to stuttering. Clearly, thoughts and feelings are difficult, if not impossible, to separate. Thus, it may seem artificial to have each one as a separate component. However, Siegel (1999) stated that affective and cognitive factors have been acknowledged for several decades as factors that precipitate and maintain stuttering, particularly as they interact with behavioral factors.

The **Linguistic** component within the model is related to the disfluent speaker's language skills and abilities that impact the frequency of stuttering. One of the key issues involved with this component is the impact of the types of language formulation demands on stuttering. The types of language formulation demands previously shown to have negative effects on fluency and linguistic complexity in individuals who stutter include increased length and changes in syntactic complexity (cf: Bernstein Ratner and Sih, 1987; Gaines, Runyan, & Meyers, 1991; Howell & Au-Yeung, 1995; Logan and Conture, 1995; Wall, Starkweather, & Cairns, 1981; Watson, Freeman, Chapman, Miller, Finitzo, Pool, & DeVous, 1991) and for some children, changes in narrative demands (Scott, Healey, and Norris, 1995; Scott Trautman, Healey, & Norris, 2001; Weiss & Zebrowski, 1993). These findings indicate that variations in language

formulation demand can precipitate changes in the frequency and form of disfluencies as well as the integrity of the language produced.

The **Motor** component is associated with a number of factors that influence stuttering such as the frequency, type, duration, and severity of stuttering as well as the presence of secondary coping behaviors and overall speech motor control that is associated with stuttering. The theoretical support for including a motor component to our model comes from the works of Smith (1999) and De Nil (1999).

The last component relates to the **Social** component of communication. This component involves a client's communicative competence relative to reactions the person who stutters has to various communicative partners in a variety of speaking situations. The social component also is concerned with any avoidances of speaking situations as well as peer teasing that could occur as a result of the stuttering. This component also focuses on the pragmatics of communication, social isolation in classrooms, participation in peer games, or "real-world" communications.

Using the CALMS Model for Assessment and Evaluation

The challenge for any clinician assessing and evaluating stuttering is determining the extent to which a number of variables and circumstances impact the disorder. One of the basic principles of assessment and evaluation is that each person who stutters is unique and presents a unique profile of thoughts, feelings, reactions, perceptions, and abilities. The level of abilities and performances across the CALMS components is not static. Rather component performance can change across each hour, day, week, months and possibly years because of maturation, knowledge, and/or experience. Furthermore, the level of performance associated with some CALMS components may appear to be within normal limits while performance levels in other components might be slightly below or well below normal. Additionally, stuttering may be

exacerbated by well-defined concomitant deficiencies in word recall, articulation problems, or syntactic difficulties that qualify a child for services in addition to the fluency disorder (Nippold, 1990). Recently, Ardnt and Healey (2001) reported that more than 40% of children who stutter also have verified phonological and/or language impairment. On the other hand, people who stutter might possess positive thoughts, feelings, attitudes and reactions to stuttering but have below normal performance in terms of their ability to manage the speech motor processes necessary for maintaining fluency.

A second basic principle of assessment is that stuttering events are not isolated occurrences but rather fall along a continuum of speech behaviors that are influenced by a variety of factors. We agree with Conture (2001) who stated, "... stuttering rarely operates in a vacuum" (p. 60). This principle implies that stuttering is related to many cognitive, affective, motor, linguistic, social and environmental issues. What is observed as "stuttering" is the end product of several processes that interact in a complex way.

Given these two basic principles underlying a multidimensional assessment and evaluation of stuttering, we approach assessment within the context of how the CALMS components were described and defined above. In order to illustrate how we approach assessment of stuttering using the CALMS Model, we will limit our discussion to school-age children who stutter. This age group represents children with variable capacities within each component area that could range from normal to severely abnormal. The same is true for very young children (i.e., preschoolers) and adults who stutter. Through specific examples, we hope to demonstrate how the CALMS Model facilitates a clinician's decision making for both assessment and treatment.

Multidimensional Model of Stuttering

In order to account for individual functional differences, the CALMS Model is used to classify the skills and abilities of children who stutter into three major levels: 1) normal functioning, 2) borderline functioning, and 3) three abnormal functioning levels (i.e., mild, moderate, and severe). Table 1 shows how each of these five levels is defined and quantified. Using these five levels, objective measures of a child's performance on a particular item within a component of the CALMS Model could be made using standardized instruments. Or, a child's strengths and weaknesses could be rated subjectively, using observations and qualitative data. For example, for an item in the Affective component of the model, a clinician could administer some of the paper and pencil tasks suggested by Chmela and Reardon (2001) as a way to provide subjective, qualitative data related to the child's feelings and attitudes about his/her stuttering. Because standardized measures of affective behaviors are difficult to obtain, qualitative information obtained from these tasks would provide the clinician at least some insights into the child's feelings and attitudes about stuttering. By contrast, using Riley's (1994) Stuttering Severity Instrument-3 (SSI-3), a clinician could collect objective data in the Motor component to rate stuttering severity. If a child received a score of 16 on the SSI-3, this would be considered mild stuttering severity which would translate into a score of "3" using CALMS Model rating scale (i.e., mildly abnormal). Specific items associated with each component within the CALMS Model could be rated and supported by data obtained during the assessment and evaluation.

Table 2 provides a list of items we typically use in assessing each component within the CALMS Model. It is important to note that each item would require a clinician to obtain quantitative and/or qualitative measures of performance in order to obtain a rating. If necessary, a clinician could modify the wording and/or select additional items to those listed in Table 2 when assessing a particular client. Once all items have been rated, an overall mean score could

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be generated for each component. Taking all of the ratings for each component and dividing by the number of items rated could generate a mean score that could be plotted on a graph. Each component would be plotted and a profile would result. An example of a client profile is shown in Figure 2. For this hypothetical child, note that the average rating in the Cognitive, Affective, and Social components reach abnormal levels. The child's average ratings for the linguistic and motor components fell within the borderline level of performance.

Using the CALMS Model for as a Framework for Treatment

Once a complete assessment and evaluation of the child's stuttering has been completed, the CALMS Model can be useful in planning and implementing treatment. A clinician can use the profile generated from the assessment as a guide in developing goals and objectives that match the unique needs of each child who stutters by considering the interaction among the components that contribute to stuttering. This could be especially useful in developing individualized educational plans (IEPs) in a school setting. The CALMS Model should not be considered a "form of treatment." Rather, it is a model that supports the use of a combination of fluency shaping and stuttering modification procedures commonly used to treat stuttering (Guitar, 1998).

Guitar (1998) describes a number of integrated approaches, including his own, which focus on creating speech changes along with a reduction or elimination of negative feelings, emotions and avoidance behaviors. Because of the multidimensional character of stuttering in older school-age children, it is easy to understand why many clinicians treat stuttering from an integrated perspective rather than relying on fluency shaping or stuttering modification procedures exclusively. Starkweather and Givens-Ackerman (1997) point out that an integrated approach to treating stuttering is not only popular among practicing clinicians, but has been

adopted by the American Speech-Language-Hearing Association's guidelines for practice in stuttering treatment (Starkweather et al., 1995).

Generally, an integrated treatment philosophy, which is consistent with the CALMS Model, involves teaching individuals with intermediate and advanced stuttering a combination of fluency skills and stuttering modification procedures. These combined approaches focus on modifying negative feelings and attitudes about stuttering through increased awareness and exploration of and desensitization to stuttering. An integrated approach would also involve teaching the child to stutter easily and/or speak more fluently in various ways through the use of progressively longer and more complex linguistic units (i.e., single words, sentences, phrases, paragraph reading and conversation). As part of this training, a specific portion of therapy might be spent on reducing negative emotions and attitudes as well as reducing avoidance behaviors. An integrated program also usually involves assisting the client to maintain the skills that have been learned, generalize speech changes to realistic speaking situations, and emphasize self-monitoring of performance.

We believe the overall structure of most current integrated treatment programs are effective for both children and adults who stutter. Clinicians who use these approaches are not concerned that a client's speech after therapy may contain some stuttering, contending that normally-fluent speakers occasionally produce dysfluencies (Starkweather & Givens-Ackerman, 1997). Improvements in stuttering along with the client's improved self-perceptions, non-avoidance, and reduction of fears are common target goals of most integrated approaches. The result is an increase in all components which underlie improved communicative effectiveness overall.

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Although integrated approaches address a number of factors related to stuttering, Healey, Norris, Scott Trautman, & Susca (1998) suggest that the structure of most integrated treatment programs limits the true interaction among the factors that maintain stuttering. It appears that many integrated treatment programs address each factor (i.e., changes in speech, reduction of negative emotions, cognitive restructuring, etc.) as a series of isolated, unidimensional activities. For example, considerable time in treatment might be spent teaching clients to reduce speech rate and/or use voluntary stuttering as a means of improving fluency. Cognitive, emotional, and social factors also might be addressed during this phase of treatment but only in a tangential manner. The main focus remains on creating speech changes (i.e., modifications of motor skills) and once improved speech performance is achieved, another factor will be addressed.

Unfortunately, following this approach will make it difficult to change the dynamic interactions among all factors maintaining the stuttering because the emphasis is on *isolated* changes and not *integrated* changes. For instance, changes in motor skills might facilitate greater fluency, but those skills will be difficult to maintain unless simultaneous changes take place in the client's cognitive, emotional, and linguistic capacities. Treating one component independent of other components is not consistent with a multidimensional treatment approach to stuttering. In order to illustrate a multidimensional treatment within the context of our CALMS Model, the following case example adapted from one presented by Healey, Scott Trautman, and Panico (2001) will be presented next.

Case Example

The case involves a seven-year-old child who stutters named Brad. Brad was enrolled in individual treatment, had no previous therapy, and was developing typically in all communication and learning areas except speech fluency. At the evaluation, Brad was aware of

his stuttering (i.e., cognitive component) and felt negatively about it (i.e., affective component), to the point of being reluctant to talk in many situations. His negative emotions and reactions to stuttering were surprising, given that his stuttering severity was in the mild range (i.e., less than 8%). Brad's disfluencies (i.e., motor component) were characterized by rapid part-word repetitions and some brief prolongations at the single word level, and he was more fluent when talking about contextualized topics (i.e., ones associated with objects, pictures, drawings, printed materials) than when talking about decontextualized topics (i.e., discourse without the aid of drawings, pictures, or printed materials). When disfluencies occurred, a rise in vocal pitch often accompanied them. Brad's parents described him as loving and extremely sensitive. Brad's father once scolded him for stuttering, which made Brad reluctant to interact with his father. When we asked what Brad was interested in, he said he liked professional football, knowing many of the teams and players. He frequently watched football on television with his family and played in a junior football league once a week. Brad's CALMS assessment profile is presented in Figure 2.

Based on Brad's disfluency pattern, targeted speech modification skills included easy onset of phonation, smooth transitions or continuous phonation, and pullouts. Football was selected as the theme (social component) for therapy because Brad was interested in and knew a great deal about that sport. Brad exhibited better fluency when topics were contextualized, so the decision was made to keep initial therapy activities highly contextualized. This reduced the demands placed on his linguistic skills, which was facilitated by using real objects, toys, books, or pictures, playing pretend football games, and telling stories and recreating games with toys. Multiple materials were gathered to support the football theme such as a football field game board for game-based activities, acquiring a soft football and toy football players, and using

colored paper to make “fans” that could be hung on the wall. Additionally, illustrated index cards listing players’ names/positions/statistics, names of football teams, positions or plays in football, and rules to the game were obtained or made during therapy.

Because Brad had never had any form of fluency intervention, initial speech targets included easy onsets, prolonged speech, and pullouts at the single word and phrase levels. One activity that was used to help Brad learn to use new speech fluency skills as well as to begin changing his negative feelings about talking with his father. This was accomplished by having him develop a list of all the reasons someone might be a fan of a particular football team. As Brad listed reasons why someone is a fan (e.g., liking the team colors, they win a lot, they’re good sports), the clinician wrote down words or phrases that he generated. First, Brad was asked to practice one of the three speech modification skills by reading the list of words and phrases. Using the toy football field, toy football players, and index cards with plays written on them, Brad and his clinician would draw a card and read the play using one of the targeted speech modification skills (e.g., use prolonged speech on the phrase “ The quarterback throws a 30 yard pass”). If the speech modification skill was used appropriately, the toy player was advanced accordingly. If the speech modification skill was not used (Brad had to self-monitor his own production as well as the clinician’s), the toy player remained in place. When a toy player reached the end zone of the football field, the player earned 7 points and at the end of the therapy session, the game winner was determined.

Second, the motor practice was then connected to cognitive and affective components. Brad was asked to think of reasons why someone might be *his* fan. He listed, “I’m nice, I’m helpful, I’m polite, I’m funny, I’m a hard worker.” As homework, we asked Brad to “interview” his father and find out why he was a fan of Brad’s. Brad was instructed to take the list home and

tell his father why someone might be his fan, using the targeted speech modification skill practiced in therapy. His father was asked to add to the list of reasons and talk about them with Brad. When Brad returned to the next therapy session, he reported that his father “is one of my biggest fans,” which motivated him to talk more about football and practice his speech modification skills with his father.

As Brad’s use of speech modification skills improved and became more consistent, activities in therapy included decontextualized topics. Given his keen interest in football, he was excited about therapy and interested to see how well he could use “smooth speech,” to talk about football with his family and friends. The football theme was continued until Brad indicated that he wanted to develop another theme for therapy.

In this brief example of an activity in therapy, we have used all five domains of the CALMS Model while also addressing Brad’s emotional relationship with his father. Note how specific aspects of the child’s cognitive, affective, linguistic, and motor components were treated around the social communication topic of football. The use of thematic, topic-centered speech contexts in stuttering therapy is an efficient way of creating realistic client-clinician interactions when treating language disorders in children and improving the literacy skills of adults (Calvin & Root, 1987; Norris, 1997). Topic-centered speech contexts are in direct contrast to the use of single word lists, carrier phrases, short sentences or any type of isolated stimulus materials that have minimal social purpose and consequences. Using word lists/unrelated phrases could result in verbal exchanges that are contrived, non-meaningful speaker-listener interactions. By contrast, using thematic, topic-centered speech contexts throughout the program will make interactions more socially appropriate and meaningful and thus enhance pragmatic communication abilities. Moreover, we believe that finding a topic relevant to clients' interests will increase their

motivation for therapy and make the treatment program more enjoyable. Any topic can form the foundation for meaningful dialogue during the session as long as the client and clinician jointly construct knowledge about the topic during each session and expand the topic across the treatment program. All of the goals and objectives of Brad's therapy program were learned, practiced, and generalized. Another advantage of using thematic topics is that other communicative partners (Brad's parents, family members, friends, etc.) can be involved in the ongoing discussion of the topic, which could act as a bridge to generalize strategies and techniques beyond the clinic.

Summary

In this article, we have attempted to demonstrate that the CALMS model is consistent with current perspectives of stuttering as a multidimensional disorder. As such, the model aids the clinician in assessing the integrative and relative contributions of cognitive, affective, linguistic, motor, and social components upon the communication disorder recognized as stuttering. Additionally, the model aids the clinician in determining how the various components influence and are influenced by other components. Thus, meaningful goals with a broad impact upon the communication disorder can be targeted and treatment can be manipulated to adapt flexibly to changing needs. The resultant improvements are likely to be generalized due to their high functional value and proven worthiness demonstrated throughout the treatment process. This perspective does not mean the clinician needs to learn new techniques. Rather, the clinician could use the techniques available in a more integrative and global manner. By treating the stuttering problem on multiple fronts simultaneously in functionally meaningful contexts, the surface features of stuttering may be modified to some extent but the overall integrated communicative features are likely to be modified to a much larger extent. Additionally, an

integrated component treatment perspective takes into account the multidimensional features of each person's unique profile of abilities at any given point in time.

References

- Adams, M. R. (1990). The demands and capacities model: I. Theoretical elaborations. *Journal of Fluency Disorders*, 15, 135-141.
- Arndt, J. & Healey, E.C. (2001). Concomitant disorders in school-age children who stutter. *Language, Speech, Hearing Services in Schools*, 32, 68-78.
- Bernstein Ratner, N., & Sih, C. (1987). Effects of gradual increases in sentence length and complexity on children's dysfluency. *Journal of Speech and Hearing Disorders*, 52, 278-287.
- Calvin, R. J. & Root, J. H. (1987). *Tutor: Techniques used in the teaching of reading*. Cleveland, OH: Follett.
- Conture, E. (2001) *Stuttering its nature, diagnosis, and treatment*. Needham Heights, MA: Allyn & Bacon.
- Chmela, K. and Reardon, N. (2001) *The school-age child who stutters: Working effectively with attitudes and emotions...A workbook*. Memphis, TN: Stuttering Foundation of America, (pp. 22-86).
- Craig, A., & Andrews, G. (1985). The prediction and prevention of relapse in stuttering. The value of self control techniques and locus of control measures. *Behavior modification*, 9, 427-442.
- De Nil, L. F. (1999). Stuttering: A neurophysiological perspective. In N.B. Ratner and E. C. Healey (Eds.), *Stuttering research and practice: Bridging the gap*. Mahwah, NJ: Lawrence Erlbaum.
- Gaines, N., Runyan, C. & Meyers, S. (1991). A comparison of young stutterers' fluent versus stuttered utterances on measures of length and complexity. *Journal of Speech and Hearing Research*, 34, 37-42.
- Guitar, B. (1998). *Stuttering: An integrated approach to its nature and treatment*. (2nd ed). Baltimore, MD: Williams & Wilkens.
- Healey, E.C., Norris, J., Scott-Trautman, L., & Susca, M. (1998). Enhancements to integrated approaches for treating stuttering. International Stuttering Awareness Day Internet Conference, Mankato State University, Mankato, MN.
- Healey, E.C., Scott Trautman, L. & Panico, J. (2001). A model for manipulating linguistic complexity in stuttering therapy. *International Stuttering Awareness Day Online Conference*, Mankato State University, Mankato, MN.
- Howell, P., & Au-Yeung, J. (1995). Syntactic determinants of stuttering in the spontaneous speech of normally fluent and stuttering children. *Journal of Fluency Disorders*, 20, 317-330.
- Logan, K.J., & Conture, E. (1995). Length, grammatical complexity, and rate differences in stuttered and fluent conversational utterances of children who stutter. *Journal of Fluency Disorders*, 20, 35-61.
- Madison, L.S., Budd, K.S., & Itzkowitz, J.S. (1986). Changes in stuttering in relation to children's locus of control. *Journal of Genetic Psychology*, 147, 233-240.

- Manning, W. H. (2000). The demands and capacities model. *Journal of Fluency Disorders*, 25, 317-319.
- Manning, W. H. (2001). *Clinical decision making in fluency disorders*. San Diego, CA: Singular Thomson Learning.
- Nippold, M. (1990). Concomitant speech and language disorders in stuttering children: A critique of the literature. *Journal of Speech and Hearing Disorders*, 55, 51-60.
- Norris, J. (1997). Functional language intervention in the classroom: Avoiding the tutoring trap. *Topics in Language Disorders*, 17 (2), 49-69. Aspen Publishers.
- Roessler, R., and Bolton, B. (1978). *Psychosocial adjustment to disability*. Baltimore: University Park Press.
- Riley, G. D. (1994). *Stuttering severity instrument for children and adults* (3rd ed.). Austin, TX: Pro-Ed.
- Riley, G. D. and Riley, J. (1979). A component model of diagnosing and treating children who stutter. *Journal of Fluency Disorders*, 4, 279-293.
- Riley, G. & Riley, J (2000). A revised component model for diagnosing and treating children who stutter. *Contemporary Issues in Comm. Science and Disorders*, 27, 188-199.
- Scott Trautman, L. A., Healey, E. C., & Norris, J. (2001). Effects of contextualization on fluency in three groups of children. *Journal of Speech-Language-Hearing Research*, 44, 564-576.
- Siegel, G. M. (1999). Integrating affective, behavioral, and cognitive factors in stuttering. In N.B. Ratner and E. C. Healey (Eds.), *Stuttering research and practice: Bridging the gap*. Mahwah, NJ: Lawrence Erlbaum.
- Smith, A. (1999). Stuttering: A unified approach to a multifactorial, dynamic disorder. In N.B. Ratner and E. C. Healey (Eds.), *Stuttering research and practice: Bridging the gap*. Mahwah, NJ: Lawrence Erlbaum.
- Starkweather, C.W. (1999). The effectiveness of stuttering therapy: An issue for science? In N.B. Ratner and E. C. Healey (Eds.), *Stuttering research and practice: Bridging the gap*. Mahwah, NJ: Lawrence Erlbaum.
- Starkweather, C. W., & Givens-Ackerman, J. (1997). *Stuttering*. Austin, TX: Pro-Ed.
- Starkweather, C. W., Gottwald, S. R., & Halfond, M. M. (1990). *Stuttering prevention: A clinical method*. Englewood Cliffs: Prentice Hall.
- Starkweather, W., St. Louis, K., Blood, G., Peter, T., Westbrook, J., Gregory, H., Cooper, G., & Healey, E. C. (1995). Guidelines for practice in stuttering treatment, *ASHA*, 37 (Supplement 14), 26-35.
- Scott, L.A., Healey, E.C., & Norris, J.A. (1995). A comparison between children who stutter and their normally-fluent peers on a story retelling task. *Journal of Fluency Disorders*, 20, 279-292.
- Van Riper, C. (1982). *The nature of stuttering* (2nd ed.). Englewood Cliffs, NJ: Prentice Hall.
- Wall, M. J. & Myers, F. L. (1984). *Clinical management of childhood stuttering*. Austin, Texas: Pro-Ed. Inc.
- Wall, M. J., Starkweather, C. W., & Cairns, H. S. (1981). Syntactic influences on stuttering in young child stutterers. *Journal of Fluency Disorders*, 6, 283-298.
- Watson, B. C., Freeman, F. J., Chapman, S. B., Miller, S., Finitzo, T., Pool, K. D., & Devous, M. D. (1991). Linguistic performance deficits in stutterers: Relation to laryngeal reaction time profiles. *Journal of Fluency Disorders*, 16, 85-100.
- Weiss, A. L., & Zebrowski, P. M. (1993). Disfluencies in the conversation of young children who stutter: Some answers about questions. *Journal of Speech and Hearing Research*,

35, 1230-1238.

Yaruss, J. S. (2000). The role of performance in the demands and capacities model. *Journal of Fluency Disorder*, 25, 347-358.

Zimmermann, G. (1980). Stuttering: A disorder of movement. *Journal of Speech and Hearing Research*, 23, 122-136.

Table

Quantification of Levels for the CALMS Model

1 = Normal:	Function is considered within normal limits in terms of behavior, performance, ability, attitude or perception. Any test data are well within normal limits.
2 = Low Normal:	Slight variation or low normal function but behaviors, performances, abilities, attitudes or perceptions are still considered to be within normal limits.
3 = Borderline:	Clinical judgment suggests function is slightly below normal levels. This category also suggests that behaviors, performances, abilities, attitudes or perceptions are just below normal levels. Any test data show standard score of .5 to .9 SD below normal level.
4 = Low Borderline:	Clinical judgment suggests low, borderline function. This category also suggests that behaviors, performances, abilities, attitudes or perceptions are only slightly above abnormal levels. Any test data show standard score of 1.0-1.4 SD below normal level.
5 = Mildly Abnormal:	Clinical judgment suggests a “mild” degree of difficulty or deficit in certain functions. Also suggests that behaviors, performances, abilities, attitudes or perceptions are just below expected levels of function. Any test data show standard score of 1.5 – 1.9 SD below normal level.
6 = Moderately Abnormal:	Clinical judgment suggests a “moderate” degree of difficulty in certain functions. Also suggests that behaviors, performances, abilities, attitudes or perceptions are consistently below expected levels of function. Any test data show standard score of 2.0 – 2.4 SD below normal level.
7 = Severely Abnormal:	Clinical judgment suggests a “severe” degree of difficulty in certain functions. Also suggest that behaviors, performances, abilities, attitudes or perceptions are substantially below expected levels of function. Any test data show standard score of > 2.5 SD below normal.

Table 2

Assessment Items for Each Component Within the CALMS Model

Domain	Item
Cognitive	Child's awareness of his/her stuttering Impact of awareness on severity of stuttering Child's thoughts about how others view his/her stuttering Child's knowledge and understanding of stuttering
Affective	Child's perceptions of himself/herself Child's attitudes and feelings about communication Child's attitudes about stuttering Child's feelings and emotions about stuttering Child's reaction to how others respond to stuttering
Linguistic	Level of stuttering as length and complexity of an utterance increases Overall Language skills Overall articulation/phonological ability Word finding and/ or receptive/expressive vocabulary ability
Motor	Types of disfluencies that characterize speech Features of disfluencies (i.e., number of repeated limits, effort, tension, etc) Frequency of stuttering Duration of stuttering Presence of secondary coping behaviors Overall speech motor control (speech rate, diadochokinetic rates)
Social	Child's avoidance of speaking situations Child's stuttering frequency in academic subjects and extracurricular activities Impact of stuttering on peer relationships Frequency of stuttering with various communicative partners Frequency of stuttering in various speaking situations

Multidimensional Model of Stuttering

Figure Captions (as separate files)

Figure 1. A Cognitive, Affective, Linguistic, Motor, Social (CALMS) model of stuttering.

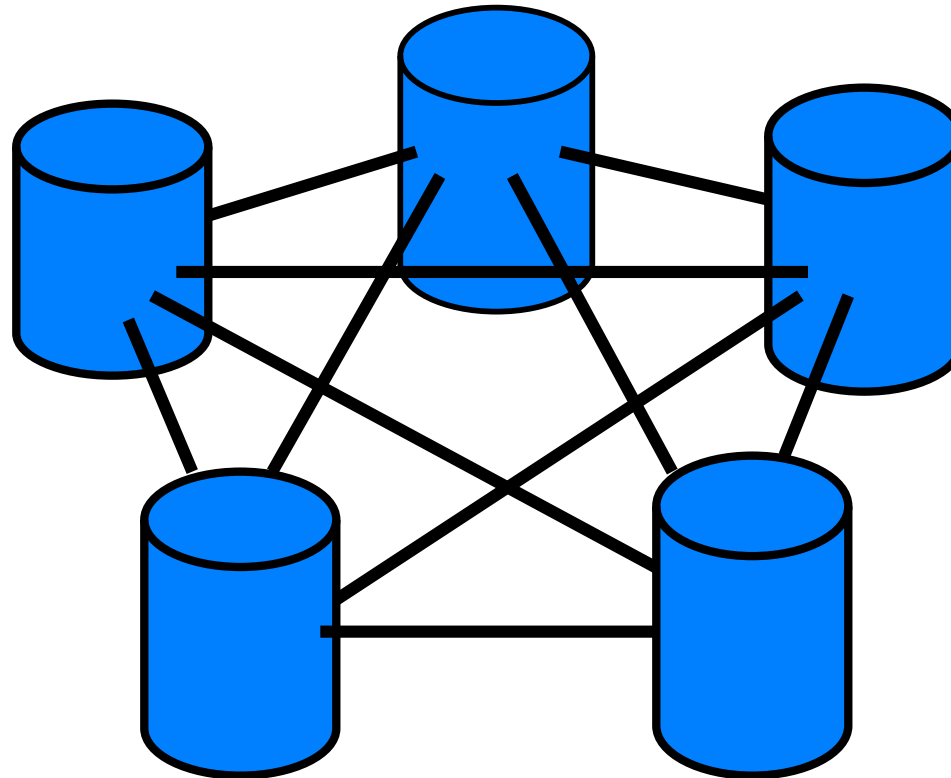
Figure 2. Example of a client's profile of performance for each of the CALMS components.

The CALMS Model of Stuttering

Affective - feelings, emotions, attitudes

Cognitive

- thoughts
- perceptions
- awareness
- understanding



Linguistic

- language skills, lang. formulation demands & discourse

Social - effects of type of listener & sp. situation

Motor - Sensori-motor control of speech movements

