Educational planning for children with fetal alcohol syndrome

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Summary. It has now been thirty-two years since Jones and Smith first identified fetal alcohol syndrome (FAS) in the United States. Since then, numerous epidemiology studies have been conducted to determine prevalence rates of this disorder. More recently, the research focus has concentrated on studies to elucidate a neurobehavioral phenotype for the alcohol-exposed population. As a result, the FAS field has learned what types of neurobehavioral issues occur most frequently with these children. This paper discusses the results of neurobehavioral research with alcohol exposed children and how that information can be used to inform school assessment, intervention planning, and support.

Key words: fetal alcohol syndrome, neurobehavioral research, intervention planning.

Riassunto *(La progettazione educativa per i bambini affetti da sindrome fetoalcolica)*. Sono trascorsi trentadue anni da quando Jones e Smith identificarono per la prima volta la sindrome fetoalcolica (fetal alcohol syndrome) negli Stati Uniti. Da allora sono stati condotti molti studi epidemiologici allo scopo di determinare la prevalenza di tale disturbo. Più di recente la ricerca si è concentrata su studi che potessero isolare un fenotipo neurocomportamentale tipico nella popolazione di bambini esposti all'alcol in utero. Grazie a questi studi la ricerca del settore ha potuto evidenziare quali sono le problematiche di tipo neurocomportamentale che ricorrono più di frequente in tali bambini. Questo lavoro esamina i risultati della ricerca neurocomportamentale sui bambini esposti all'alcol e come tali informazioni possano essere utilizzate nella valutazione scolastica, nella pianificazione degli interventi e nell'assistenza.

Parole chiave: sindrome fetoalcolica, ricerca neurocomportamentale, piani di intervento.

INTRODUCTION

July 2003, marked the 30th anniversary of the introduction of the term fetal alcohol syndrome (FAS) in the United States [1, 2]. Kenneth Jones and David Smith, along with a group of astute nurses and psychologists from The University of Washington, recognized and described a group of Washington State children who had similar facial dysmorphology. On closer scrutiny, that group of children had all been exposed to excessive amounts of alcohol *in utero*. Common among the children was a distinct constellation of physical abnormalities, growth retardation, central nervous system damage, and prenatal alcohol exposure. It was determined that all of these children had suffered teratogenic damage as a result of maternal alcohol ingestion during the gestational period. Consequently, the term FAS was introduced and these children were assigned the diagnosis.

In the subsequent 30 years, through animal and human population studies, much has been discovered about the effects of prenatal alcohol exposure. For example, the developmental outcome of children exposed to alcohol prenatally is dependent on a wide range of factors including; the quantity and timing of the alcohol exposure, maternal age, nutritional status of the mother, and parents' intelligence and level of education. Therefore, the effect of prenatal alcohol exposure on a child's development is highly variable, and not all children who have been exposed to substantial amounts of alcohol display all of the features of full-blown FAS.

In addition, researchers have had difficulty determining an alcohol consumption threshold that causes adverse neurobehavioral findings. Some researchers, though, suggest that seven standard drinks per week may be enough to cause neurobehavioral challenges for a child [3]. Because the factors contributing to developmental issues are so complex and the developmental outcomes so variable, the field of FAS study has begun to discuss the continuum of effects that occurs with children who have had prenatal exposure to alcohol. The preferred nomenclature is now fetal alcohol spectrum disorders (FASD).

USING A HOLISTIC MODEL AS A BACKDROP FOR PROVIDING INTERVENTION SERVICES TO CHILDREN WITH PRENATAL ALCOHOL EXPOSURE

In the United States, as well as Italy, educational mandates promote the inclusion of children with special needs within regular classrooms whenever possible (educating children within the least restrictive en-

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vironment) [4, 5]. This means that the individual needs of a child with disabilities must be addressed within the context of the regular classroom. Although these educational mandates are country-specific, culturally-specific, and historically-specific events, one salient question remains: How can we best serve children with FAS or FASD in their schools, community, and homes? The overall goal of intervention is to provide the necessary academic and functional supports so that the child grows into an independent adult who can have a positive life experience. In order for this to happen, intervention must begin as early as possible and focus on developing both the academic and functional abilities of the individual.

The following model *(Fig. 1)* illustrates the factors that must be considered when planning interventions for alcohol-exposed children. Because the goal of any intervention is to promote the general well-being of the child within his school, home and community, a complex set of factors must be considered. The diagnosis of FASD presents an interface between the health community and the educational community and all aspects of both must be considered in the planning of educational and social interventions for the affected child. The health community and educational community are inextricably connected. This model considers the child within the context of his/her community, social milieu, family, and culture. The promise of this model includes cross discipline sharing of resources, greater access to community health personnel, a greater opportunity for coordinated curriculum development, improved teaching methods, and realistic understanding of the child's individual educational needs.

GENERATING A LEARNING PROFILE

Because there are few medical doctors who feel confident in making the diagnosis of FAS or any other level of FASD or who are trained appropriately to do so, children may come into an educational setting with or without a specific diagnosis of FASD. If there is a diagnosis, the school may or may not be aware of it. In most cases, however, children who were prenatally exposed to alcohol come to the attention of the educational system because of the learning issues they display. In either case, the schools generally will initiate an assessment of their own to determine the learning profile of an identified child. While standardized IQ measures are helpful, neuropsychological testing, achievement testing, contextual observations, and behavioral assessments provide the most useful information for developing programming for children with FASD. Often children with a diagnosis of FASD are ineligible for special services because their intellectual abilities fall within the average range of intelligence. Studies have shown that the average intelligence scores of children with prenatal alcohol exposure fall two standard deviations below the mean. Approximately fifty percent of children with FAS are mentally retarded, however, IQ scores range from severely retarded to high average in this population [6]. Because of the variability of IQ scores in this population and the known deficits in higher order cognitive functioning found in this population [7-11], an individual learning profile must be developed for each child. Children who have average intelligence and are prenatally alcohol-exposed benefit most from a battery of tests that can best elucidate issues of attention, verbal learning and recall, verbal memory, auditory memory, spatial memory, auditory processing and verbal processing. In a typical school process, children will be given the following standard battery of tests: an IQ measure, achievement measure, and an adaptive measure. We propose the use of neurobehavioral testing to better elucidate the individual learning profile of affected children.

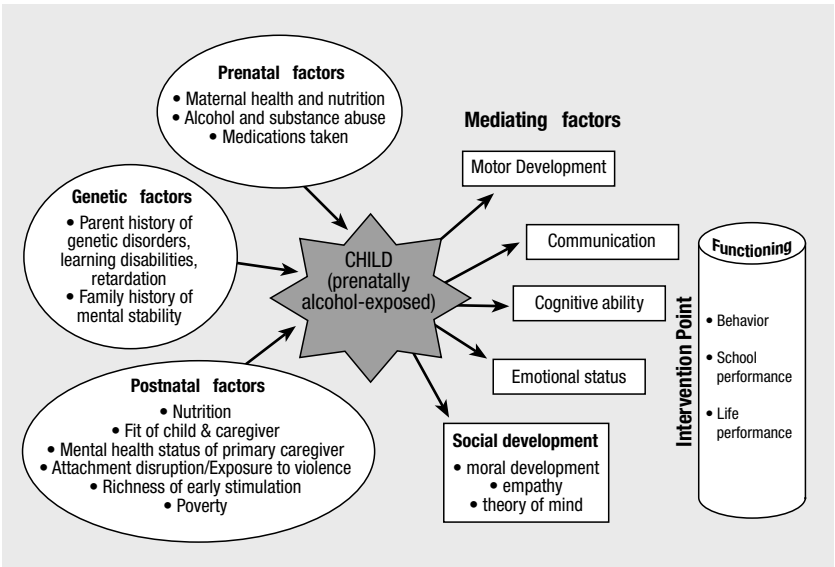

Fig. 1 | *Factors influencing the life functioning of children prenatally exposed to alcohol.*

Utilizing neuropsychological testing results to develop a learning profile for individualized programming

Although a typical neurobehavioral phenotype of FAS has not yet been described, the field is moving toward the articulation of such a phenotype. Some researchers have promoted the concept of identifying a set of core deficits in these children. The Collaborative Initiative on Fetal Alcohol Spectrum Disorders (CIFASD) has been funded by the United States, National Institute on Alcohol Abuse and Alcoholism (NIAAA) to, "coordinate basic, behavioral and clinical investigators in a multidisciplinary research project to better inform approaches aimed at developing effective intervention and treatment for FASD. Input and contributions are coming from basic researchers, behavioral scientists, and clinical investigators who are willing to utilize novel and cutting edge techniques, not simply to replicate previous or ongoing work, but rather to move the field forward in a rigorous fashion" [12]. This consortium is an international effort that includes studies of children in Finland, Russia, Ukraine, South Africa, United States, and Italy.

Children exposed to moderate amounts of alcohol may not show all of the features of the full syndrome but may still display neurobehavioral issues, particularly in executive functioning abilities [3]. Executive functioning refers to an individual's cognitive ability to plan and sequence behavior to efficiently achieve a goal. Neuroscientists evaluate this ability by presenting testing tasks that involve effortful, deliberate actions requiring working memory (holding and manipulating information mentally in order to complete the task successfully). In addition, attentional abilities of the child are also evaluated as part of this rubric.

Executive functioning has been the focus of a number of studies with children exposed to alcohol during gestation. Findings have revealed that those individuals with FAS and individuals with known exposure but without a diagnosis of FAS exhibit executive functioning difficulties. Mattson *et al.* reported executive functioning deficits in children with known prenatal alcohol exposure with and without the diagnosis of FAS [9]. These executive functioning deficits were also seen in children whose intelligence fell in the average range of functioning. Specifically these children demonstrated marked difficulty in complex working memory related tasks and shifting sets (in both cognitive and emotion-based tasks), planning ability, cognitive flexibility, selective inhibition, and concept formation and reasoning [8]. In addition, executive functioning deficits in alcohol-exposed children have been found to closely correlate with reported behavioral issues in these children.

The information derived from neuropsychological testing of executive functioning in affected individuals can be useful in two specific ways. First, the neurobehavioral effects of alcohol-exposure on developmental outcomes are thereby better understood for each child. And, secondly, results of executive functioning testing provide valuable information regarding attention, memory, problem-solving and inhibitory control, all of which are extremely useful in tailoring interventions to suit the needs of a child.

The usefulness of neurobehavioral test protocols involving executive functioning tasks is apparent. This type of testing assists the family, medical provider, and classroom teacher with a clearer understanding of the issues that interfere with learning and behavior in the classroom, home and community. The next section of this paper will outline the empirically determined deficits often seen in alcohol exposed children and the functional deficits observed as a result.

Executive functioning

As described, executive functioning difficulties are common among children who were prenatally exposed to alcohol [7-11]. Deficits in this area interfere with successful completion of some of the simplest tasks of daily living, academic achievement and problem solving. The types of functional issues that may be seen as a result of executive functioning deficits fall into two broad categories: cognition-based difficulties and emotion-related difficulties [8].

Cognition-based executive functioning limitations may manifest in the child's inability to understand and hold in memory the specific steps of a given task or sequence. For example, children with this type of difficulty struggle with following sequences that are inherent in a typical daily routine, the steps of social exchange, and typical learning sequences. Daily routines are apparent to most of us and do not require much extra cognitive effort to hold in our understanding. Similarly, most learn the steps of appropriate social exchange by observing and being guided by the adults and children with whom we interact. Typically, it is not necessary to teach these steps explicitly. However, for children with prenatal alcohol exposure, the steps of appropriate social interaction are not so apparent and easily understood. Therefore, the steps of social engagement must be taught by rote and eventually learned through repetition.

Learning sequences can also be very difficult for children with FASD to grasp. In the process of learning, many tasks require the use of cognition-based executive functioning abilities. One good example of this is arithmetic. Arithmetic is a subject that requires a clear understanding of the relationship between the specific order and function of the numbers with which one is working to derive a correct answer on a given computation. If the order and function of that task are not cognitively held in working memory, and if the specific steps to correctly solve the problem are not understood, then the child will not be successful in completing the arithmetic problem.

Emotion-related executive functioning deficits may manifest themselves in the inability to inhibit responses. This can be seen behaviorally when children speak or act out inappropriately, or when a child's behavior is impulsive or overly active. In the classroom, a child may speak out before thinking about what is acceptable in that situation. He or she also may have difficulty controlling his actions when he/she is upset.

Functional issues related to executive functioning deficits

Social pragmatics. - Acting before considering the consequences of the behavior is a hallmark of children with FAS [13]. For example, children with FAS often are socially intrusive to those around them. They will encroach on the personal space of peers, have difficulty inhibiting themselves to wait their turn, and blurt out inappropriate communication. These are examples of the challenges this population has with social pragmatics (the rules and steps of social interaction). Logically, these types of deficits interfere greatly with an affected child's ability to make friends and maintain relationships.

Memory and attention. - As discussed previously, children with executive functioning difficulties have trouble holding information in memory for later use (working memory) in solving novel problems, planning a task's trajectory, and maintaining attention to complete a goal. In the classroom this deficit may manifest itself in the child's inability to follow directions, retain information previously presented, generalize information from one situation to another, or organize events into a logical sequence or timeline. General organizational abilities also present a challenge to a student who has been exposed to alcohol prenatally. It may be very difficult for that child to organize and keep track of his personal belongings and school materials, independently organize a learning task into a meaningful sequence for completion, and grasp that most tasks contain a beginning, middle, and an end. In addition, working memory deficits interfere with academic skill acquisition. The tools necessary for academic readiness often progress much more slowly for children with FAS. As a result, foundational concept acquisition such as shapes, letters, numbers and words present more of a challenge.

Using Mirsky's model of attention, Claire Coles *et al.* [14] compared children diagnosed with FAS with those children who were diagnosed with ADHD. Mirsky's [15] model defines attention using a four part theoretical model: Focused attention, Maintenance of attention, Ability to Shift attention, and Ability to Encode new information. Her research revealed that children with FAS have the most difficulty shifting their attention and encoding new information whereas children with ADHD have more difficulty focusing and sustaining attention. When a child has issues with shifting attention, there is greater potential for that individual to perseverate on a given task. He or she may have extreme difficulty moving from one topic to another, become confused by a change in the routine, and become resistant to transitioning from one place to another. Additionally, life changes such as family membership, moving from one school to another, and changing from one grade to the next may all be highly frustrating and perplexing to a child with this type of attentional challenge.

Willford *et al.* [11] looked at verbal and visuospatial learning and memory with children with moderate prenatal alcohol exposure. They found that moderate prenatal exposure was associated with a generalized deficit in learning (encoding) and memory, impaired learning (encoding) and memory performance in the auditory/verbal domain, and impaired encoding/storage and retrieval processes. In other words, these children have a hard time taking in new verbal information through auditory channels and holding that information in memory for use at a later time. This was consistent with previous studies done with children who had been exposed to substantial amounts of alcohol [9, 16-18]. However, a more recent study revealed that, although children with FASD have more difficulty encoding new information, once they have learned or encoded the information, they are able to retain that information and recall it for use later [19]. These difficulties functionally translate into problems adequately learning (encoding) information initially, recalling auditory verbal information, following directions presented in verbal form, and the ability to generalize information from one application to another. These characteristics of the fetal alcohol exposed child lead to what can be termed the Speech/Comprehension Paradox. Often children with FAS have relatively good vocabularies and are loquacious. However, because of the deficits in verbal memory, most often the comprehension level lags behind the expressive ability and makes the child appear to be more capable than is actually the case.

Working in concert with the family to develop educational programs

The ultimate goal of educational planning and community responsiveness to individuals with FAS is to work toward a respectable and desired quality of life for that individual. The way that is defined and how that might look will be different for each individual because of the unique nature of that child's experiences, degree of need, family culture, and community culture.

The family of the child is instrumental in defining and guiding the school program for the child with FAS. Professionals are educated and trained in a variety of disciplines to assist children in their development of skills in all areas of life; social, academic, physical, and emotional. However, professionals move in and out of a child's life over the educational career and are financially compensated for their services. In most cases, a professional will not follow a child through his life span. Therefore, the professional must recognize and regard the hopes, wishes, and desires families hold for their children with FAS.

The parents and primary caregivers of the child must play an integral part in the educational planning process so that the wishes of the family for their child and the motivations of the child become the basis for goals set for the child. Ideally, the school team and the family will work in concert to develop, assess, and redefine a child's school program over his school career. It is helpful to encourage families to think about the long term goals they hold for their child (*i.e.*, goals to set over the course of the child's lifetime). These long term goals transcend the yearly goals set for children in the educational process. The yearly goals that are set by

the school and family team become the stepping stones toward the achievement of the desired long term goals. Often the long term goals shift as time passes and development of the child takes its course, however, this is only revealed in the cooperative process over time. One good resource to help schools work with families to set long term goals is a educational planning tool created by Michael Giangreco titled Choosing Outcomes and Accommodations for Children (COACH) [20].

DIAGNOSIS *VERSUS* ASSESSMENT, MAKING THE DISTINCTION

Once the diagnosis is made, the real work begins to determine the individual needs and the differences that are specific to each child. These individual differences are determined through assessment processes that are ongoing. The assessment(s) will determine what special supports and modifications will be required for each student. The importance of the assessment process is that it feeds directly into the actual goals and objectives that will be included on the individualized plan for instruction in the classroom [21]. Often schools leap from the eligibility evaluation straight to the goals and objectives of the individualized plan without fully assessing the current skill levels of the child and the specific needs the child has in various school settings. There are many different ways a comprehensive school assessment can be accomplished. Ideally, the assessment should contain information from a myriad of sources: parents, previous teachers, and observation of the child in a variety of settings. The primary components of the assessment process should lead to useful information to answer the following questions:

1) *Is a particular skill present or not, and if present, at what competence level is it observed and in what form(s)?* For example, when assessing reading readiness, is the child able to recite the alphabet, is the child able to write the letter of the alphabet, is the child able to write all letters of the alphabet in capital and lower case forms, is the child writing his or her name, is the child combining letters to form words?
2) *What potential does the child have for developing that skill?* For example, if the child is delayed in his acquisition of reading readiness skills, how delayed is he, and is there anything that will ultimately prevent him from acquiring those skills?
3) *What type of organization and structure will be needed for the child to develop the ability to independently display that skill?* For example, will the child who is displaying delays and difficulties acquiring reading readiness skills require specific structuring tools, systematic teaching methods, or increased repetitions to help him become competent in that area?

Based on what we know empirically about children with FASD (their possible cognitive, behavioral, and academic challenges), we begin to create an individual profile for each child to determine the best school programming and intervention methods to apply. It is important to reiterate consideration of each individual child and his or her unique learning profile in the process of planning interventions. Each child with FASD is an individual and the kinds of support the child needs will reflect the particular situation.

FUNCTIONAL CLASSROOM ASSESSMENTS

Using the above described questions as a guide, functional or real life abilities of the child must be assessed [22, 23]. This will supplement the diagnostic testing (IQ, academic achievement, behavioral, and neuropsychological) results, family information, and, actual school achievement information. How does one embark on this functional assessment process? First, the assessment process must include comprehensive observation of the child and it must be done in a variety of natural settings. This helps the observer see how the child does in different settings and assess the impact of the environmental conditions on his abilities. Observations should be conducted on at least two to three different occasions in several different settings so that the observer can account for setting-triggered events and assess the child over time. It is very important to conduct observations across settings to determine where identified behaviors occur as well as where those behaviors are absent. Multiple observations allow the observer to determine current abilities and establish reasonable expectations. This process also enhances one's understanding of what conditions may be necessary for the child to perform optimally. It also helps to determine what conditions might disrupt effective functioning. The following key factors should be observed during the observation time: 1) skills; 2) attention; 3) independence; 4) social interactions; 5) functional language; 6) strengths and interests; and 7) behavior.

Skill acquisition

First, the actual skills that the child displays should be observed and noted. What *skill does* the child have or not have, and what skills are emerging? How do the skills of the observed child compare to the skills of the other children in the classroom? As part of this process it is important to note the child's ability to understand the verbal and written directions that are given during the observation time. Does the child understand what is expected in the classroom?

Attention

Another key factor to observe is the child's *attention* to specific expectations in the environment [24, 25]. How well does the child take in and use new information (encode)? How does the child do when required to shift attention from one task to another? When transitioning from one setting to another or from one topic to another, how well does the child follow and cope with the change? Also important to note is the child's ability to focus on a task. We know that children focus better and attend longer to tasks that are interesting and motivating. Children also are able to focus their attention better to tasks that provide the "just right" developmental chal-

lenge. In other words, the educator can determine if a task is developmentally appropriate if the child is able to maintain focus on the task. Finally, the observer should watch the child's ability to sustain attention during a task. This includes determining what is termed a "distractibility quotient". For example, does the child turn to every noise? Does the child spend excess time looking out the window? Do the activities and movement of others in the class take him off task?

Ability to work independently

The next factor to observe is the child's *ability to work independently*. Inherent in these observations is the need to assess the level and types of assistance the child requires to complete a task. Also, the observer must determine how well the child can independently set up and organize an activity. Because children with FASD have extreme difficulties with executive functioning, one must determine how much additional structure and organization he may need in the environment to successfully complete a given task. Children with FASD may only display skills when an appropriate amount of structure is provided for them. If a task is organized and structured for the child to help him independently complete the task and he still cannot complete it successfully, then he may not have the skills to complete the tasks (*i.e.* the task may be outside his developmental skill level). When assessing this, start with minimal amount of structure and add more as necessary until you provide the exact amount of structure needed for success.

Interactional abilities

Another area to assess in children with FASD is the nature of their *interactions* with other students as well as the teacher [26]. It is beneficial to determine if the child prefers to interact with adults or peers. In addition, the observer should note how frequently or infrequently the child attempts to initiate interactions with other. How well does he respond to the overtures of others to interact with him? When the child does attempt to interact with others, watch for how well he navigates the pragmatics of that interaction. The pragmatics of social interaction involves how well the child can follow the accepted rules of social engagement. For example, is the child appropriate in his interactions or does he engage in rude behavior? Is he able to stay on topic? Is he overbearing or overly intrusive into another's personal space. It is also good to note his social preference. Does the child have the ability to share space with another or is the child resistant to sharing space? Can the child work or play side by side with another child without interacting or intruding with another child? Is the child able to freely share materials? How well does he cooperate? Can she take turns or does his behavior interfere with his ability to wait for a turn?

Functional language

Although formal language testing is most likely available for the child you are observing, it is informative to assess the *child's language* informally in the context of real life situations at home, at school and in the community. Noting the amount of language a child processes and understands (receptive), the way(s) a child communicates and the reasons why the child communicates (expressive), and the pragmatics the child uses in real life contexts should all be included in the process of the informal assessment [27-29].

Strengths and interests

Another component of a functional assessment involves the discernment of the child's *strengths and interests* [30]. This is key to successful school programming. By watching what a child is interested in, we can determine what might provide the "hook" to motivate the child's learning. This is done by discussing the child's interests and strengths with the child's family as well as observing what attracts the child in the school setting. Assessment of a child's choices helps determine what kind of learner he is: visual, tactile, auditory, or proprioceptive.

Behavior

Specific target *behaviors* may be interfering with the learning path of a child with FASD [31]. When a problematic behavior is observed, a functional behavioral assessment (FBA) is suggested to identify what conditions exist that are perpetuating the target behavior [32, 33]. Functional behavior assessments provide a critical link between topographical descriptions of behavior and intervention planning. FBA considers the biological, social, affective, and environmental factors as potential contributors to problem behavior. When a child's behavior is impeding learning, a FBA followed by positive behavioral supports and interventions can often remediate the situation and address the behavior. Functional behavioral assessment is appropriate for any behavior that interferes with a student's education or that of the child's peers.

Once all informal assessment is completed and/or a functional behavioral assessment is completed, the school team, including the family, can utilize the information to create a specific learning profile for the child. The information gained through formal testing and these assessment processes provides a comprehensive packet of information from which initial program planning can begin [34]. The child's needs as well as the child's strengths will be revealed in the process of the formal evaluation and the informal assessment. This information is then pieced together like a puzzle to reveal a specific *learning profile* for each child. Although there may be similarities among profiles, each profile should reflect the unique picture of the particular child with whom you are working. No two learning profiles are ever the same.

DEVELOPING INDIVIDUALIZED INTERVENTIONS WITH THE LEARNING PROFILE AT THE CORE

It is important to understand the child's present levels of performance when planning your instructional activities so that those activities are appropriate for his

developmental abilities. If a child with FASD is placed with age peers, he may have a wide range of abilities that may not all fall in the range of abilities compared to his classroom peers. In addition, one must carefully consider the modifications and supports that will be necessary in the environment to support the child. It is helpful to think of the environment as an external nervous system of the child, a place where supports can be implemented to bolster the deficit areas of the child. Because of the learning differences that exist with many children who have FASD, structure is a very helpful environmental support. Placing appropriate structure in the environment is an imperative for success with children who have FASD [13]. Structuring the teaching environment helps the child know what is expected of him. Although structuring is helpful, it is important that adults are mindful when structure is appropriate and when structure turns to control. At times, a child's escalating behavior can make an adult seek more control over the child. When this scenario presents itself, it is important, as the teacher, to know when structure turns to control. At this juncture it is advisable to re-assess what is not working and restructure the environment accordingly [24].

Structure and systematic teaching for children with fetal alcohol syndrome

Environmental structure (functional routines and structured teaching) and systematic teaching are excellent tools to use with the FASD population. Functional routines occur naturally for all individuals and provide a structure that lends predictability and a clear understanding of what activities will happen and in what sequence to complete a routine [35]. Functional routines provide opportunities for parents and teachers to provide systematic instruction. Teaching functional routines requires identifying skills, routines or activities that can be taught through routine practice such as dressing, getting ready for bed, bathing, etc. A teaching plan must be created for teaching a functional routine. The teaching plan will include developing strategies/objectives, deciding where an activity will be taught, what materials will be needed, the steps involved, the cues that will indicate the beginning of the routine, and what responses will indicate correct and incorrect performance (the reinforcement procedures promoting independence). Teaching functional routines early in a child's life provides clarity and organization on which the child comes to depend [13].

Structured teaching, developed by the Division of TEACCH in the Department of Psychiatry of the University of North Carolina School of Medicine, aims to understand the child's unique learning challenges and to develop environmental support to compensate. Once there is an understanding of the individual needs of the child, an intervention program is built around the child's strengths and needs. The visual structure provided for the child makes the environment and learning tasks predictable and visually clear. Predictability helps the child feel more comfortable and safe. Building structure into a child's day not only makes life more predictable but it provides external supports that assist the child toward better organization. External structuring techniques provide compensatory tools to aid the child's deficit areas (*e.g.* executive functioning, set shifting, working memory and attention).

Visual structure

To begin developing structuring tools, it is useful to think of the various aspects of structure. One aspect of structure is visual structure. *Visual structure* includes physical structure of the environment that decreases both visual and auditory distraction, the use of individualized daily schedules, incorporates routines, and includes tasks structure that provides visual organization, clarity, and instructions [36].

Visual structure can provide organization, clarity and instructions. Some examples of visual organization include using containers to separate materials, taping off sections of the room for specific activity centers, and using assigned carpet squares for circle time. Visual clarity is achieved through highlighting relevant and important information pertinent to a task or activity, color coding each content area, and labeling tasks or work centers. Visual instructions provide the child with a clear visual cue regarding the sequence to complete a task. Some examples of visual instructions include placing arrows to direct the student, numbering the steps of a given sequence, providing written steps of an instruction, and providing a finished example of the assigned task so the child can see what is expected.

When a visual structuring tool is being developed, ask the following questions:

1) how might a visual support tool benefit the child?
2) will the visual tool assist in teaching a skill?
3) will it provide clarification?
4) could it support memory deficits?
5) might it assist in the student's problem solving? or
6) would it help the student to manage time (transition from one task to another, within the group, or work independently)?

A widely used example of a visual structuring tool is a schedule. Schedules can be used for many purposes. Almost everyone uses some kind of daily schedule to get through their day or week. Some make lists, others fill in a calendar, and still others use a daily planner. These visual schedules help indicate what will occur during the day and in what sequence events will happen. Children with FASD benefit from visual schedules in that they help to alleviate anxiety during transitions, give information that helps them anticipate and predict what will happen next and in what sequence. They also help to provide motivation by giving the child a concrete reference for how long his day will be. Because the schedule can be changed as the needs of the environment change, these schedules often help build flexibility into the child's thinking. These tools help the child learn to work more independently in that they help the child rely on the schedule (a thing) rather than the teacher (a person).

Schedules are set up in a number of ways. They may be arranged top to bottom or left to right, depending upon which is most comfortable for the child. It is helpful if

the schedule can be manipulated by the child to indicate progress or when an activity is finished (*i.e.*, crossing off tasks as they are completed, checking off tasks, moving a task icon off the schedule when it is complete).

Environmental structure

Environmental structure helps provide the best conditions for learning as well as define what occurs in a particular location [37]. For example, a child with FASD may be able to complete difficult academic activities that require vigilant concentration and attention if they are provided a space that is clear from distractions. Thinking about the task and the setting in which the child can best accomplish that task is key to the child's success. Children with FASD are often distracted by visual clutter. Therefore, keeping the environment simple with a minimum of decorations can be helpful. Another example of environmental structure involves clearly defining work centers for the child. For example, there may be a place in the classroom for arithmetic, another place for reading, another for the computer, etc. It is worth spending the time to determine the best environmental structure for children with FASD in the classroom. This enhances the student's understanding of their environment and what the expectations are, minimizing the potential for behavior challenges.

Task structure

Specific task structuring can be very beneficial to the child with FASD in that tasks structuring provides a clear system for the child to follow. A task can be structured so that the child understands what task expectations there are, how many tasks need completing, when one task is finished, and what task comes next.

CONCLUSION

For children with FASD, the school environment can be difficult to traverse and schooling may become a negative experience. The keys to success for these children are properly assessing the child and the environments in which he or she will function and to then develop structures and routines that create a sense of safety and comfort so the child will be more inclined to step out and take risks. With risk-taking comes increased skill development.. With increased skill development comes a greater sense of competence and ultimately an enhanced quality of life.

Once those educating and supporting the child with FASD understand the specific learning challenges of each student, appropriate structure can be applied to the environment and clear multi-modal environmental cues implemented to help assist the child toward a better educational outcome.

Armed with adequate diagnostic and assessment information, a school team can utilize that information to create a positive school program for a child [38]. The intervention tools described in this paper are meant to provide an overview of the external supports needed for most children who have experienced prenatal exposure to alcohol. As these intervention tools are created and tailored to the individual learning needs of each child, it is necessary to assess how well they are working and if the tools need to be adjusted or changed in any way. Utilizing these types of interventions with students who have FASD is not static but instead, a dynamic ongoing process.

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