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Dyslexia and Mindfulness: Can Mental Training Ameliorate the Symptoms of Dyslexia?

Julia Keller

Julia A. Keller
Candidate

Psychology
Department

This dissertation is approved, and it is acceptable in quality and form for publication:

Approved by the Dissertation Committee:

Dr. Eric Ruthruff, Chairperson

Dr. Bruce Smith

Dr. David Witherington

Dr. Jennifer Averill

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by

Julia A. Keller

B.A., English, University of Southern Colorado, 1991
M.A., Education, University of Northern Colorado, 1994
M.S., Psychology, University of New Mexico, 2012

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ABSTRACT

Dyslexia (DYS) can be defined as a reading disorder that is not caused by sensory or cognitive deficits, or by a lack of motivation or adequate reading instruction. Remediation of a deficit in phonological processing has been the focus of most DYS interventions to date, but these studies have had despairingly little impact on generalized reading abilities. Reading Recovery and mindfulness (MF) training are two interventions that emphasize the development of metacognition. Reading Recovery teaches children how to use multiple metacognitive strategies (e.g., using context clues, making predictions) while in the process of decoding and comprehending text. MF, or mental training, is a well-established technique for developing attentional capacities and can also be considered a metacognitive skill. In this mixed-methods study, I investigated whether training in metacognitive strategies (including MF) would significantly improve reading and writing skills compared to a control condition. Twenty students in grades 2-5 with an identified learning disability were recruited from the public school district. After matching on age, severity, gender, and primary language, participants were randomly assigned to an experimental group or active control group.

Participants in the experimental group received a five-week intervention that incorporated phonics training, Reading Recovery, and MF. Subjects in the control group received only phonics training for five weeks. Pre- and post-measures were collected on reading, writing, and a lexical-decision task. Quantitative results demonstrated that MF significantly increased response times during decoding (indicating a possible increase in reflectiveness due to metacognitive processes) and significantly lowered heart rate over the course of the intervention. Qualitative themes pointed to improvement in self-expression, motivation, focus, self-confidence, positive affect, and use of metacognitive strategies.

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The ability to read opens the doorways to knowledge in a multitude of realms, even in our image and sound-bite saturated society. A person who cannot read or spell simple words cannot "just google it" and find the information she needs on the Internet. Nor can she write an effective résumé. The inability to read fluently also means not gaining access to the halls of higher education where a degree can be earned, creating the potential to make more money.

Dyslexia

Unfortunately, learning to read is extremely difficult, and sometimes impossible, for the 5 to 17% of children who have developmental dyslexia (DYS), "a persistent difficulty in learning to read that is not explained by sensory deficits, cognitive deficits, lack of motivation, or lack of adequate reading instruction" (Gabrieli, 2009, p. 280). Standard interventions for DYS in regular and special education usually fail to remediate reading problems, and the likelihood of failure increases with the age of the dyslexic student. A child who struggles with reading will not choose to read books unless forced to do so, while a child who reads easily will often choose to read extensively on her own. This difference in reading practice continues to widen the gap between good and poor readers. Outside of school, a good ten-year-old reader may read as many words in two days as a poor reader does in a whole year (Gabrieli, 2009). Therefore, it is important to identify at-risk children at an early age. A child in first grade who cannot read at grade-level has a 90% probability of reading below grade level in fourth grade and may never catch up to the typical reader (Gabrieli, 2009).

Terminology

School systems do not label children who have a persistent difficulty in learning to read as DYS. Instead, they use the term "learning disability" (LD). For many years, school intervention teams (as well as researchers and clinical diagnosticians) used a formula determined by a discrepancy between an average or above-average score on an intelligence quotient (IQ) test and a low score on a standardized reading test. Now, many school districts use a response to intervention (RTI) approach to identify learning disabilities. In the RTI process, reading interventions are given to all students within the regular classroom at the first level (or tier) of support. Students who fail to reach grade-level reading expectations with Tier 1 instruction are then provided additional instruction at Tier 2 which usually involves small group instruction. Teachers who can document a student's consistent failure to respond to Tier 2 instruction can then recommend Tier 3 instruction, which is the most intense level of remediation. Students receiving this level of intervention are usually labeled as LD.

In academic and clinical fields, the term LD is often used interchangeably with DYS, and DYS is still defined by many researchers and clinicians as a discrepancy between IQ and achievement. However, the core mechanisms of DYS seem to be similar across dyslexic readers, regardless of IQ. Children who have both low scores in reading and low IQ scores can still benefit from the same type of remedial instruction that children with discrepant scores receive (Gabrieli, 2009; Tanaka et al., 2011). While DYS appears to be independent of IQ, it can be characterized in other ways. It persists into adulthood and is often comorbid with other disorders like attention-deficit/hyperactivity disorder (ADHD), speech and language disorders, and dyscalculia (difficulty in learning or understanding mathematical principles). It has a higher prevalence in boys and is often accompanied by depression in adults, unemployment, suicide attempts, and dropout from school (Schulte-Körne et al., 2007).

Primary Symptoms

Symptoms of DYS are usually described as difficulties in learning to read and spell and calculate. Parents and teachers report that their children read and write very slowly, often reverse numbers and letters, have trouble memorizing basic math facts, and spell words in unusual ways (Pennington & Welsh, 1995). Boder's (1970) three subtypes of DYS are widely referenced in the DYS literature. The largest of the three subtypes is the *dysphonetic* group. According to Boder, the primary deficit of this group is in the integration of letters and sounds (e.g., the letter "b" says "buh") and in their ability to sound out or spell words phonetically. Thus, "they read ***globally*** [emphasis mine], responding to whole words as configurations, or gestalts" (p. 289); this means they are unable to decode words that are not in their sight vocabulary (words students can read automatically without decoding). Their writing, being nonphonetic, is typically unintelligible. They often make "semantic-substitutions" errors while reading (e.g., they read "funny" for "laugh"). The *dyseidetic* group cannot perceive words as gestalts; they always read phonetically, sounding out most words as if they had never seen them before. Children who are both *dysphonetic* and *dyseidetic* cannot sound out words or perceive words as gestalts. They are the most likely group to remain *alexic* or *nonreaders.*

Although DYS was first perceived as "word blindness" when it was discovered in the late 19th century ("Dyslexia," n.d.), Boder's (1970) description of *dysphonetic* dyslexics corresponds with the widely-held view that the cause of DYS, whether originating in nature or nurture, is a deficit in the phonological processing of sounds in language (Gabrieli, 2009). Children with DYS have difficulty deciding which words start with the same sound (e.g., Does "ball," "dog," or "pat" start with the same sound as "boy"?). They often cannot segment or blend the sounds in a word (e.g., "chat" is segmented into the sounds "ch," "a," and "t," and blending these separate sounds makes the word "chat"). For older children who have accumulated a sight word vocabulary and can read a number of words, their phonological impairment shows up when they are asked to read nonsense words (like "twale") that can only be deciphered using decoding (phonological) strategies.

Phonological impairment is the most widely researched symptom of DYS. A second impairment that has been largely ignored by researchers involves the fluent reading of text. Even after children have improved their accuracy in reading single words, they still read text very slowly and with a great deal of effort. The energy they expend to decode words interferes with their ability to comprehend text. This problem with fluency continues into adulthood, even with compensated dyslexics (Eide & Eide, 2011). Much less is known about the fluency deficit in DYS, but the inability to read smoothly and confidently becomes increasingly problematic for older children and adults who want and need to read more advanced textbooks and informational literature (Gabrieli, 2009).

Brain Activation in Dyslexia

Children with DYS often hit their heads when they are trying to read or calculate, much like people kick coke machines or hit televisions when they malfunction. Over the course of the 17 years that I spent teaching dyslexic children, I often observed that some academic tasks were easy for them to finish, while other tasks—although simple to most other students—seemed to require a Herculean effort.

Electrophysical measures have documented functional differences in the left hemisphere of DYS individuals (Pennington & Welsh, 1995). The normal process of learning to read is associated with an increase of activity in left hemisphere areas and a corresponding decrease of activity in right hemisphere areas (Turkeltaub, Gareau, Flowers, Zeffiro, & Eden, 2003). In comparison to non-dyslexic subjects, dyslexics exhibit a pattern of decreased activity (or underactivation) in the left posterior regions such as the temporo-parietal cortex—a region that supports the cross-modal relationship of auditory and visual processes during reading (Gabrieli, 2009; Temple et al., 2003)—and increased activity (or overactivation) in anterior brain regions as dyslexics perform increasingly more difficult tasks that require phonologic analysis (Maurer et al., 2007; Shaywitz et al., 1998). This pattern of relative overactivation in anterior areas may be a reflection of the increased effort made by dyslexic readers during tasks that require phonological processing and can be measured behaviorally as an increase in the number of errors made (Maurer et al., 2007; Shaywitz et al., 1998).

Several researchers have used neuroimaging to investigate brain activation in DYS. Using electroencephalographic (EEG) event-related potentials (ERPs), Maurer et al.

(2007) investigated how *tuning* of visual activity for print develops in children before and after reading remediation. Tuning refers to how the neuron responds (usually measured as its firing rate) to different stimuli. Children with (*n* = 15) and without DYS (*n* = 22) completed a repetition detection task (they pressed a button after the repetition of a stimulus) with words, symbol strings, nonsense words and images, while their ERPs were recorded. Maurer et al. found impaired tuning (an underactivation in comparison to controls) of a fast occipito-temporal response in the ERP (in both hemispheres of dyslexics) to words as compared to symbols, *even after two years of intensive reading instruction*. These results suggest that children with DYS develop reading skills more slowly than their normal peers, even when they receive intense remediation.

Araújo, Bramão, Faísca, Petersson, and Reis (2012) compared the ERPs of 20 dyslexic children (ages 9-13 years) to 20 age-matched controls while they performed an implicit reading task. Subjects had to decide which of two letters/symbols had been present in the preceding stimulus (words, pseudowords, consonant sequences, and symbol sequences). When contrasting the consonant- and symbol-sequences, there were significant differences in early ERP waveforms (P1 and N1, which are sensitive to prelexical orthographic processing) in only the control group. In addition, the amplitude of later ERP waveforms (N320, thought to reflect phonological processing) was larger for pseudowords than for consonant sequences in both groups, and the control group showed greater left than right negativity. The dyslexic group did not exhibit a lateralization effect. The authors hypothesized a less consolidated reading network in the left hemisphere of dyslexic children.

Bilateral brain processes. Jung-Beeman (2005) discussed at length the contribution of both hemispheres of the brain during language processes. Anatomically, the two hemispheres are more similar than different; there are asymmetries in the sizes of some language areas, but the same cortical areas and pathways are present on both sides of the brain. However, at the microanatomical level, there are a number of asymmetries between the hemispheres. The right hemisphere (RH) has a greater proportion of white matter and so is generally more interconnected than the left hemisphere (LH), and RH activity is more highly correlated across regions. Jung-Beeman proposed the hypothesis that RH processing is more coarsely tuned than LH processing. Evidence for this is the greater neuronal branching of inputs and outputs in RH semantic areas, producing more widely spread semantic activation as compared with LH semantic areas.

These microanatomical differences could be why the LH seems to support the majority of language tasks, while a growing number of studies report greater RH than LH activity while performing higher-level language tasks (e.g., understanding metaphors, getting jokes, making inferences, discovering inconsistencies in stories, and generating sentence endings; Jung-Beeman, 2005). Dendrites that branch further from the cell body in the RH favor input from relatively distant sources in the RH, while close connections favor input from relatively close sources in the LH. Having diffuse connections would allow for the inclusion of distant and unusual semantic features. While this coarse semantic activation would provide a disadvantage in many language comprehension tasks (due to the need for precision in speech production—speakers needs to produce a single word and not a hodgepodge of related words), it does provide an advantage when interpreting words in ambiguous contexts. Patients with RH brain damage (but an intact LH) often miss the gist of stories or conversations (Jung-Beeman, 2005). Thus, understanding the possible contributions of each hemisphere in language processing may shed some light on how differences in hemispheric brain activation affect DYS.

ERP studies with at-risk newborns. ERP studies on newborns with a familial risk for DYS continue to shed light on lateralization (or the lack of it) in DYS. ERPs record the brain's electrical response to repeated stimuli. By averaging these responses over many trials, it is possible to identify a synchronized ERP pattern that represents the brain's response to a specific stimulus. Since certain types of ERPs do not require conscious attention or an overt response, this technique is very useful for studying the development of auditory cognition at a very early age (Gabrieli, 2009; Guttorm, Leppanen, Richardson, & Lyytinen, 2001).

Molfese (2000) found a clear relation between brain responses at infancy and later reading success or failure. In this experiment, phonetic discrimination abilities were tested in 48 newborns with and without a genetic risk for DYS. ERPs were recorded to a repeated series of four sounds, each of which began with an initial 50-ms consonant sound followed by a 250-ms vowel sound (e.g., /bi/ and /gi/.) Analysis revealed a difference in responses to the sound /bi/ that predicted with over 81% accuracy those infants who would become dyslexic readers eight years later.

Additionally, the left hemisphere latency (N1; the speed of response to a stimulus) to the sound /bi/ was shortest for the control group, but was not well-defined in the dyslexic group—the dyslexics' ERP did not show a sharp, well-defined peak. The results indicate that infants whose brains can detect, respond to, and process auditory information more quickly will have an advantage during language development over infants whose perceptual mechanisms are delayed. They also indicate that well-defined lateralization is most likely an important part of developing subsequent language skills.

Cognitive Deficits in DYS

Research on perceptual deficits proliferates throughout the DYS literature, while research on cognitive deficits is relatively scarce. However, evidence from neuroimaging studies seems to point to an executive function deficit. Greater activation of the frontal lobes during language tasks (as a function of increased effort) supports this hypothesis because the frontal lobes have been linked to executive functioning (Smith-Spark & Fisk, 2007). Executive functioning (EF) is defined as goal-directed behavior and affects the following cognitive domains: goal setting, response inhibition, cognitive flexibility, working memory (WM), attention, emotion regulation, and progress monitoring (Haydicky, Wiener, Badali, Milligan, & Ducharme, 2012). Students with learning disorders often exhibit impairment in one or more of these domains.

Attention. Attention is important in the acquisition of reading. Letters must first be selected out of a cluttered visual field of other letters by a rapid orientation of attention before associations can be made between graphemes and phonemes. "Efficient attention improves the perception of stimuli and increases the development of neural connections between letter and speech sound" (Franceschini et al., 2013, p. 462). According to Nicolson and Fawcett (1990), dyslexics do not use attention efficiently. Instead, they allocate extra attentional capacity to tasks they are completing to hide their inability to complete (what should be) automatic skills. This might explain why anterior brain regions of dyslexics are overactivated during language tasks (Maurer et al., 2007; Shaywitz et al., 1998). Because children are using a lot of effort to focus on difficult tasks, their cognitive resources are quickly exhausted, causing them to easily become frustrated and tired and thereby increasing errors. Training students in efficient attentional skills could be critical in remediating DYS (Franceschini et al., 2013).

Automaticity and cognitive inhibition. Even though dyslexics may take much longer to become automatic at fundamental academic skills, the evidence that they eventually become automatic (at least on some tasks) is provided by several studies using the Stroop task. During this task, participants are asked to quickly name the ink color of words. Reaction times (RTs) when reading color words that are in printed in conflicting colors (e.g., "red" printed in green) are especially long. This phenomenon is known as the *Stroop effect:* a demonstration of interference (indicated behaviorally by slower RTs on incongruent color words) reflecting difficulty inhibiting automatic responses (Galotti, 2008).

Two studies have found a Stroop effect in children with DYS. Everatt, Warner, Miles, and Thomson (1997) found that dyslexics showed larger levels of interference on the classic Stroop task than age-matched controls. Lazarus, Ludwig and Aberson (1984) used the Stroop task to measure selective attention in 45 children with learning disabilities (LD) and 50 non-LD children. Non-LD children show significantly less interference than LD children (non-LD M = 52, LD M = 47.2, $t(93) = 7.3$, $p < .0001$). Lazarus et al. concluded that LD children have significant selective attention deficits.

Other researchers interpret the Stroop effect as a measure of cognitive inhibition and have explored the hypothesis that there is a deficit in inhibitory mechanisms in DYS. Jeffries and Everatt (2004) used both the Stroop task and a naming interference task to explore this hypothesis with 20 dyslexic children and 40 controls. In the naming task, the participants named the numbers 5 and 7 as quickly as possible. On the second presentation, the children had to say "five" when they saw the number 7 and "seven" when they saw the number 5. The Stroop task did not show a significant difference between the groups; however, in the naming task, the dyslexics demonstrated significantly more interference (calculated by subtracting the time taken to complete the correct name sheet from the reverse name sheet) than the control group (Control M=6.09, DYS M=9.10, p = .01).

Anxiety and DYS

Another symptom of DYS that needs remediation is anxiety. Students with LD often experience higher levels of trait and state anxiety than their peers without LD (Fisher, Allen, & Kose, 1996). In a controlled study with 90 boys (ages 9 to 11), Fisher et al. (1996) studied the effects of high, medium, and low pretest levels of anxiety on problem-solving performance. Boys with LD reported significantly higher pretest trait and state anxiety than did non-LD boys, and their state anxiety increased over the time period of the problem-solving session.

Anxiety has been found to affect academic performance in people with LD more than people without LD. Connolly (1969) observed that LD children become increasingly more disorganized than non-LD children during testing and Dean and Rattan (1987) discovered that LD children responded more negatively to reading failure and had greater difficulty recovering from this stress. Other researchers have also found that children with LDs exhibit higher levels of test anxiety than their non-LD peers (Swanson & Howell, 1996) and this leads to the development of poor motivational, coping, and task strategies (e.g., proneness to cheating and making careless errors, negative self-evaluation, trouble concentrating, and daydreaming). These strategies exacerbate the cognitive interference that children with disabilities experience during learning and testing and cause further increases in test anxiety (Swanson & Howell, 1996).

Sarason, Sarason, Keefe, Hayes, and Shearin's (1986) *cognitive interference model* asserts that what people think about during a task affects their behavior. For example, if a people think repetitive negative thoughts during a test (e.g., "I don't know any of the answers," and "Everybody else is doing better than me"), they may fail to discriminate subtle differences between answers on a multiple choice exam. Their attention is divided between self-relevant and task-relevant variables, in comparison to the person with low anxiety who can focus her attention more completely on the task (Wine, 1971).

Research suggests that negative self-evaluations are important in testing situations. Students with high test-anxiety have more intrusive thoughts while taking assessments than those with less anxiety. Many of these thoughts are negative ones about themselves. An individual's focus during a task (whether on themselves or on the task) and their expectations (whether positive or negative) have an important effect on their performance. If a person expects success, they may perform better. But if a person anticipates failure, their performance may be negatively affected. Instructions to focus attention on the current task have been shown to greatly improve the performance of subjects with high anxiety (Sarason et al., 1986). Development of attentional skills seems to be key in remediating many of the symptoms of DYS.

Traditional Remediation of DYS

Well-controlled studies with random assignment to experimental and control groups have demonstrated that progressive training in phonological awareness and decoding strategies improves reading accuracy in dyslexic children (Gabrieli, 2009; Temple et al., 2003). In an fMRI study with 20 dyslexic children (ages 8-12), Temple et al. (2003) investigated the effect of an eight-week remediation program on dysfunctional neural mechanisms. For 30 days, 100 minutes per day, dyslexic children were trained on auditory and language processing skills (but not on reading per se) using a computerized intervention program composed of seven gamelike and adaptive exercises. For example, the exercises contained a stimulus individuation task, in which phonemes were identified from consonant-vowel (CV) and vowel-consonant-vowel (VCV) pairs, and a task that involved following directions of increasing complexity. No mention is made of whether or not skilled teacher intervention was required during the completion of these computer exercises, or whether students were left to navigate through the program under the supervision of a minimally qualified research assistant.

fMRI scans of the dyslexic group during phonological processing tasks (identifying rhyming letters, and matching letters and lines) before and after training showed increased activation, after remediation, in both the left *and* right hemispheres. The increased left temporo-parietal activity was almost (but not quite) the same as the activation seen in non-dyslexic control children (scanned at the same time as the dyslexic group but not treated), reflecting a partial but not complete amelioration of disrupted function in brain regions associated with phonological processing.

Temple et al. (2003) explained the increases in right activation as compensatory in nature—previous research of brain injury has indicated that the right hemisphere increases its activity to compensate for left hemispheric damage. Yet the children with DYS showed increases after remediation in brain areas that are not associated with compensation (and were not activated in the control children)—e.g., in the left lingual gyrus, an area associated with the processing and encoding of complex visual imagery and with word processing ("Lingual gyrus," n.d.) and the precuneus, a region connected with visuospatial imagery, mental imagery concerning the self, and recall of episodic memories ("Precuneus," n.d.). The activation of these areas suggests that dyslexics may call on visuospatial abilities to redress their phonological and orthographic weaknesses.

Behavioral measures demonstrated significant improvements for dyslexics in oral language, word identification, pseudo-word decoding, and passage comprehension (control children only improved significantly in passage comprehension), but *no significant correlation with reading improvement was found*. This indicates a lack of far transfer—effects of training on tasks that are very different from tasks that have been trained (see Melby-Lervåg & Hulme, 2013). In future remediation studies, Temple et al. (2003) recommended an untreated dyslexic comparison group to control for test-retest, practice and developmental effects that may be different in the DYS population.

Effective phonological processing remediation. For training in auditory processing to be effective, the instruction must be intense (e.g., 100 minutes a day for 30 days; Temple et al., 2003), in small groups (one or two students per teacher), repetitious, adapted to each participant's instructional level, and the participants must be attentive and motivated (Gabrieli, 2009). Under these conditions, studies show that the gains made during the remediation are sustained for a year or two by ***half*** of the children after training (Torgesen, 2006). Children who maintain their benefits continue to improve from year to year, but *never catch up to typical readers*. And, while phonological decoding may improve, there is only limited transfer (if any) to reading in context or to an improvement in fluency (Ahissar, 2007). Therefore, the efficacy of these remedial programs is somewhat limited, in addition to being extremely resource demanding. The typical special education teacher has a heavy caseload and can afford to give one-on-one (or two-on-one) instruction to only their most severely disabled students, and then typically for only thirty minutes at a time. Students' poor attention and motivation for completing tasks that are extremely difficult for them is another challenge that educators and researchers must address. These practical considerations need to be taken into account when determining the most effective remediation possible for dyslexic students.

Generalization of phonological processing remediation. A pilot treatment program was developed and tested by Wah, Yeap, and Low (2012) in Malay on an eight-year-old boy with DYS. The program, based on research in DYS, focused on phonological decoding at the word level (e.g., counting and blending phonemes and syllables, naming letters and sounds, and tracing letters). The boy made progress in phonological awareness skills and in learning letter-sounds in insolation, but these skills did not generalize into word decoding. The primary lesson from this case study was that phonological processing needs to be taught in a *real word context*, enabling students to understand the meanings of syllables and words.

A second lesson learned in this study was the need to explicitly teach and encourage students to develop *metacognitive strategies*. Gaskins et al. (1997) recommended a guided discovery process while students are reading text, with skillful prompting from the teacher, to help students become "word detectives." Prompting students to "use what they know" about letters and sounds and to ask themselves "what makes sense" in the context of the surrounding words are examples of metacognitive strategies that can help students decode words. When the boy in this particular case study attempted to use such strategies, the teacher—who was using a highly-structured, manualized program—did not recognize his attempts or give him feedback encouraging the development of higher-level word analysis. Perhaps this lack of recognition for his analytical skills was one reason that the boy's negative behaviors increased during the course of the remediation. The authors also believed that the use of multimedia, especially computer technology, may decrease students'' negative behaviors due to more engaging and dynamic visual and auditory feedback.

Visual and orthographic remediation. Twenty-four French children with DYS (9 to 11 years old) received two months of training from parents or speech therapists using two evidence-based training programs—one based on phonemic awareness exercises and the other on visual and orthographic processing. Julca, Nenert, Chaix and Demonet (2010) studied ERP correlates (N170 and P300) of this multimodal training. The N170 is believed to reflect the first cognitive orthographic process and its amplitude is larger after words or nonsense words than after meaningless letter strings. N170 amplitude increase is also believed to reflect an increase in reading levels. The P300 is thought to reflect the amount of attentional resources used in a task.

Six days a week for ten to twenty minutes a day, parents or speech therapists gave instructions and took note of the child's answers. The phonological training consisted of completing six exercises a day in a workbook. In the first two exercises, children had to find the odd word among three pseudo-words or words; the odd word was either a rhyming word or one that started with a different onset (beginning phoneme). The visual and orthographic training was split into two three-week phases: first, a non-verbal phase consisting of visual attention training (e.g., finding a path through a maze and matching nonsense figures) and then a verbal phase (searching for words or letters, and spelling or counting letters in a word). Dyslexic children (and 11 age-matched control children) were tested before and after training during a visual lexical decision task—deciding whether a presented stimulus (words, pseudo-words, pseudo-homophones, and non-words) was a French word or not.

Behavioral results of this simple training showed a significant group effect on accuracy rate ($F(1,32) = 5.65$, $p = 0.023$); the dyslexic group was less accurate than the control group at both timepoints. Both groups also demonstrated a significant improvement between the two sessions, but, because the control group did not receive any specific training, this result is most likely due to the practice effect and no implications for remediation can be determined. ERP results indicated a dissociation between N170, P300 and behavioral improvement. In the dyslexic group, a decrease in P300 amplitude for both non-words and words was associated with improvement in recognizing words. In the control group, a decrease in P300 was associated with improvement in recognition of pseudo-words. The opposite pattern happened for the N170 latency, which became shorter for pseudo-words in the dyslexic group and for words in the control group. The N170 amplitude in the dyslexics became *smaller* for pseudo-words, indicating that the training did *not* increase reading skills in this group. The authors explained these findings by arguing that behavioral improvement in the lexical decision task might rely more on attention than on orthographic processing skills. The decrease in P300 amplitude in the word condition could be the result of a reduced allocation of attention due to an improvement in reading ability. However, an improvement in reading ability is doubtful due to the decrease in N170 amplitude in the dyslexic group after training, so the decrease in P300 is most likely due to the practice effect—both groups became better at the task and so needed less attentional resources to successfully perform.

A Different Approach to Remediation

A different approach to the remediation of DYS has been suggested by several researchers (Chakravarty, 2009; Jeffries & Everatt, 2004; Schneps et al., 2007; von Károlyi et al., 2003). Children with DYS should be "encouraged to develop . . . hidden talents to full capacity, rather than be subjected to overemphasizing on the correction of the disturbed coded symbol operations, in remedial training" (Chakravarty, 2009, p. 570). Such remediation would focus equally on dyslexic strengths and weaknesses, rather than only focusing on weaknesses (Jeffries & Everatt, 2004).

Successful adults with DYS. This view is supported by a twenty-year longitudinal study by Raskind, Goldberg, Higgins, and Herman (1999) on adults with learning disorders. Gathering data from case records, public records, a life stressor checklist, cognitive and academic testing, and in-depth interviews, Raskind et al. followed up on the lives of 41 adults who had attended the Frostig Center for learning disabilities 20 years previously. Some of these individuals, now 35 years old, were "failures" (e.g., serving a life sentence for murder at a state penitentiary) and others were "successes" (e.g., president of a successful software company). The researchers wanted to know what factors led to the success of one individual and the failure of another.

Raskind et al.'s (1999) study was the second phase of an ongoing longitudinal study. The first phase of the study was completed ten years before this study, when the same participants were 25 years old. At that time, three independent raters had reviewed the data using a multidimensional view of success model that included educational achievement, employment history, social and familial relationships, and life satisfaction. Out of the original sample of 50 adults (then 25 years old), the raters identified 29 as successful and 21 as unsuccessful. Qualitative analyses of interviews revealed a set of *success attributes*: self-awareness, perseverance, proactivity, emotional stability, goal setting, and social support systems.

Ten years later, Raskind et al. (1999) prepared score sheets operationalizing these attributes and, using transcripts of interviews with the participants, scored the adults (now 35 years old) on attributes of success. Data from interviews, case records, and public records were also used to determine success in six domains: employment, education, independence, family relationships, community relations/interests, and crime/substance abuse. Finally, the researchers conducted a quantitative analysis of the data to determine predictors of success at year 20.

Three possible predictors of success emerged that explained 49 to 75% of the variance—IQ, academic achievement, and success attributes. IQ and academic achievement made only a minor contribution (0-5%). Thus, the success attributes differentiated between the successful and unsuccessful individuals, with the successful adults demonstrating greater self-awareness and self-acceptance of their learning disability. This research suggests a reevaluation of educational practices that focus almost exclusively on the remediation of academic deficits in DYS. Since success attributes were more predictive of success than academic skills, it follows that the development of these positive traits should be given at least as much attention as the improvement of academic skills.

Reading Recovery. One program that uses traditional phonological training as well as a gestalt approach to learning word analysis is Reading Recovery (RR), a literacy intervention for first-graders who, according to diagnostic screening in literacy skills, are scoring in the bottom twenty-five percent of their class. RR is based on the systematic research of Marie Clay, a New Zealand researcher with a doctorate in clinical child psychology. She created the RR program, adopted by all of the New Zealand schools in 1983 and is still being used today in Great Britain, Canada, Australia and the United States (Horner & O'Connor, 2007; "Marie Clay," n.d.).

Reading Recovery is a daily, one-on-one, thirty-minute literacy intervention taught by a highly trained teacher. Children are instructed to use multiple metacognitive strategies in order to decode and comprehend text. Examples of these strategies include using graphophonetic, visual (looking at illustrations or word shapes) and context clues, making predictions, reading ahead or looking back in the text, and cross-checking one strategy against another, while in the process of reading the text or in writing meaningful sentences related to the child's life. Children are encouraged to make informed guesses and to correct themselves in the light of new information (Moore & Wade, 1998). They are also given individualized instruction, tailored to their specific needs and to the specific text they are reading. When higher-level language is encountered (cf. Jung-Beeman, 2005), the teacher shows the child how to draw on their episodic memory in order to interpret figures of speech, derive themes, and draw inferences. Horner and O'Conner (2007) summarized the instructional strategies of RR teachers in this way:

> Reading Recovery teachers are always considering how what they are teaching today is going to help children develop a reading and writing process. To this end, they teach strategic activities (e.g., using analogies), not

> simply items (e.g., isolated words). They use a variety of methods such as modeling, explicit teaching, prompting and praising to help struggling readers become *self-regulatory* [emphasis mine]. What they teach depends on their close observations and knowledge of what the children are able to do and what they need to learn to progress to the next level. In other words, they do not practice items, or even strategic activities, *in isolation* [emphasis mine] nor do they follow any specific sequence; what the children are taught is based on their current strengths, needs and what they are attempting (i.e., emerging behaviors). Therefore, struggling readers learn not only how to perform strategic activities and use mental strategies but learn when and why they should use them… In other words, the teachers help the children become self-regulated readers. (p. 99)

A different approach to remediation of DYS should, according to the studies reviewed in this section, include instruction in self-awareness and self-acceptance of learning disabilities and in metacognitive strategies. Training should be intense, individualized, and focused on strengths as well as weaknesses. Graphophonetic skills should still be included in the curriculum, but taught within the context of reading meaningful text, and not in isolation. Additionally, increasing attentional abilities may also improve reading skills. Mindfulness is a metacognitive strategy that improves the self-regulation of attention and is an intervention that can be incorporated within a program like Reading Recovery. It may ameliorate other cognitive and affective deficits in DYS as well.

Mindfulness

Research supports the importance of metacognition in cognitive development and academic learning (Paris & Winograd, 1990). MF, a well-established technique for developing attentional capacities and emotional stability, can be considered a metacognitive skill. MF has been operationally defined by Bishop et al. (2004) as the self-regulation of attention involving sustained attention, attention switching between tasks, and the inhibition of elaborative processing.

A Theoretical Model of Mindfulness

The theoretical foundation of MF can be found in another definition by Jon Kabat-Zinn (1994), one of the first researchers of MF and Professor of Medicine Emeritus at the University of Massachusetts, is this: "paying attention in a particular way: on purpose, in the present moment, and non-judgmentally" (p. 4). According to Shapiro et al. (2006), this definition contains the three axioms (or fundamental building blocks) of MF: Intention ("on purpose"), attention ("paying attention"), and attitude ("in a particular way" and "non-judgmentally"). Intention, attention, and attitude are not separate processes of MF; they are instead simultaneous processes woven together in a moment-to-moment fabric of consciousness (Shapiro et al., 2006).

Intention is the determination or resolve to act or achieve a specific goal. *Attention*, within the context of practicing MF, involves *meta-awareness:* closely observing one's own mental processes. It means suspending the incessant mental dialogue that generally accompanies perceptions, emotions, and thoughts—"I shouldn't be thinking about this right now. I should be feeling this instead of that"—and giving "bare" attention to the experience presenting itself in the here and now. Attention in MF does not have the cold, critical quality that is normally associated with observation. Instead, it is characterized as having an openhearted, warm and friendly interest in or *attitude* regarding what is happening in and around oneself (Shapiro et al., 2006; Williams, 2010). It is this *openhearted* quality of attention that makes it possible to observe thoughts and emotions that had previously been considered as "unacceptable" or "threatening" to the ego.

The practice of intentionally attending to the present moment with kind-hearted attention may lead to a metacognitive shift in one's relationship with thoughts and feelings that Shapiro et al. (2006) termed *reperceiving*, or the process of becoming objective about one's internal experiences, a continuation of natural human development that is essential to healthy growth across the lifespan. In the process of reperceiving, or *disidentifying* from one's thoughts (from "these are *my* thoughts" and "this is *my* story" to "these are thoughts and stories"), we can become disentangled from the drama of our personal narrative and are simply able to witness what is happening without elaboration. This may mean we are able to attend to the perceptions of each moment, thereby gaining access to more data. Thus comes the development of more efficient mechanisms for engaging and disengaging from stimuli when performing tasks (Lutz, Slagter, Dunne, & Davidson, 2008).

The development of reperceiving may lead to improved self-regulation and cognitive, emotional and behavioral flexibility. Self-regulation is the ability to change oneself in accordance with one's intentions. Cognitive, emotional and behavioral flexibility are the natural outcomes of reperceiving. If we are able to see ourselves with greater mental clarity, then we are able to respond more freely and less automatically and rigidly (Shapiro et al., 2006). Freedom from automatic behavior is the result of a shift from *conceptual* (language-based) processing—thinking, planning, daydreaming, analyzing, comparing—to *sensory-perceptual* processing. Instead of attending to the sights, sounds, smells, tastes, and touch of the outside world and then freely responding to these perceptions (sensory-perceptual processing), our bodies are usually on automatic pilot while we think, daydream, plan, etc. (conceptual processing; Williams, 2010). If, instead of worrying about the day's events, we are able to watch ourselves consume a gallon of Rocky Road ice cream, we may have the ability to disengage from this automatic stress response and choose a healthier behavior.

Shapiro (1992) asked 27 individuals before and after they finished a two-week or three-month meditation retreat to complete questions on adherence to meditation, expectation and goals of meditation (*intentions*), and an open-ended question on effects (positive, adverse, and general) of meditation. Ten participants had practiced meditation <2 years; 9 participants had practiced between 2-7 years, and 8 had practiced seven years or more. Answers were then coded based on three categories: self-regulation, self-exploration, and self-liberation and compassionate service goals. Results found that goals and expectations about meditation shifted from self-regulation, to self-exploration, to self-liberation in relationship to how long the individual had practiced meditation. Also, 18 of the participants listed effects of meditation that were congruent with their original intentions for meditation. That is, if their intention for meditating was self-regulation, then they reported self-regulatory effects. Fourteen years after this study, Shapiro et al. (2006) wrote about the above-described model of MF, linking *intention* to *reperceiving* to improvements in self-regulation.

ERPs and Mindfulness

Neuroimaging studies of the impact of MF on brain systems can give us an idea of its potential impact on individuals with DYS. Neuroimaging evidence also allows us to see changes in brain response where we do not see behavioral effects (Anderson, Lau, Segal, & Bishop, 2007). Novice practitioners are often used in MF studies in order to exclude potential training effects due to pre-existing differences between groups (Lutz et al., 2008b). But novices often find practicing MF very difficult in the first few weeks and months of a MF program (Williams, 2010). This is because of what MF practitioners call "the monkey mind." When people first start meditating, they notice that their thoughts are like wild monkeys—jumping from branch to branch, swinging from tree to tree, screeching and chattering ceaselessly (Dowd, 2004; Kristeller, 2003). In the course of one 45-minute meditation session, a novice practitioner may find that they spend most of their time "swinging with the monkeys," or lost in discursive thought. In neuroscientific terms, monkey mind is also known as the default mode—a mode of thinking that the brain automatically reverts to when at rest or when mind-wandering or daydreaming (Dastjerdi et al., 2011). It is also known as "stream of consciousness" that occurs during rest and consists of mostly self-referential or stimulus-independent thoughts (McKiernan, D'Angelo, Kaufman, & Binder, 2006). In other words, it is the state of mind that we most naturally default to when we are not attempting to direct or control our thoughts.

It takes considerable effort to stop the turbulent mind for even a few seconds. It is for this reason that MF training programs with novices may not see many or any behavioral changes at first, but neuroimaging studies of beginning meditators may reveal that some of the brain's electrical and neurophysiological patterns have changed.

In Moore, Gruber, Derose, and Malinowski's (2012) longitudinal EEG study, 40 meditation naïve participants were randomly assigned to a wait list group and a meditation group, who received three hours of MF training. (In order to counter the argument that group differences may occur due to pre-existing differences between people who are pre-disposed to meditate and people not so disposed, many MF researchers recruit their control group from a waiting list of people who want to learn how to meditate.) All participants completed a traditional Stroop task during EEG recordings before the meditation group's training, after eight weeks of training, and after sixteen weeks of training. The researchers wanted to know whether a small dose of MF (the meditation group was told to practice 10 minutes a day) would have any effect on cognitive processing. No behavioral effects were found, but ERP analysis discovered two between-group effects that emerged over the sixteen weeks. The control group demonstrated a habituation effect, expressed as a reduction of N2 posterior ERP amplitudes. The meditation group exhibited the opposite pattern—increased activation of task-relevant cortical areas, perhaps reflecting an improvement in attentional focus. A second effect (P3) was observed during incongruent stimuli. The control group showed an increase in P3 amplitude for incongruent stimuli, while the experimental group showed a decrease, suggesting an increased efficiency (through the reduction of resource recruitment) in the self-regulation of attention.

Cognitive Amelioration

Most of the research conducted on MF over the past 20 years has been in the area of health psychology, where studies have consistently demonstrated benefits, including reduced pain and stress and an increase in positive emotion (Davidson et al., 2003; Majumdar et al., 2002; Tang & Posner, 2009). So, many would ask, because MF training is clearly linked to health outcomes, why focus on MF and cognition? The answer to this question—as any experienced practitioner of MF would tell you—is that changing *mental* processes has been the focus of MF training for thousands of years (Wenk-Sormaz, 2005).

In a search of 4515 articles in five databases, Chiesa et al. (2011) found 23 controlled studies that provided objective measures of cognition following MF training in adults. Ten studies assessed sustained attention, eight assessed selective attention, nine assessed executive attention, and four assessed attention switching. Overall, Chiesa et al. found that beginning phases of MF training aimed at developing focused attention were associated with significant improvements in selective and executive attention. Later stages of MF training, described as an open monitoring of internal and external perceptions, were associated with the improvement of unfocused sustained attention skills.

Attention. Chiesa et al.'s (2011) meta-analysis of MF and cognition found five controlled studies that demonstrated the beneficial impact of MF on specific subsystems of attention in adults. One of these was Jha, Krompinger, and Baime's (2007) investigation of the effect of MF training on particular aspects of attention, as assessed by the Attention Network Test (ANT; Fan, McCandliss, Sommer, Raz, & Posner, 2002). There were three groups of 17 participants: (a) experienced meditators who practiced concentrative meditation at a one-month intensive retreat (the first experimental group), (b) novice meditators receiving instruction on mindfulness-based stress reduction (MBSR; see Kabat-Zinn, 2003) at the University of Pennsylvania (the second experimental group), and (c) novice meditators from the same population, but who had not yet received MBSR training (the control group). The experienced meditators demonstrated superior conflict monitoring performance compared to the control group and the second experimental group before they received MBSR training**.** There was a significant difference across groups for RT ($p < .03$) and accuracy ($p < .001$). Furthermore, the second experimental group demonstrated significantly improved spatial orienting following MBSR training compared to before (approximately 30 ms shorter RT on average at the second time point—after MBSR training—than the first group and the control group combined at the second time point). These results suggest that MF training increases voluntary, top-down attentional skills such as orienting, or the direction and constraint of attention to specific inputs, and conflict-monitoring, or selecting between competing responses.

Anderson, Lau, Segal, and Bishop (2007) randomly assigned 86 meditation-naïve adults to an eight-week MBSR course or to a waitlist control group. They tested participants before and after the course on measures of sustained attention, attention switching, Stroop interference, non-directed attention (measured by an object detection task) and self-reports of MF and emotional affect. In the object detection task, participants saw an object (e.g., a chicken) and then a complex drawing (e.g., a farmyard). They pushed a button to indicate whether they saw (or didn't see) the target object in the scene. *Consistency effects* are reflected in accuracy scores and RTs when objects are placed in either consistent or inconsistent scenes (e.g., a chicken on a skyscraper versus in a barnyard). No significant results were found for attentional measures, but improvements in self-reported MF were correlated with improvements in object detection. The authors explain that a lack of significance on the Stroop measure may have been due to the ceiling effect or to the use of a clinical version of the Stroop (participants rated positive and negative adjectives as characteristic or uncharacteristic of themselves) with a healthy sample. Additionally, due to the difficulties that novices have early on with meditating (discussed earlier in this chapter), neuroimaging might provide more evidence of change in this population than behavioral measures.

Automaticity and cognitive flexibility. Cognitive flexibility is closely related to attentional processes and is the ability to flexibly adapt to rapidly changing situations. It also refers to the capacity for interrupting automatic responses when it is expedient to do so (Moore & Malinowski, 2009). The Stroop paradigm is considered a measure of both cognitive flexibility and inhibition in that, to inhibit and interrupt the automatic reading of color words when the ink color is incongruent, it is necessary to reinvest attention into the task. A study by Moore and Malinowski (2009) investigated the relationship between MF and cognitive flexibility. They compared a group experienced in MF practice with a control group on measures of Stroop interference and a test of selective attention. The d2 test is a paper-and-pencil task that requires participants to find the letter "d" with two quotation marks (" ") in a page full of "ds" and "ps" with one to four quotation marks. The data showed positive correlations between MF practice and performance on the d2 (total number of items scanned: $r = .510$, $p < .001$; total number of items minus errors: $r = .620$, $p < .01$), and the Stroop RT ($r = .331$, $p < .05$) and negative correlations with d2 errors ($r = -.527$, $p < .001$) and Stroop errors ($r = -.780$, $p < .001$). While this was a correlational study and therefore no causal relationships between MF practice and attentional performance can be directly inferred, the results suggest that MF may help to deautomatize or inhibit behaviors that are destructive or are simply not the most effective for completing the task at hand.

Affective Amelioration

The development of cognitive flexibility and the more efficient processing of cognitive resources due to MF training affords the mental space to discover negative self-evaluations that would normally be unconscious (Moore & Malinowski, 2009). Negative thoughts increase anxiety and decrease performance on tests, which, in turn, leads to more negative thoughts, greater anxiety, and lower test scores. MF training stops this vicious cycle through the process of *reperceiving* negative thoughts with warm-hearted attention.

Numerous studies on meditation have found that mental training diminishes anxiety and increases positive emotion (Davidson, 2010). Semple, Lee, Rosa, and Miller (2010) investigated the effect of MF training on attention problems, behavior problems, and anxiety in a sample particularly relevant to this proposal—25 children (9 to 12 years old) referred to a clinic-based remedial reading program by an educational psychologist because they had significant reading difficulties. They were matched by age and gender and then randomly assigned to a waitlist control group or to mindfulness-based cognitive therapy for children (MBCT-C). This is manualized (a treatment with exact steps) group therapy for children (90 minutes weekly) designed to increase resiliency through the practice of MF. Before, immediately after, and three months following the completion of the therapy, parents of the children completed the Child Behavior Checklist (CBCL; Achenbach, 2001). Using the Attention Problems scale, the Internalizing Problems scale, and the Total Problems scale from the CBCL, data analysis revealed that participants who completed the program exhibited fewer attention problems than controls and sustained those lower scores for three months following the end of the intervention (p = .025, Cohen's d = .42). Additionally, a strong correlation was found between attention problems and behavior problems (r = .678, p < .01). Among the six children who were rated by their parents as clinically anxious at pretest, half of them fell below the clinical cutoff after 12 weeks of treatment. Two more studies on the impact of MF on the reduction of anxiety in children with LDs will be reported later in this literature review (cf. Zylowska et al., 2008; Haydicky et al., 2012 in MF and adolescents with ADHD and MF and adolescents with DYS).

MF and Children with DYS

"It's like a shower. It cleans your mind, so you can do your best thinking."

—Jamie, age 10 (from Fisher, 2006)

Teaching children to "take a break and breathe" has been very beneficial in the classroom, where I used to teach MF and now I train others to teach MF. It helps children to calm down after conflicts on the playground and reduces their anxiety during the ever-present standardized testing that now occurs in the classroom year-round. It helps them when they become frustrated and angry because they do not know how to solve a math problem or answer a reading comprehension question. It prepares them for creative activities like brainstorming and journal writing (Fisher, 2006). It helps them see problems in a new light. Napoli, Krech, and Holley (2005) wrote:

> When we are mindful, we can . . . (1) view a situation from several perspectives, (2) see information presented in the situation as novel, (3) attend to the context in which we are perceiving the information, and eventually (4) create new categories through which this information may be understood. (pp. 101-102).

MF and elementary school children. Although the positive impact of MF training on adults is well-established, only a few studies have investigated the impact of MF practice on the development of cognition in children. Flook et al. (2010) examined the effects of a MF awareness program on executive function (EF) in 64 second- and third-grade children. For the experimental group, the program was provided in the students' regular classroom by trainers from the Inner Kids Foundation for 30 minutes twice a week, over the course of 8 weeks. Many of the training sessions were aimed at increasing top-down control of attention (e.g., bringing attention to the breath, monitoring when attention has wandered from the breath, and bringing it back to the breath—the target of attention). Demands on MF were assumed to gradually increase as the exercises that developed the top-down control of attention increased (e.g., sitting meditation and body scan meditation) and the more goal-directed and less-reflective exercises decreased (e.g., activities and games that promoted sensory awareness, attention regulation, awareness of others and of the environment). Teachers and parents completed the Behavior Rating Inventory of Executive Function (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000), that includes 86 items on cognition, emotion and behavior (rated on a 3-point scale: *never*, *sometimes* and *often*) before and after the MF training. Children who started out with low EF scores showed greater EF improvements than controls (who read silently instead of receiving MF training). Also, experimental students with poor initial EF also showed gains in behavioral control, metacognition, and global executive control following MF training. There were no overall differences between the group who received MF training and the control group. One criticism of this study is that the improvement in the low EF students might merely reflect regression to the mean. Another criticism is that these findings were based entirely on subjective reports from the teachers and parents. In the abstract, the authors acknowledge that their findings need to be replicated using neurocognitive tasks, behavioral observations, and multiple classroom samples.

In a second study investigating the impact of MF on children's cognition, Napoli et al. (2005) recruited 254 first, second, and third grade students. Two facilitators (professionally trained MF instructors), met with students during their physical education classes for 45 minutes twice a month for a total of 12 sessions over 24 weeks. The training was designed to help students learn to pay attention to the present moment without judgment, and to find novelty in each experience. Students were randomly assigned to the experimental group, which received bimonthly MF training (n = 114), or to the control group, which instead participated in reading or other quiet activities (n = 114). Before and after the MF training, each child was assessed on three measures. The first measure was the ADD-H Comprehensive Teacher Rating Scale (ACTeRS: Ullmann, Sleator, & Sprague, 1997) which uses a rating form that teachers fill out with 24 items assessing the attention, hyperactivity, social skills and oppositional behavior of each student in their classroom. The second measure was adapted from the Test Anxiety Scale (TAS; Sarason, 1978), which measures debilitative test anxiety. The modified version uses a Likert scale (*strongly disagree* to *strongly agree*) instead of true-false questions (as in the original version). The TAS has four subscales: self-evaluation, worry, physiological reactions, and concerns about time constraints. The third measure was the Test of Everyday Attention for Children (TEA-Ch), which has two major subtests measuring sustained attention and selective attention (Manly et al., 2001).

Difference scores between pre and post-test measures were standardized and submitted for analysis. Paired t-tests showed statistically significant benefits of MF on the TEA-Ch selective attention subscale ($p < .001$, $d = .60$), the ACTeRS Attention Subscale ($p = .001$, $d = .49$), the ACTeRS Social Skills subscale ($p = .001$, $d = .47$), and the Test Anxiety Scale ($p = .007$, $d = .39$). The TEA-Ch sustained attention subscale showed a trend towards improvement from pre- to post-test, but the difference did not reach statistical significance ($p = .350$.) Overall, these findings indicate that there was a decrease in test anxiety, a decrease in negative classroom behaviors, and an increase in the ability to selectively pay attention for the experimental group.

The findings from Napoli et al. (2005) suggest the promise of MF training for children, but they need to be replicated with older and younger students and extended by using other measures of executive control (such as WM). Also, the Napoli study is limited in that they used relatively infrequent MF training (only twice per month), so perhaps they underestimated the potential benefit of MF training. Furthermore, Napoli et al. did not examine the impact of MF training on important variables such as cognitive flexibility and academic performance.

MF and adolescents with ADHD. Controlled studies on MF and cognition in children are very limited, and have numerous methodological issues (cf. Meiklejohn et al., 2012). Studies on the effect of MF training on children and/or adolescents with disabilities are even rarer and more problematic. As discussed earlier, Semple et al. (2010) used subjective measures (parent ratings) and found some evidence that MF may help children diagnosed with reading difficulties in the areas of attention, anxiety and behavior problems. Zylowska et al. (2008) conducted a feasibility study on the influence of an eight-week MF training on the EF of adolescents (n = 18) and adults (n = 18) with ADHD. The MF training was modified in order to address the specific challenges of ADHD. Sitting meditation periods were shorter than normal, participants could choose to do walking meditation instead of sitting meditation, MF concepts were illustrated with visual aids, and a loving-kindness meditation was used at the end of each session to increase participants' self-esteem. Before and after the MF intervention, subjects took the Attention Network Test (ANT; Fan et al., 2002), the Stroop, the Trail Making Test

(TMT; Bowie & Harvey, 2006; measures visual attention and task switching; in the first part of the test, subjects are told to connect 25 dots as quickly as possible; on the second part, the subject connects dots while switching between numbers and letters), and the Digit Span (measures WM). Significant improvements were made on the ANT (in conflict monitoring), the Stroop, and the TMT (all $p < .01$), all measures of attentional conflict and inhibition, but not on the WM task. Eighteen of the 23 subjects also reported a decrease in ADHD symptomology (specifically, anxiety and depression). This study can only be considered exploratory since it did not have a control group and relied on self-report measures of ADHD symptoms. A controlled version of this study is needed to determine what aspects of the MF training (e.g., MF, group support, and/or ADHD modifications) were most important in achieving these preliminary results (Siegel, 2007).

MF and adolescents with DYS. DYS, also known as LD in the literature, is often found to be comorbid with ADHD and other clinical symptoms like anxiety or hyperactivity. A common remedy frequently prescribed by psychiatrists for children with these disorders is medication, which often has debilitating and stigmatizing effects. Parents and teachers are actively searching for alternatives to medication that will help their children and students perform better in school and lead happier and more productive lives. Hoping to find better treatment alternatives, Haydicky et al. (2012) evaluated the effect of a 20-week MF program on EF and on internalizing and externalizing behavior in 49 boys with LD (ages 12 to 18). Mindfulness Martial Arts (MMA) is a manualized group treatment program that uses elements of MF, martial arts, and Cognitive Behavioral Therapy (CBT). In weekly 90 minute sessions, the boys practiced Bushido (a Japanese word for the way of the samurai; this is a practice that combines meditation and martial arts) and gradually progressed from focused attention (FA) meditation to open monitoring (OM) meditation. Participants were clients of a mental health center who were already enrolled or on a waiting list. (Because families often waited as long as a year to enter the program, random assignment was not ethically or practically possible.) Due to the heterogeneity of the sample, participants were divided into subgroups based on their diagnoses/clinical symptoms and on whether or not they were receiving active treatment or on the waiting list (WL): the LD/ADHD group (14 MMA and 14 WL), the hyperactive/impulsive group (12 MMA, 17 WL), the inattentive group (15 MMA, 18 WL), and the anxiety group (12 MMA, 17 WL). Adolescents and their parents completed three rating scales before and after training: the Conners' scales (CPRS; Conners, 1997; assesses ADHD and anxiety symptoms), the Child Behavior Checklist (CBCL; used in the Semple et al., 2010 study) and the BRIEF measure of EF functioning (used in the Flook et al., 2010 study).

All of the boys improved significantly on all measures (due to maturation and practice effects). Because of the heterogeneity of the groups, no overall differences between groups was found, so multiple subgroup analyses were conducted (no references to the Bonferroni or other multiple-comparison correction methods were made). The LD/ADHD group significantly decreased in parent-rated oppositional defiant problems and conduct problems in comparison to boys on the WL (LD/ADHD oppositional defiance difference $M = 6.77$, WL difference $M = .10$, $p < .03$, $\eta^2_p = .25$;

LD/ADHD conduct problems difference *M* = 4.44, WL difference *M* = 1.82, $p < .027$, η^2_p = .26). The inattentive group (IA) significantly decreased in parent-rated social problems (IA social problem difference *M* = 6.71, WL difference *M* = 2.47, $p < .04$, η^2_p = .18). The anxiety group (A) reported significant improvements in anxiety (A anxiety difference *M* = 6.73, WL difference *M* = 1.2, $p < .016$, η^2_p = .23). Only one group improved in EF. The hyperactive/impulsive (HI) group significantly improved in monitoring skills (HI monitoring difference *M* = 7, WL difference *M* = -.08, $p < .02$, η^2_p = .24). These results provide a tiny bit of hope (but not much due to probable Type I error) that MF may be an effective intervention for reducing anxiety and behavior problems in children with LD, although self-reports are often inaccurate because of positive illusory bias (underestimating difficulties and overestimating strengths) and parent reports may have been inaccurate because of expectancy effects (they expect and thus create a specific result). To determine whether MF was responsible for the results of this study (and not cognitive therapy or martial arts), future studies will need more homogeneous groups exposed to MF alone and assessed with objective measures.

Using a pre-post no-control design, Beauchemin, Hutchins, and Patterson (2008) conducted a pilot study on the use of MF with 32 adolescents attending a private school for students with learning disabilities. Two classroom teachers were trained on how to teach MF to their students. For 5 to 10 minutes at the beginning of each class period, for a period of 5 weeks, students (under the direction of their teachers) focused attention on their breath and intentionally observed thoughts and feelings in a nonjudgmental manner. Students and the two classroom teachers completed the Social

Skills Rating System (SSRS; Gresham & Eliot, 1990) before and after training, and the students also filled out the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, & Lushene, 1970). The student form of the SSRs centers on social skills while the teacher form has three subscales that focus on social skills, problem behaviors, and academic performance. After the training had concluded, students answered informal questions asking them to determine their focus in class, their enjoyment of the MF practice, and whether or not they thought they would continue using MF on their own.

Post-intervention scores on the STAI indicated that participants demonstrated decreased state and trait anxiety (trait anxiety pretest: $M = 42.56$, posttest $M = 39.68$, $p < .05$; state anxiety pretest $M = 38.21$, posttest $M = 32.59$, $p < .05$). The student SSRS forms showed that the LD students thought their social skills had increased (pretest $M = 95.68$, posttest $M = 100.06$, $p < .05$). The teacher SSRS forms reflected the teachers' beliefs that their students had significantly improved on all three subscales (social skills: $M = 86.65$, posttest $M = 94.41$, $p < .05$; problem behaviors: pretest $M = 116.06$, posttest $M = 105.74$, $p < .05$; academic achievement: $M = 87.56$, posttest $M = 92.68$, $p < .05$). On the informal questionnaires, students indicated that they enjoyed the training ($M = 1.5$ on a Likert scale in which 1 = *strongly agree* and 5 = *strongly disagree*), that it helped them focus in school ($M = 1.5$), and that they intended to keep practicing on their own ($M = 1.8$).

While the surveys used in this study were subjective measures, and as such were especially prone to demand characteristics, these outcomes are consistent with a *cognitive-interference model* of LD: "Poor performance of anxious individuals is a result of problems with attentional focus, concern about competence, and a preoccupation with self-oriented and negative thoughts" (Beauchemin et al., 2008, p. 36). In their conclusion, the authors postulated that methods like meditation and relaxation training reduced cognitive interference, allowing students to focus on their work without anxiety, and recommended that future studies include a direct measure of cognitive interference.

In a review of 14 studies since 2005 that directly trained K-12 students in MF (including Beauchemin et al., 2008, Flook et al., 2010, Napoli et al., 2005, and Zylowska et al., 2008), Meiklejohn et al. (2012) found a need for more "rigorous scientific evidence of the benefits" of MF practice in schools (p. 2). With the exception of Napoli et al. (2005), all of the 14 studies in Meiklejohn et al. provide only limited evidence due to methodological issues of small sample size, inadequate design (e.g., non-randomized, no control group), and subjective measurement (e.g., parent ratings, self-reports, interviews). Five of these studies investigated cognition directly or indirectly, but only one (Napoli et al., 2005) used objective measures to investigate the effect of MF training on executive control in children. Future research on the impact of MF on DYS in children will need to use randomized, controlled experimental designs with objective measures.

Methods

The Current Study

Experience coupled with attention leads to physical changes in the structure and future functioning of the nervous system. This leaves us with a clear physiological fact… ***Moment by moment we choose and sculpt how our ever-changing minds will work*** *[emphasis mine], we choose who we will be the next moment in a very real sense, and these choices are left embossed in physical form on our material selves.*

—Merzenich & deCharms, 1996, p. 77

Deficit models of DYS focus on identifying deficits in impaired readers. Principal among these is the phonological theory, wherein the cause of DYS is a deficit in phonological processing. Remediation of this deficit has been the focus of most DYS interventions to date. Remediation studies ignoring dyslexic strengths and targeting only the remediation of phonological processing have had despairingly little impact on generalized reading abilities. However, alternatives to deficit models exist, suggesting attractive alternative approaches to remediation. These researchers hypothesize that DYS, instead of being primarily a syndrome of deficits, is a different pattern of brain organization, with processing advantages and disadvantages. A review of the anatomical, neuroimaging, and behavioral support for this alternative hypothesis revealed numerous special abilities common to DYS, such as creativity and visuospatial skills.

Neuroimaging evidence indicates that the brains of dyslexics seem to favor the development of more coarsely tuned processing and diffuse connections in the RH at the expense of more finely tuned connections in the LH. This results in a broad spectrum of both deficits and strengths. MF training may be a possible amelioration of DYS deficits and enhancement of DYS talents.

Dyslexics exhibit an overactivation in frontal regions due to the increase of effort during language tasks; changes in frontal activity after MF practice reflect increased efficiency in focusing attention. Reduction in global activation after mental training could be the result of less effortful mental processes. Dyslexics need to develop efficient attentional skills in order to improve rapid perception of letters and words; focused attention developed through MF practice increases selective attention and vigilance and improves conflict monitoring and orienting. Individuals with DYS have difficulties with cognitive inhibition; MF has been shown to increase cognitive flexibility. Executive control (WM) problems are widely reported in the DYS literature; the development of focused attention during MF training increases executive attention and protects against WM deterioration during stress. Dyslexics have higher levels of state and trait anxiety, especially while solving problems or taking tests due to increased negative self-evaluations; many studies on MF have shown diminished anxiety, increased positive affect, and decreased reactivity.

MF training may also enhance the development of strengths in DYS. Dyslexic individuals display talents in visuospatial skills; MF practice with mental imagery enhances the capacity to tap into latent VS abilities (Kozhevnikov, Louchakova, Josipovic, & Motes, 2009). Creativity is another dyslexic strength; meditation increases unusual responding and improves insight problem solving (Ostafin & Kassman, 2012;

Wenk-Sormaz, 2005). In order to be successful as adults, dyslexics need to develop greater self-awareness and self- acceptance; MF develops meta-awareness, or the observation of ongoing contents of thought.

As discussed earlier, remediation of DYS needs to focus on both strengths and deficits using a gestalt approach to instruction. Reading Recovery is a gestalt approach to reading remediation that develops metacognitive strategies for improving decoding accuracy during the process of reading. MF is a metacognitive strategy that can remediate and enhance many characteristics associated with DYS and can be easily integrated into a RR intervention.

MF presents an exciting and cost-effective way to remediate the difficulties and enhance the creative potential of a population that has often been marginalized in our society—children and adults whose brains may not be dysfunctional or impaired, but simply different. To return to the quotation at the beginning of this conclusion, MF represents one way that these creative and unique individuals can take control over the direction of their attention and use it to sculpt their brains and realize their potential in the process of becoming fully self-actualized human beings.

The primary purpose of this research was to investigate whether mindfulness practices can ameliorate of the symptoms of dyslexia in children. Though there isn't much research directly investigating this link, I predict that, based on previous studies and Shapiro et al.'s (2006) MF model, training in metacognitive strategies (including mindfulness), relative to control training, will result in the following behavioral benefits:

- Improvement in reading skills (i.e., accuracy in decoding text and reading level)

- Improvement in fluent reading
- Improvement in writing skills
- Improvement in use of metacognitive strategies to decode unfamiliar text
- Improvement in self-correction rate during reading of text
- Improvement in academic engagement during instruction
- Improvement in positive affect during instruction
- Decrease in anxiety during instruction

Training in metacognitive strategies may result in the following qualitative changes:

- increased self-awareness (of both strengths and weaknesses) and self-acceptance of learning disability

Research Design

According to Cresswell and Plano Clark (2011), it is helpful to use a diagram to describe and communicate the design of a mixed method study. Using the notation system of Cresswell and Plano Clark, the design of this research study was QUAN + QUAL—that is, both quantitative and qualitative data were collected at the same time, and there was an equal emphasis on both types of data. The following figure is a diagram of the research design (Cresswell & Plano Clark, 2011).

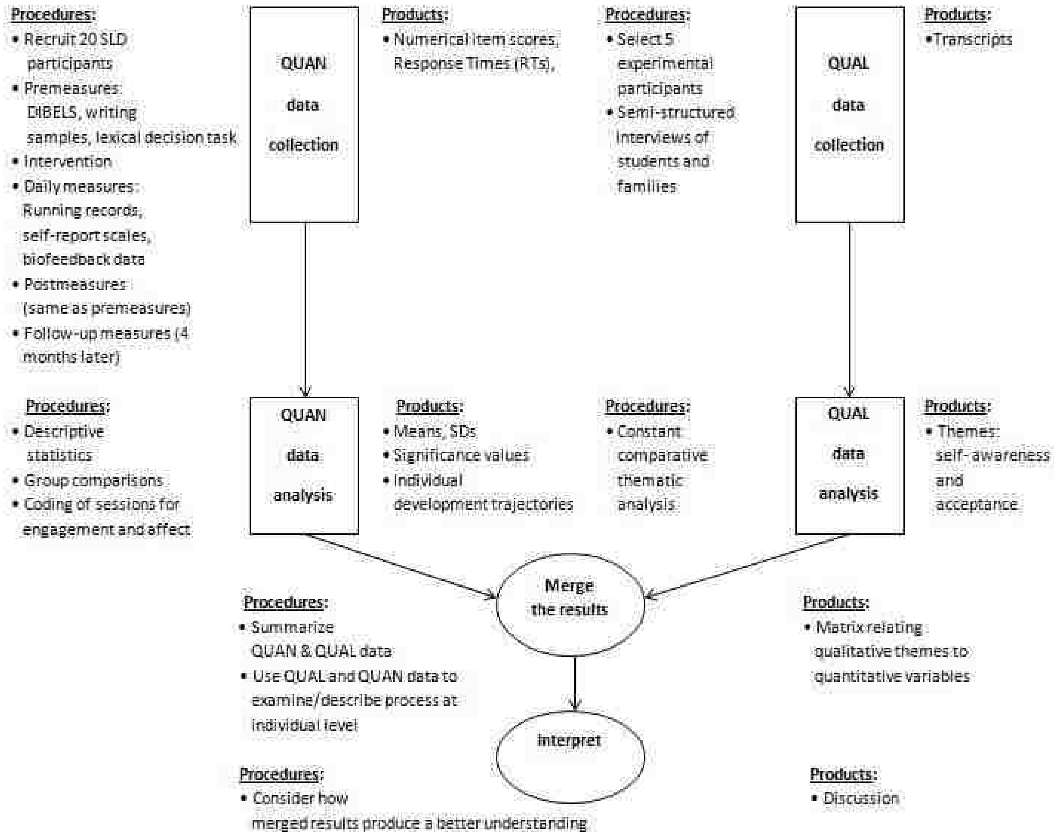


Figure 1. Research design.

Participants

After obtaining approval from the UNM IRB as well as the Research, Deployment and Accountability (RDA) Department of the Albuquerque Public Schools (APS) school district, twenty students from grades 2 through 5 were recruited from Reginald Chavez Elementary School in APS who were determined to have a Specific Learning Disability (SLD) by the school's Eligibility Determination Team (EDT). According to the New Mexico Public Education Department (2011), after implementing the three-tiered model of student intervention (described early in this proposal as the RTI process), a child is identified as SLD if the following three conditions are met:

1. The child demonstrates significant academic underachievement that is

documented and supported by a pattern of strengths and weaknesses in performance and/or achievement. This underachievement persists despite sustained, high-quality, scientific, research-based instruction and intervention.

2. There is evidence of basic neurological processing deficit(s).
3. The child's challenges are not caused by the following exclusionary factors:
    - Lack of appropriate instruction in reading
    - Lack of appropriate instruction in math
    - Limited English proficiency
    - Visual, hearing, or motor disability
    - Intellectual disability
    - Emotional disturbance
    - Cultural factors or
    - Environmental or economic factors (pp. 185-186)

(Note: the above criteria are quoted from the New Mexico Public Education Department's 2011 *Technical evaluation and assessment manual: Determining eligibility for IDEA Part B Special Education services.)*

After their parents signed consent forms and students signed assent forms, the 20 participants were matched in pairs (as well as possible) on age, sex, English Language Learner (ELL) status, and level of service (see Table 1 below) and then the pairs were randomly assigned to either the experimental group (n = 10) or the active control (n = 10). Two of the students in the control group whose parents gave consent did not show up for summer school and so were dropped from the study.

Overall, seven girls and eleven boys participated in this study. Seventeen students were Hispanic; one was black. The mean IQs of the groups were not significantly different (Experimental M = 92.2; Control M = 93.75; p > .05).

Table 1

Matching Experimental and Control Subjects on Age, Sex, ELL status, and Level of Service

Experimental					Control				
Age	**Sex**	**ELL?**	**IQ**	**Level**	**Age**	**Sex**	**ELL?**	**IQ**	**Level**
8.4	F	No	84	D	8.1	F	No	92	C
8.4	M	No	90	C					
8.8	F	No	105	B	9.3	F	No	103	B
9.0	M	No	91	D	9.0	F	No	96	D
9.3	M	Yes	103	B	9.7	M	Yes	95	B
9.3	M	No	97	B	9.4	M	No	98	B
9.7	M	No	75	D					
9.8	M	Yes	96	B	10.3	M	Yes	94	B
10.6	M	Yes	89	C	10.6	M	Yes	87	C
10.6	F	Yes	76	B	9.11	F	No	85	B

Note: IQ was measured by assessors from the school district who used multiple cognitive tests: the Differential Ability Scales—Second Edition, the Wechsler Intelligence Scale for Children—Fourth Edition, and the Kaufman Assessment Battery for Children—Second Edition. Level of service from the school was based on severity of need and/or the parent's wishes. Level B students received 10 hours of intervention per week; Level C students received 15 hours of intervention per week; Level D students received 20 hours of intervention per week. All had either a primary or secondary label from the school district as Specific Learning Disability (SLD).

Procedures

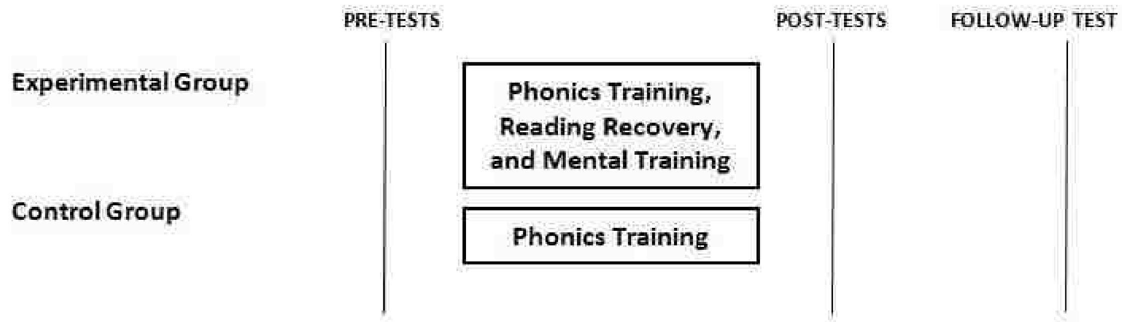


Figure 2. Simplified timeline of study events.

Before assignment to condition, participants were assessed by three individuals. A certified teacher (not myself) assessed students on reading skills using the DIBELS and a research assistant collected writing samples (assessed after the conclusion of the study with the Six Traits Writing Rubric). These measures (the DIBELs and the writing samples) took place in a quiet classroom, free from distractions, within the elementary school. A graduate assistant tested students on the lexical decision task on the second floor of Logan Hall.

Interventions for participants in both conditions began during the school district's five-week (25 days, six hours a day) summer school program. The school district offers summer programs to provide students with additional academic intervention, remediation, or advancement. It is an optional program—students are not required to attend. Parents must register their child for summer school.

Before the intervention began, I randomly selected five experimental students to interview. Using a tape recorder, I recorded an interview of the participants and their families. I asked questions (see Appendix A) to gather information on the participant's life history and the participant's self-awareness and self-acceptance of their disability. Parents were compensated for their time with a $20/hour stipend (for the interviews and for the lexical decision task).

During the intervention, all participants completed 10-15 minutes daily of computerized training using research-based software that included exercises in phonics, phonemic awareness, orthography (i.e., spelling), and fluency. Both groups also received daily one-on-one support in literacy for 24 consecutive days. The control group completed 10-15 minutes daily of phonetic and orthographic activities with a trained RA. The experimental group received 30-45 minutes of instruction from myself using the Reading Recovery approach described earlier in the literature review. Students were taught how to use metacognitive strategies to decode text, with mindfulness employed as a metacognitive strategy to ameliorate symptoms of cognitive interference, fatigue, and anxiety that arose during instruction. Examples of MF practices are learning how to take deep breaths, recognizing and focusing on thoughts, feelings, and physical sensations, eating, smelling, listening, and walking mindfully, focusing on moment-to-moment awareness, separating thoughts from emotions and physical sensations, and developing kind thoughts and behaviors. Data was collected daily using running records, writing samples, biofeedback software, and self-report scales on emotions and attitudes concerning reading attitude and confidence.

After the completion of the five-week intervention, the pre-measures listed above (the DIBELS, writing samples, and the lexical decision task) were readministered by the same individuals listed above (the certified teacher, research assistant, and graduate student), who were all blind to condition (experimental vs. control). Interviews were conducted again with four of the five same participants and their families to determine if there had been any changes in self-awareness and self-acceptance.

To determine whether participants maintained growth in reading for at least one academic semester after the intervention, follow-up data was collected four months later from all participants on reading skills using the DIBELS. See Figure 2 for a simplified timeline of the study events.

Instruments. *The Dynamic Indicators of Basic Early Literacy Skills* (DIBELS) is a standardized measure used by APS (and many other school districts in the United States) to assess children on reading accuracy, fluency, and comprehension. It is designed to be short (one minute) and to monitor progress in accuracy and fluency at a particular grade level. A teacher times a student for one minute while they read a passage and marks the amount of errors they make while reading. DIBELS is typically administered on three separate passages to get a baseline score. Words that are omitted or substituted, and hesitations longer than three seconds are marked as errors. Words that are self-corrected within three seconds are scored as correct. The number of words read correctly in one minute is the child's oral reading fluency score (ORF). Then the teacher gives the student one minute to retell the story and records how many words the child uses (Retell Fluency: RTF). The number of words that the child used to retell the passage is the child's comprehension score. The DIBELS was administered on three separate passages at all three timepoints (pre-test, post-test, and follow-up); the three resulting ORF and RTF scores at each timepoint were used to calculate a mean ORF and RTF score. Reliability of the ORF is .89-.94 and the criterion-related validity is .52-.91 (Pearson, 2006). Reliability of the RTF is .59 (Pearson, 2006).

The *Six Traits Writing Rubric* is a rubric, or a scoring tool, widely used by many districts in the United States to assess student writing using a set of criteria and standards (see Appendix B). It assesses students on the following six traits: ideas and content, organization, voice, word choice, sentence fluency, and conventions. Participants in this study were only assessed on voice and word choice. An exemplary score in the voice category (6 out of 6 points) meant that a student's writing was expressive, engaging, sincere, had a strong sense of audience, and showed emotion, humor, honesty, suspense or life. An exemplary score in the word choice category meant that a student's words were precise, carefully chosen, and contained strong, fresh, vivid images (Six Traits Writing Rubric, n.d.). A certified teacher (not myself) blind to condition scored participants' pre- and post-writing samples on voice and word choice using the Six Traits Writing Rubric.

The *lexical decision* task (cf. Julca et al., 2010) is a computerized task that involves words, pseudo-words (pronounceable meaningless letter sequences), pseudo-homophones (words that sound the same as a real word but are spelled differently), and pseudo-homophones (unpronounceable sequences of letters). Subjects were asked to indicate if the letter sequence presented was a real word by pressing one of two designated keys on the keyboard.

Running records are an individually-administered assessment of reading accuracy, error rate, patterns of effective and ineffective strategy use, and self-correction rate (see Appendix C for an example). It is a method developed by Marie Clay used to document reading progress over time and can be used with any text. In the Reading Recovery program, the teacher takes a daily running record of a book that the child has practiced reading at home. The teacher uses the data to determine if the child is ready to advance to a new reading level.

Self-report scales (see Appendix D) were collected on a daily basis from all students at the beginning of each session. These scales are based on ones used in Semple, Reid, and Miller's (2005) study on the impact of MF training on anxiety in children. After reading (or being read) the question, children decided on how many stickers (from 1 = "I feel bad" to 5 = "I feel very good") to put in each day's column to signify how they felt at that moment, thereby creating histograms that graphically demonstrated their emotional states (Semple et al., 2005).

Research using *heart rhythm coherence biofeedback* with students in the classroom has found improvements in academic performance, behavior, and emotional wellbeing (McCraty, 2005; see "Heartrate and Coherence Measures" in the Quantitative Results chapter and Appendix E for an example of data collected by this program). Note: I will not be able to screen extraneous variables that may affect coherence ratios, e.g., medication, stress at home, etc. (see Table 2 for a summary of dependent measures used in this study).

Table 2

Summary of Dependent Measures

Measure	Ability Measured	Time Points
The Dynamic Indicators of Basic Early Literacy Skills (DIBELS)	Reading fluency and comprehension	3
Sound Reading Progress Assessment Test	Phonics ability	2
Six Traits Writing Rubric	Voice and word choice	2
Lexical Decision task	Reading accuracy and response times	2
Daily self-report scales	Mood, reading attitude, and reading confidence	16-20
*Running records	Reading accuracy, number of words read, self-corrections	16-20
*HeartMath	High coherence, low coherence, average heartrate	16-20

Note: Time points: The number of times each participant took the assessment. Asterisked measures were only administered to the experimental participants.

Data Analysis

Quantitative data analyses consisted of ANOVAs and follow-up tests on the dependent variables described in the predictions and measures (decoding accuracy, fluency, voice, word choice, positive affect, HeartMath data, and reading confidence and attitude during instruction), to see whether the independent variables of group (MF vs. control) and time of test (before, after, and 4 months following the intervention) influenced the dependent variables (Maxwell & Delaney, 2004).

Consistent with standards of qualitative inquiry, qualitative data generation occurred through face-to-face interviews and researcher-field notes/reflections on all research activities, including student engagement (sustained involvement in reading, writing, and MF activities) and affect during experimental sessions. Qualitative data management, analysis, and interpretation are often concurrent and/or overlapping, since the research process for this kind of inquiry is not strictly linear. However, its overall stages consisted of transcription transfer from word processing format to a software package in order to facilitate coding, sequential coding, and thematic derivation from the codes (Patton, 2002; Silverman, 2010). The transcribed interviews were prepared initially as Word documents. After they were complete, the transcribed documents, students' writing journals, and my daily reflections on experimental sessions were loaded into a qualitative software package (Dedoose Version 6.1.9, 2015) for organization, sorting, and analysis. Within this package, I read all transcripts and did open coding for general conceptual categories in the transcripts, the students' journals, and my field notes. Once that was complete, commonly coded categories were pulled from the original transcripts and recombined in new documents, and coded at a secondary level for refinement of conceptual categories across the group data. From these group level codes, themes, which are larger units of meaning that propose relationships between/among the codes, were developed as findings for the qualitative portion of the study. I anticipated that the themes would relate to the student's self-awareness of their strengths and weaknesses and self-acceptance of their disability and the family's perceptions of the student's strengths and weaknesses.

After analysis was complete, findings were synthesized and placed into a matrix so that they can be displayed in an accessible and comprehensible form to the stakeholders (e.g., the research team, dissertation committee, the school principal, the

Special Education team, the RDA department of APS, and the parents and students). Finally, I proposed an interpretation of the merged results, quantitative and qualitative. Current research efforts in the social and health sciences, as well as education, often represent a blending of methods, yielding outcomes and insight that exceed a single strategy of inquiry (Creswell & Plano Clark, 2011).

Quantitative Results

The primary purpose of the proposed research was to investigate the link between mindfulness (MF) practices and the amelioration of the symptoms of dyslexia (DYS) in children. We predicted that training in metacognitive strategies (including MF), relative to control training, would result in writing, reading, and affective benefits. Overall, there was evidence that the experimental intervention improved performance.

Analysis Plan

Missing data (a lexical decision posttest and a HeartMath session) was estimated using Maximum Likelihood (Baraldi & Enders, 2010). For the analysis of response times (RTs) for the lexical decision task, 60/4200 trials (1%) were eliminated before the analysis because they were no responses. RT outliers were defined as fast responses (<200 ms) or slow responses (>2.5 standard deviations above the group mean). One experimental participant's data were excluded from further analysis because 88/120 (73%) of his RTs on the pretest and 49/120 (41%) of his RTs on the posttest were either too slow or he did not respond. Altogether, 98/4080 (2.4%) of the RTs from the remaining 17 participants were eliminated from the analysis: 18 were too fast (<200 ms) and 80 were too slow (>2.5 standard deviations above the group mean).

To determine overall improvement across the experiment, and to see whether there was an effect of condition (MF vs. control), difference scores were calculated. Specifically, I subtracted the first test score from the last test score on the four dependent measures that provided quantitative assessments of writing, reading, and affective improvements. Independent sample *t*-tests on the group factor (experimental vs. control) were then conducted on these difference scores. Three more *t*-tests were conducted comparing the experimental and control groups on average daily mood, reading attitude, and reading confidence scores. Improvement in writing, reading, use of metacognitive strategies, and affect are discussed below.

Writing Improvement

We predicted that participant writing scores would improve in the areas of voice and word choice, as measured by the Six Traits Writing Rubric (n.d.). An improvement in voice meant that the student's writing became more expressive and showed more emotion, humor, honesty, or life. An improvement in word choice meant that the student used more strong, fresh, and vivid images in their writing. Although non-significant, experimental difference means (reflecting overall improvement) were higher on the Six Traits Writing Rubric Voice test (Exp. M = 1.60; Control M = .00, t_{diff}(16) = -1.11; p > .05; see Table 3) and the Six Traits Writing Rubric Word Choice test (Exp. M = .50; Control M = .25; t_{diff} (16) = -.49; p > .05). There was a medium effect size (d = .52) on the Six Traits Writing Rubric Voice test.

Table 3

Summary of Group Means on Six Traits Writing Rubric Difference T-tests (First Test Score subtracted from Last Test Score) and Significance Level

Measure	Test	Group	Mean	*p*	*d*
Six Traits Writing Rubric	Voice	Control	.00	n.s.	0.52
		Experimental	1.60		
	Word Choice	Control	.25	n.s.	0.23
		Experimental	.50		

Reading Improvement

We predicted that participants would improve their accuracy and fluency while decoding text. There was no evidence of this from the *t*-test difference scores (although there is some evidence of this from Running Records data presented in the Qualitative Results: Individual Level chapter, but not relative to the control group). Neither of the two groups improved their accuracy on the lexical decision Word subscale; however, although non-significant, mean difference scores in experimental students' accuracy decreased slightly less than the control students' accuracy on the lexical decision Word subscale (Ex*p.* M = -.005; Control M = -.011; t_{diff} (16) = -.10; $p > .05$; see Table 4). Most of the remaining evidence from the DIBELS, the phonics test, and the accuracy score on the Nonword subscale contradicts our prediction about improved reading accuracy and fluency. Although non-significant, control group difference score means were higher than the experimental means on the DIBELS Oral Fluency Test (Ex*p.* M = 1.4; Control M = 6; t_{diff} (16) = 1.46; $p > .05$), the phonics test Ex*p.* M = 2.1; Control M = 2.5; t(16) = .30), and the accuracy score on the Nonword subscale (Ex*p.* M = .046; Control M = .063; t_{diff} (16) = .35; $p > .05$).

One thing we did not predict was improvement in reading comprehension, as assessed by the DIBELS Retell Fluency test, a measure of how much a student remembers from the text they have just read. The experimental difference score mean was higher than the control mean (Ex*p.* M = 2.37; Control M = 2.14; t_{diff} (16) = -.05; $p >$ .05), but the *t*-test on the difference scores was non-significant.

Table 4

Summary of Group Means on Reading Difference T-tests (First Test Score subtracted from Last Test Score) and Significance Level

Measure	Test	Group	Mean	*p*	*d*
DIBELS	Oral Reading Fluency	Control	6.0	n.s.	0.03
		Experimental	1.41		
	Retell Fluency	Control	2.138	n.s.	0.01
		Experimental	2.37		
Phonics test		Control	2.5	n.s.	0.45
		Experimental	2.1		
Lexical decision	Word accuracy	Control	-.011	n.s.	0.0
		Experimental	-.005		
	Nonword accuracy	Control	.063	n.s.	0.10
		Experimental	.046		

Improvement in Use of Metacognitive Strategies

We predicted that the intervention would increase the MF participants' use of metacognitive strategies while decoding text. During the intervention, students were encouraged to slow down and "use what they knew" about letters and sounds and to ask themselves "what made sense" in the context of surrounding words. In other words, students were taught to become more reflective while decoding words, instead of just randomly guessing at words as fast as they could. Two results from the Word and Nonword lexical decision task indicated that difference scores on the response times were significantly longer in the experimental group than in the control group (see Figures 3 and 5).

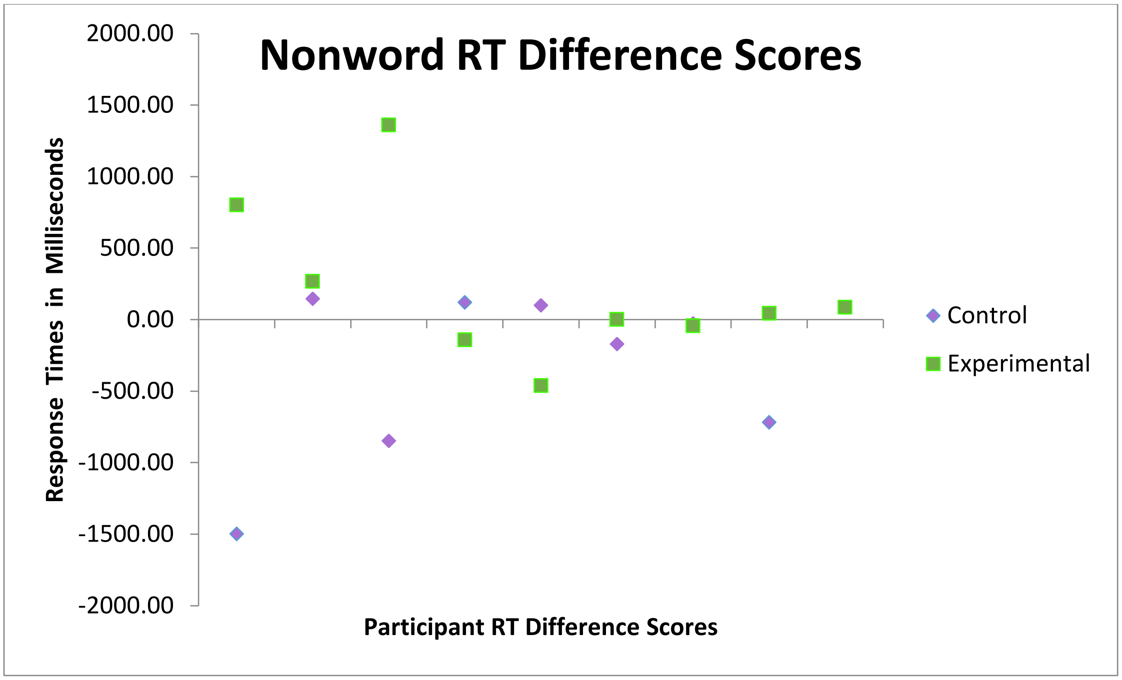


Figure 3: Nonword response time difference scores for participants in control and experimental groups.

Nonwords on the lexical decision task included letter strings (e.g., "bkw"), pseudowords (e.g.,"weven"), and pseudohomophones (e.g., "heer"). Mean difference RTs on the Nonword subtest of the lexical decision task were longer in the experimental group (Exp. Nonword RT *M* = 213, *SD* = 548; Control *M* = -362, *SD* = 599; see Table 5). The *t*-test on the lexical decision Nonword RTs approached significance, t_{diff} (16) = 2.07; *p* < .056, *d* = 1.00 (considered large, Cohen, 1992). See Figure 5 for a bar chart showing the mean RTs and error bars (95% confidence intervals) for the Nonword pretest, posttest, and difference scores for the control and experimental groups. See Table 6 for confidence intervals for the Nonword and Word RT pretest, posttest, and difference mean scores.

Table 5

Summary of Group Means on Lexical Decision Response Time Difference T-tests (First Test Score subtracted from Last Test Score) and Significance Level

Measure	Test	Group	Mean	*p*	*d*
	Word RT	Control Experimental	-300 310	.016	1.32
	Nonword RT	Control Experimental	-362 213	.056	1.00

Note: RT = response time

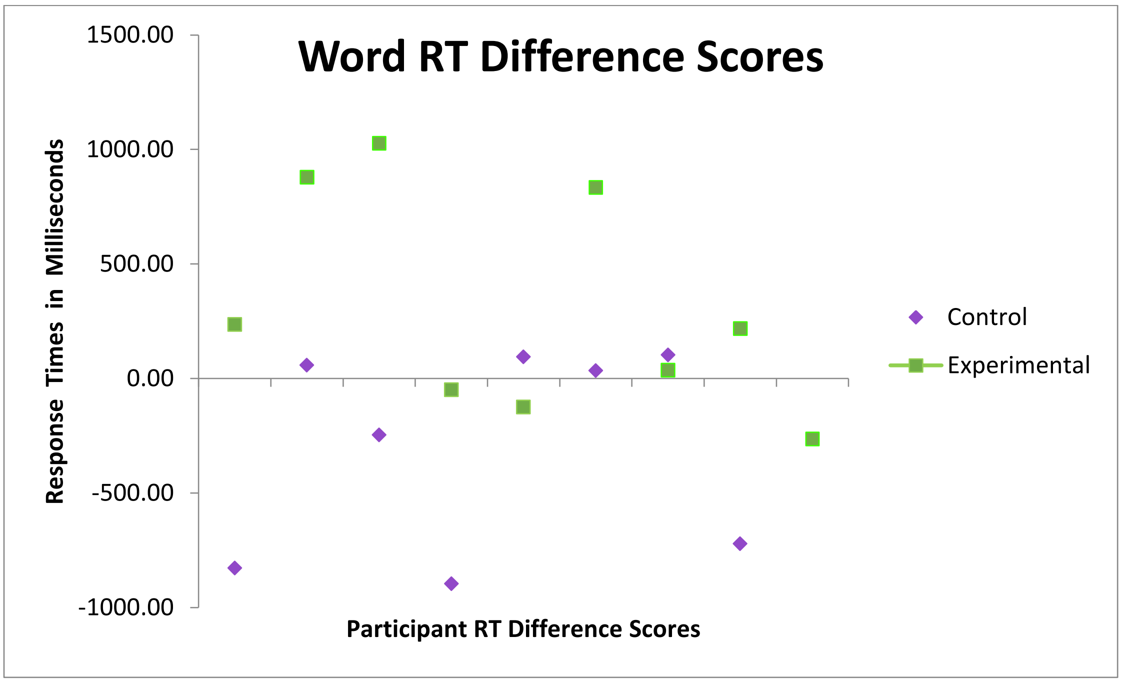


Figure 4. Word response time difference scores for participants in control and experimental groups.

Mean difference RTs on the Word subtest of the lexical decision task were longer in the experimental group (Exp. Word RT M = 310, SD = 481; Control M = -300, SD = 443). The t-test on the lexical decision Word RTs was highly significant; t_{diff} (16) = 2.71, p < .016; d = 1.32, (considered very large), indicating that participants who practiced MF became more reflective when decoding words. I'll elaborate more on the implications of this finding in the Discussion chapter. See Figure 6 for a bar chart showing the mean RTs and error bars for the Word pretest, posttest, and difference scores for the control and experimental groups.

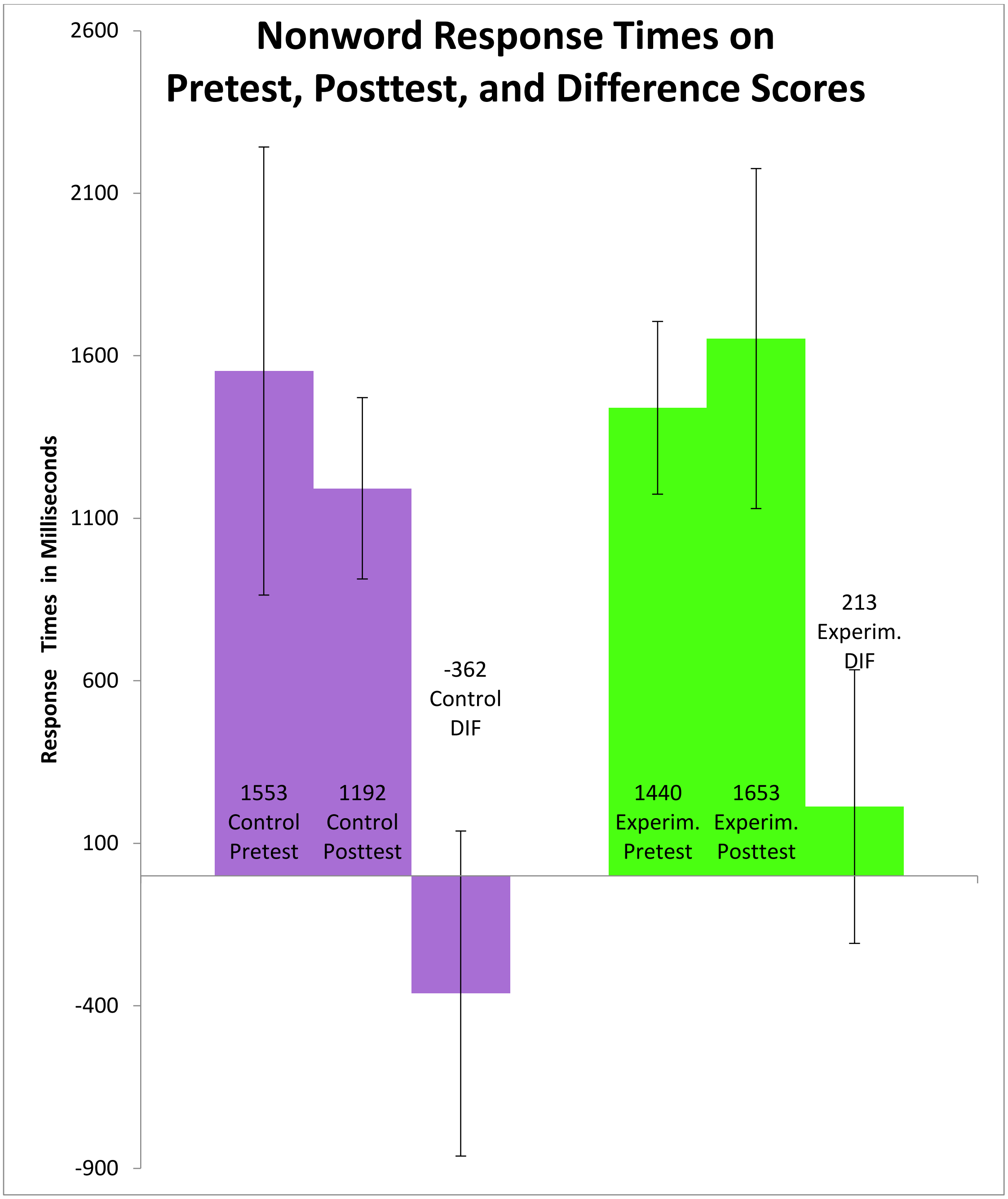


Figure 5. Nonword response times on pretest, posttest, and difference scores.

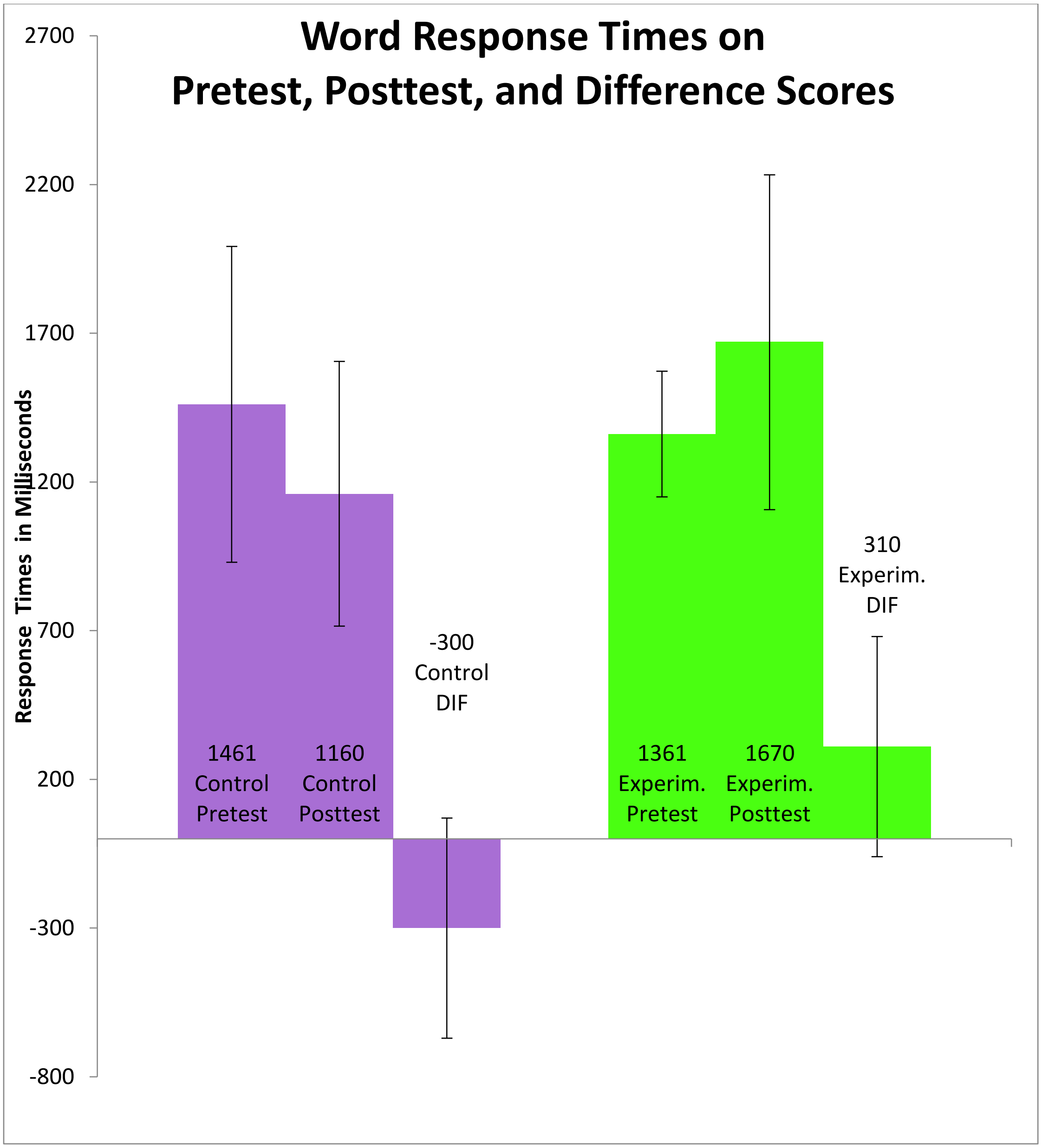


Figure 6. Word response times on pretest, posttest, and difference scores.

Table 6

Confidence Intervals for Nonword and Word Response Times

	Test	Condition	Confidence Interval
Nonword	Pretest	Control	1553 ms +- 689
		Experimental	1440 ms +- 266
	Posttest	Control	1192 ms +- 279
		Experimental	1653 ms +- 523
	DIF Scores	Control	-362 ms +- 500
		Experimental	213 ms +- 421
Word	Pretest	Control	1461 ms +- 531
		Experimental	1361 ms +-211
	Posttest	Control	1160 ms +- 445
		Experimental	1670 ms +- 563
	DIF Scores	Control	-300 ms +- 370
		Experimental	310 ms +- 370

Affective Improvement

We predicted that the MF intervention would improve positive affect and decrease anxiety in experimental subjects. This prediction was supported (although not significantly) by one of the three self-report scales and by the significant lowering of heartrate in the MF group as measured by the HeartMath program.

Self-report scales. Subjects in both conditions filled out daily self-report scales on Mood, Reading Attitude, and Reading Confidence (see Appendix D). These scales were not successful in capturing daily changes in students' affect because the majority of the students reported feeling at the top of the scale every day (e.g., they gave themselves a "5: I feel very good"). Nevertheless, experimental participants, on average, rated themselves as slightly higher on the Mood scale (Ex*p.* M = 4.68; Control M = 4.63; $t(16)$ = -.20; p > .05; see Table 7); the results were non-significant. Contradicting our prediction, the control students rated themselves slightly (but non-significantly) higher on the Reading Attitude scale (Exp. $M = 4.54$; Control $M = 4.61$; $t(16) = -.08$; $p > .05$) and the Reading Confidence scale (Exp. $M = 2.74$; Control $M = 2.75$; $t(16) = -.17$; $p > .05$). This may be because some of the experimental participants became more aware of the anxiety they experienced while reading during the intervention (I will elaborate more on this in the Qualitative Results chapters).

Table 7

Summary of Group Means on Average Daily Self-Report Scales and Significance Level

Measure	Test	Group	Mean	*p*	*d*
Daily self-report scales	Mood average	Control	4.63	n.s.	0.12
		Experimental	4.68		
	Reading attitude average	Control	4.61	n.s.	0.08
		Experimental	4.54		
	Reading confidence average	Control	2.75	n.s.	0.02
		Experimental	2.74		

Heartrate and coherence measures. *Coherence* is an indication of balance between the sympathetic and parasympathetic nervous systems. The Institute of HeartMath has developed biofeedback technology that teaches individuals how to self-induce a state of psychophysical *coherence*—"a highly efficient functional mode associated with increased nervous system harmony, enhanced emotional stability, and improved cognitive performance" (McCraty, 2005, p. 130). Interactive hardware/software monitored and displayed heart rate variability (HRV) patterns as students practiced breathing mindfully. Heart rhythm patterns became smoother and more wave-like as the practitioner's state of coherence increased.

The software also analyzed and recorded the heart rhythm patterns and calculated a coherence ratio for each session (see Appendix E for an example of data collected by this program; note the three gauges—red, blue, and green, that indicate low [red], medium [blue], and high [green] levels of coherence). Low coherence "is characterized by a lower frequency, more disordered heart rhythm pattern and increasing mean heart rate" (McCraty, Atkinson, Tomasino, & Bradley, 2006, p. 12. Here is an explanation of how coherence is calculated by the HeartMath program (McCraty et al., 2006):

> Heart rhythm coherence is reflected in the HRV power spectrum as a large increase in power in the low frequency (LF) band (typically around 0.1 Hz) and a decrease in the power in the very low frequency (VLF) and high frequency (HF) bands. A coherent heart rhythm can therefore be defined as a relatively harmonic (sine-wave- like) signal with a very narrow, high-amplitude peak in the LF region of the HRV power spectrum and no major peaks in the VLF or HF regions. Coherence thus approximates the LF/(VLF + HF) ratio…First, the maximum peak is identified in the 0.04-0.26 Hz range (the frequency range within which coherence and entrainment can occur). The peak is then determined by calculating the integral in a window 0.030 Hz wide, centered on the highest peak in that region. The total power of the entire spectrum is then calculated. The coherence ratio is formulated as: (Peak Power/(Total Power-Peak Power))^2. This method provides an accurate measure of coherence that allows for the nonlinear nature of the HRV waveform over time. (p. 8)

Linear contrasts were calculated on low and high coherence scores and average daily heartrate collected over 16 sessions (timepoints) from experimental participants by weighting each session (e.g., session 1 was weighted by multiplying by -15, session 2 by -13, session 3 by -11, .. session 16 by 15). After calculating contrasts, confidence intervals were calculated and one-sample *t*-tests were run.

The linear contrast tests indicated no significant changes on low or high coherence levels over the course of the intervention (see Figures 7 and 8). Confidence intervals and *t*-tests on low and high coherence were non-significant; low coherence $M = -244.4$; $t(9) = -0.42$, $p > .05$; 95% CI [-1550.93, 1062.13]; high coherence $M = -256$; $t(9) = -0.44$, p > .05; 95% CI [-1561.5, 1049.5] (see Table 8). The test on heartrate was highly significant; $M = -534.8$; $t(9) = -3.48$, $p = .007$; 95% CI [-186.84, -882.76] indicating that the average heartrate of experimental participants became significantly lower over time (see Figure 9).

Table 8

Summary of Contrast Tests

Measure	**Mean**	***p***	**Confidence Interval**
Low coherence	-244.4	n.s.	-244.4 +- 1306.53
High coherence	-256	n.s.	-256 +- 1305.50
Heartrate	-534.8	.007	-534.8 +- 347.96

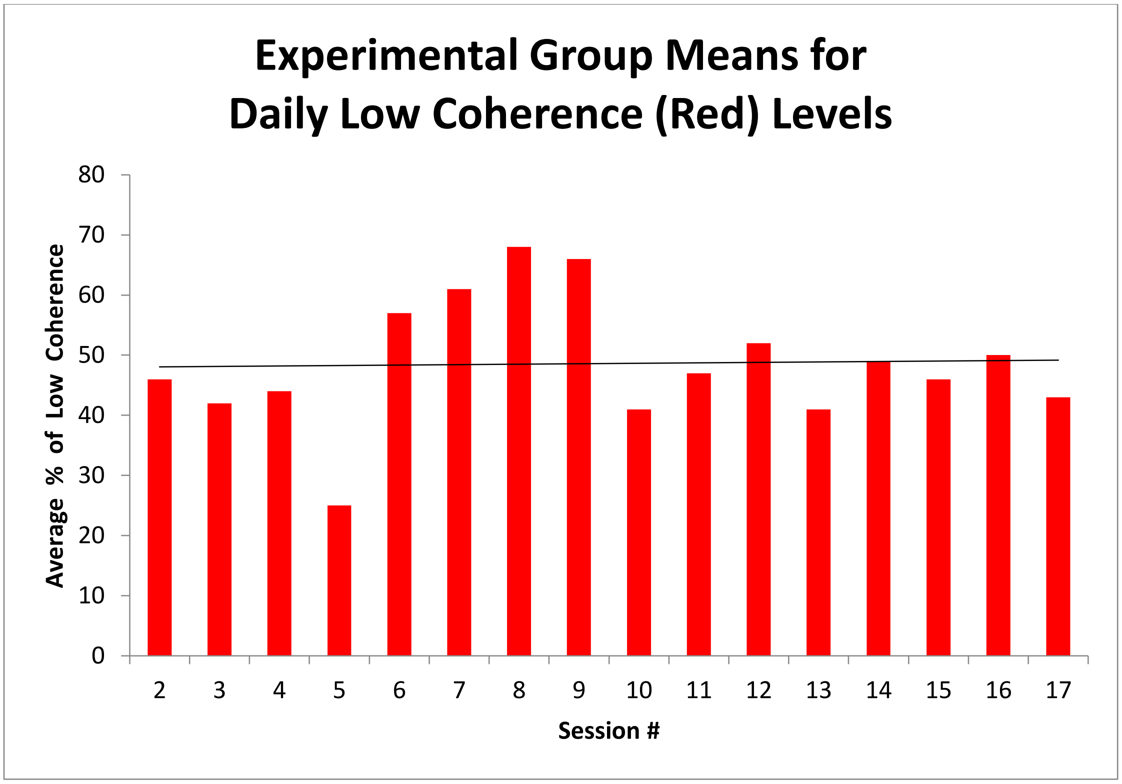


Figure 7. Experimental group means for daily low coherence (red) levels.

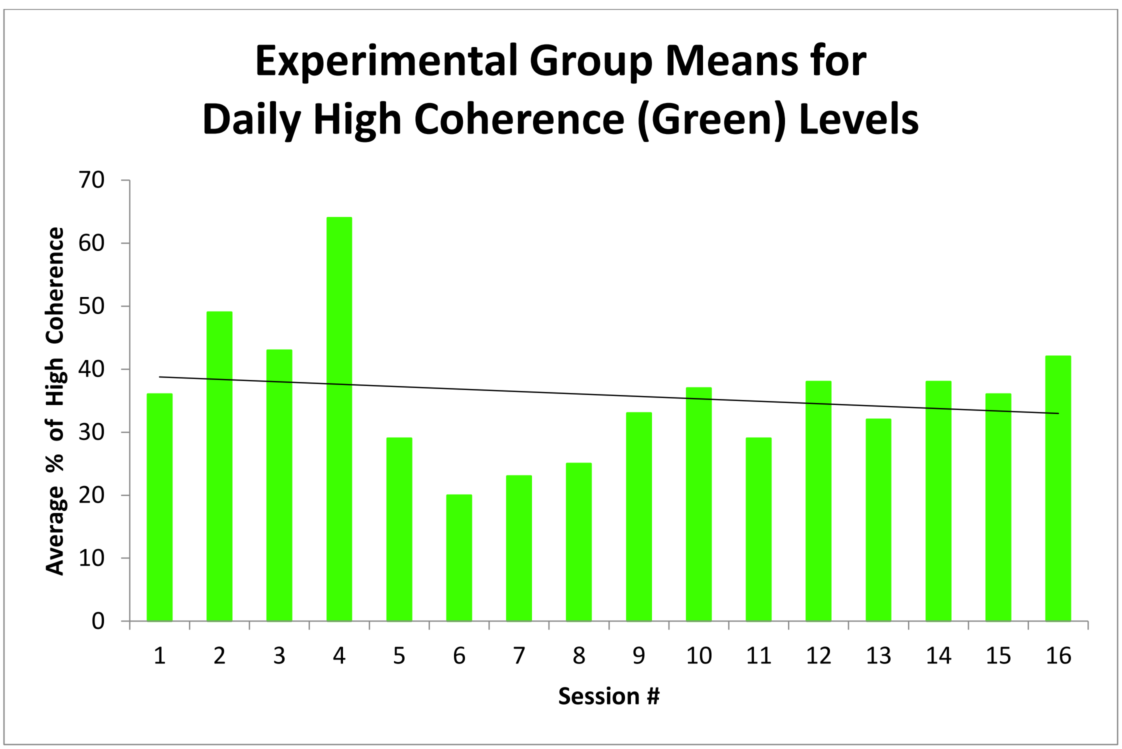


Figure 8. Experimental group means for daily high coherence (green) levels.

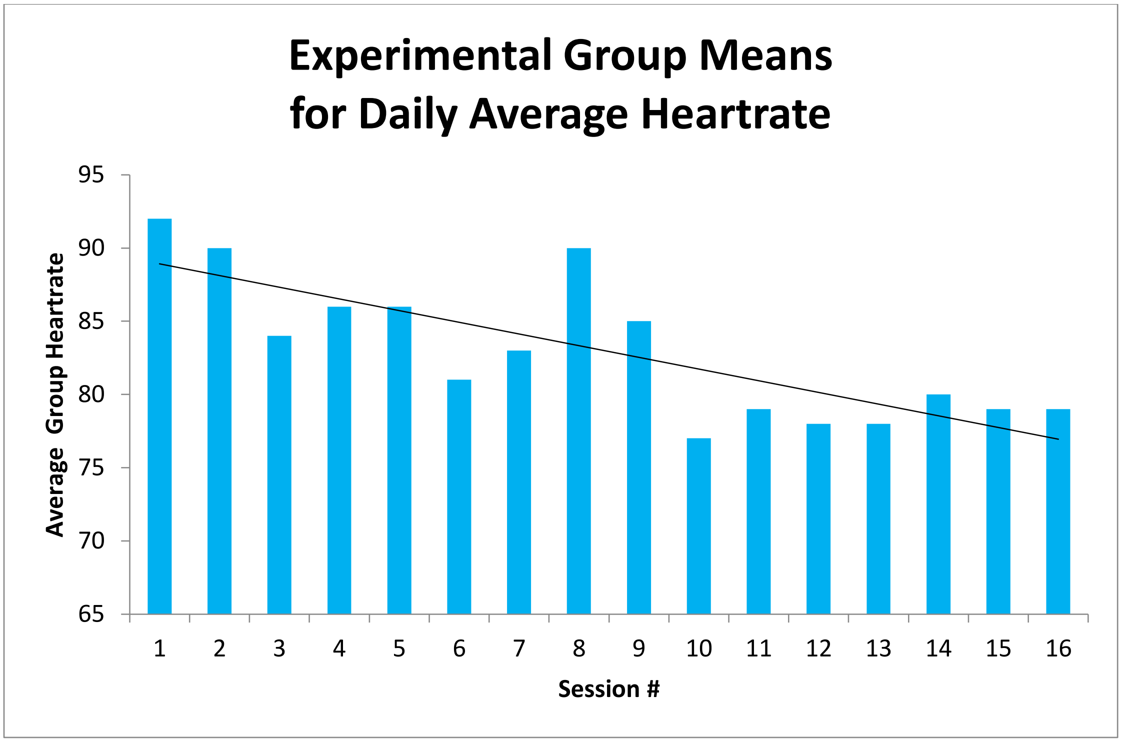


Figure 9. Experimental group means for daily average heart rate.

Qualitative Results: Group Level

The overall aims of this study were to investigate whether or not training in metacognitive strategies (including mindfulness) could help ameliorate symptoms of DYS in children. The quantitative data discussed in the previous chapter provided some objective answers as to whether or not the training provided in this study improved performance on specific measures. In this chapter, the qualitative results at the group level will be discussed. Qualitative data , while often considered to be less objective, can provide a window into understanding the participants' subjective experience. This is essential for a more complete comprehension and appreciation of the human mind and heart (Varela, 1996). "In fact I believe that research focused on discovery, insight, and understanding from the perspectives of those being studied offers the greatest promise of making a difference in people's lives" (Merriam, 2009, p. 1).

In this chapter we will discuss how the qualitative data was collected, organized, and analyzed. Then we will discuss three overarching themes that emerged from the data: *Understanding the Participants, Understanding the Intervention,* and *Understanding Improvements.* In the last section of this chapter, we will discuss how our predictions were supported by the qualitative results.

Qualitative data was collected from multiple sources: nine face-to-face interviews with parent(s) and child experimental participants in their homes, over 500 pages of researcher field notes and journaling written during the five weeks of the intervention, participant journals and drawings, and personal education information from school records. As discussed in the Data Analysis section of this dissertation and as suggested by the committee, I analyzed my field notes—or daily reflections on experimental sessions. During the sessions, I jotted down a few words or short sentences to help me remember things the participant said or did. At the end of each day, I expanded these jottings into detailed behavioral descriptions and reflections. It is common practice in qualitative research to analyze field notes. According to Sullivan (1995):

> The researcher's task is to sift through the mass of field notes and decode the data to make sense of events, situations, and the interactions noticed… Well-kept records and their analysis are able to communicate the setting and happenings well enough for another researcher to learn them sufficiently to become part of the group. (p. 201)

After transcribing the interviews, I organized my field notes/journaling around four areas of interest:

1. General observations (e.g., participant's mood, parent contact, health, tardiness, etc.)
2. Mindfulness (MF) data, lesson plans, and MF observations
3. Reading data, lesson plans, and reading observations
4. Writing data, lesson plans, writing observations, and student writing and drawing

Then, after copying assessment scores and testing information from school records into documents for each participant, I loaded all the data into a qualitative software package (Dedoose Version 6.1.9, 2015). Within this package, I carefully read all the documents, highlighting excerpts and creating codes based on my first impression of the relevance and importance of the excerpt to my research questions (Merriam, 2009), coding these excerpts with multiple themes regarding participant characteristics, instructional strategies, and behavioral and academic improvements.

After the initial creation of codes, I eliminated minor codes, reorganizing and combining the remaining codes into larger ones. This process enabled me to discover meaningful patterns in the data, and finally to merge the patterns into conceptually distinct themes. General themes pertaining to the experimental group will be presented in this chapter, while individual themes for each of the ten experimental participants will be presented in the next chapter.

Reorganizing and combining smaller codes into larger codes resulted in three conceptually distinct and interconnected themes pertaining to the researcher's understanding of the experimental group. *Understanding the Participants* led to *Understanding the Intervention*, because the intervention was designed to address the needs and develop the strengths of each subject. *Understanding the Intervention* led to *Understanding Improvements*, which occurred as a result of the instructional strategies used in the intervention.

Understanding the Participants

Understanding the Participants includes the four subthemes of *Student Needs, Student Strengths, Family Themes*, and *Student Feelings*. Half of the experimental participants were receiving 15-20 hours of intervention a week from the school district (Level C or D students) because they were considered to have more severe needs than the Level B students who received 10 hours/week of service. However, one of the B students was severely disabled in reading; although almost ten years old, he was still reading at a first-grade level. Consequently, these students were doing very little work in class and had challenging behaviors that tended to isolate them from teachers and other students and make them in grave danger of falling through the cracks of the school system, becoming part of the grim statistical prognosis for people with learning disabilities—depression in adults, unemployment, suicide attempts, and dropout from school (Schulte-Körne et al., 2007).

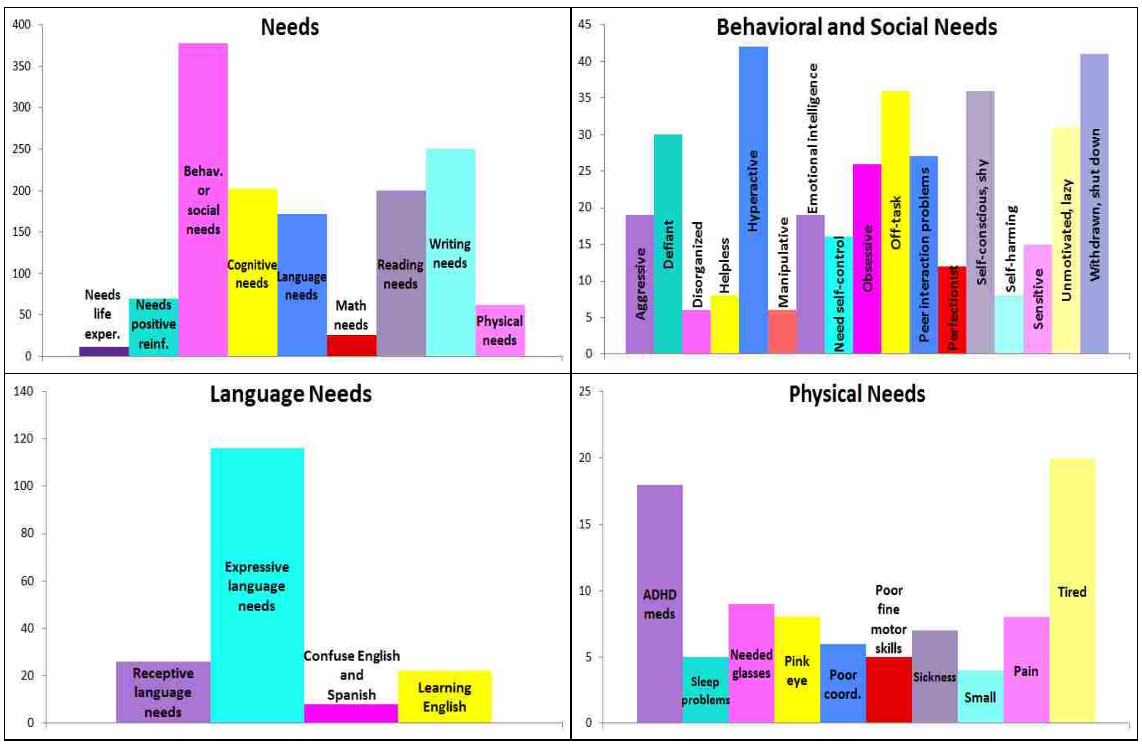


Figure 10. Overall student needs and behavioral, social, language, and physical needs (Behav. = behavior; Life exper. = life experience; Positive reinf. = positive reinforcement; Poor coord. = poor coordination).

Student needs. For the most part, themes about student needs emerged primarily from coding school records, but also from my observational notes and from interviews. One important overall need that I observed in students was *Needs positive reinforcement* (70 excerpts; see "Needs" in Figure 10), or, as described in my codebook, the participant's need for affectionate, humorous, and playful rapport. This theme was not as frequent as other student need themes because it only appeared in my field notes, and not in student records. I found that using a kind and playful tone with students improved their ability to respond positively to my requests and increased awareness of their own behavior in a non-threatening manner. The theme *Needs life experience* (11 excerpts) came up in the reading data; if a child had limited life experiences, it was difficult for them to understand concepts in books like the earth going around the sun or what swimming was like if they had never been to a pool.

Behavioral and social needs was the greatest overall area of need (378 excerpts; see "Needs" in Figure 10) and included subthemes like *Emotional intelligence* (19 excerpts; see "Behavioral and Social Needs" in Figure 10), or the need for an individual to identify emotions—in themselves as well as in other people—and to use this information to manage their own emotions and respond appropriately in social interactions.

Behavioral, social, language, and physical needs. Two of the most common behavioral themes in student records and observations were *Hyperactive* (42 excerpts; see "Behavioral and Social Needs" in Figure 10) and *Withdrawn or shut down* (41 excerpts). It is interesting that these codes represent opposite behaviors—either too much activity or too little. Students who were hyperactive or withdrawn were also *Off-*

task (36 excerpts), a term commonly used in schools to describe a student who is unwilling or unable to complete class assignments and is one of the main reasons that students are flagged as needing additional interventions. *Unmotivated, lazy* (31 excerpts) is often the reason cited for off-task behavior; two parents in this study did not believe that their child was disabled, but instead was just "lazy."

Contributing to and sometimes exacerbating severe behavioral problems were significant language needs (172 excerpts in "Needs"; also see "Language Needs" in Figure 10). *Receptive language* (26 excerpts) is defined as being able to understand spoken or written language and participants observed to have needs in this area had difficulty understanding and following directions. Four of the subjects were English Language Learners (ELL), and this necessarily made reading and writing even more difficult, causing them to *Confuse English and Spanish* (8 excerpts) phonetic rules while decoding or spelling. *Expressive language* (116 excerpts), or the ability to successfully convey one's thoughts and feelings, is an important need in this study—a theme that appears often in student records, observations, and interviews—and is something that I specifically addressed in the intervention, encouraging students to explore thoughts and feelings during MF breathing and then express them in writing.

Participants in this sample did not have physical disabilities and so there were not a lot of excerpts reflecting physical problems or needs (62 excerpts in "Needs"; also see "Physical Needs" in Figure 10). The two most common themes here, *ADHD meds* (18 excerpts) and *Tired* (20 excerpts), echo the overactive and underactive behavioral themes of *Hyperactivity* and *Withdrawn or shut down.* One of the Level C students had

Poor coordination (6 excerpts) and *Poor fine motor skills* (5 excerpts), impacting his ability to write. Three of the participants *Needed glasses* (9 excerpts) but did not wear them because their glasses were lost or broken during the intervention. Of course, not having corrected vision then also impacted their cognitive and academic needs as well.

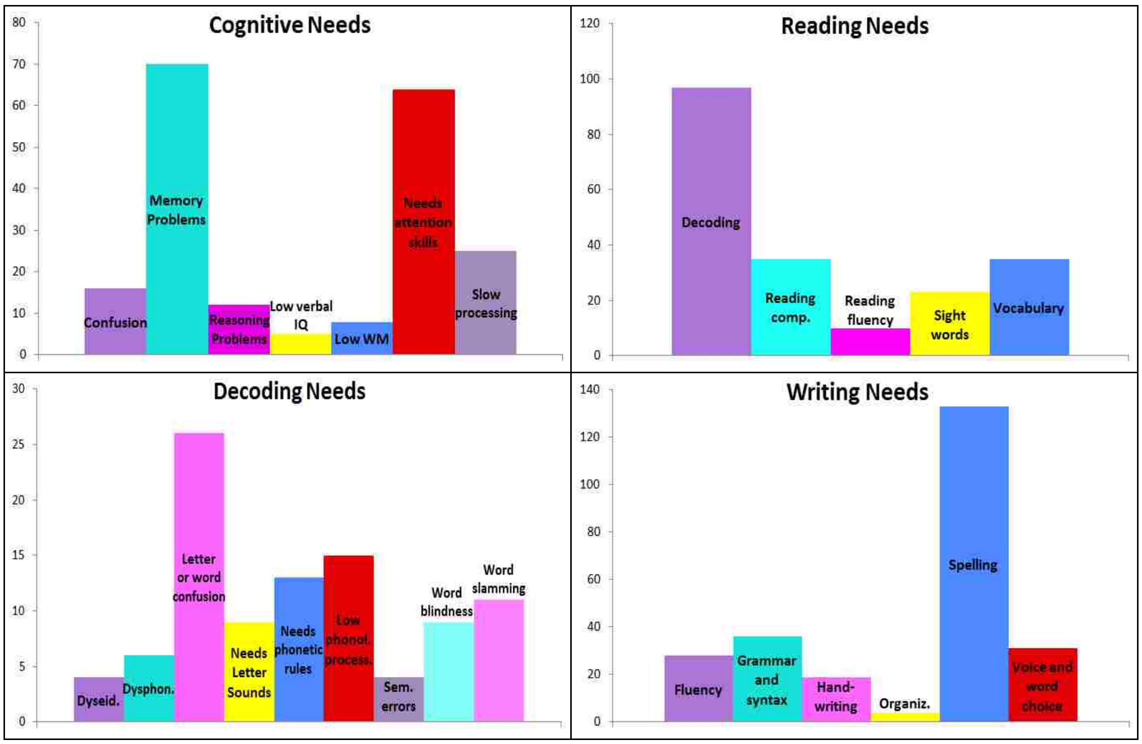


Figure 11. Cognitive, reading, decoding, and writing needs (WM = working memory; Reading comp. = reading comprehension; Dyseid. = dyseidetic; Ddysphon. = dysphonetic; Low phonol. process. = low phonological processing; Sem. errors = semantic substitution errors; Organiz. = organization).

Cognitive, reading, and writing needs. It is not surprising, in a participant sample of learning disabled children, that *Cognitive needs* (202 excerpts), *Reading needs* (200 excerpts) and *Writing needs* (251 excerpts) were common themes (see "Needs" in Figure 10). *Memory problems* (70 excerpts; see "Cognitive Needs" in Figure 11) and

Needs attention skills (64 excerpts) were the most frequently observed and documented cognitive needs. *Needs attention skills* is a theme directly related to the prior themes of *Hyperactivity* and *ADHD meds*; three participants had been officially diagnosed as having ADHD and two of them were taking medication for this disorder during the intervention. However, other students not labeled as ADHD also exhibited significant difficulties with the self-regulation of their attention and this affected their *Withdrawn or shut down* and *Off-task* behavior. Unable to focus on the teacher's directions or on the classroom task at hand, they shut down during class and found other things to do (e.g., sharpening pencils repetitively or diving under their desks to retrieve fallen objects). *Memory problems* also influenced *Off-task* behavior and *Expressive language needs*. Unable to remember directions or to find an answer to a question in their long-term memory, students became *Aggressive* (16 excerpts) and/or *Defiant* (26 excerpts; see "Behavioral and Social Needs" in Figure 10) because they could not express their feelings and thoughts. *Confusion* (16 excerpts; see "Cognitive Needs" in Figure 11) is a theme that comes mostly from my own observations, where I noted that a participant became confused, usually because of *Reasoning problems* (12 excerpts) or from a lack of comprehension or memory problems. For example, when writing down things he remembered from a book about Yellowstone Park, one boy—who had probably never seen a geyser—incorrectly recalled a cannon being at the park because he remembered the words "shot out of the ground." His very low working memory (WM) and very low processing speed also contributed to and compounded his confusion. According to the district's tests, four of the experimental participants had low working memory (WM;

Low WM; 8 excerpts) and four had *very* low WM. Four students were reported to have low processing speed (*Slow processing;* 25 excerpts) and four had *very* low processing speed. The two cognitive difficulties tend to be linked to each other. Slower, more effortful processing places a greater load on working memory, already overwhelmed because many of the basic skills required for a reading/writing task have not become automatic (Eide & Eide, 2011).

As noted in the previous paragraph, cognitive problems directly impact reading problems. The most frequent reading need in this sample was *Decoding* (97 excerpts; see "Reading Needs" in Figure 11), not surprising in the population of reading disabled, where difficulty translating phonological symbols into meaning is well-documented (*Low phonological processing*; 15 excerpts; see "Decoding Needs" in Figure 11). As stated in the literature review of this dissertation, decoding difficulties slow down *Reading fluency* (10 excerpts; see "Reading Needs" in Figure 11) and make *Reading comprehension* (35 excerpts) more difficult. Even after improving their ability to read single words, children still read text very slowly and with a great deal of effort. Depleted after spending large amounts of cognitive energy to decode words, they have significantly less energy left over to comprehend text.

Dyslexia (DYS) was first perceived as *Word blindness* (9 excerpts; see "Decoding Needs" in Figure 11), and I observed this "blindness" in students when they miscued on words, seeing letters that were not there. For example, one student read "holes" as if it had a "ch" at the beginning. Word blindness can also be described as confusing letters (e.g., reading "b" as "d") and words (e.g., reading "for" as "from") and is the average person's conception of DYS. I observed this *Letter or word confusion* (26 excerpts) in seven of the participants, only two of whom were formally identified by the school district as dyslexic.

Other "Decoding Needs" that echoed themes from this dissertation's literature review are *Dysphonetic* (6 excerpts) and *Dyseidetic* (4 excerpts)—two of Boder's (1970) three subtypes of DYS. Dysphonetic individuals have difficulty sounding out or spelling words phonetically, perceiving words as gestalts, and often make *Semantic errors* (4 excerpts) when reading (e.g., reading "hop in" as "get in"). The dyseidetic group, in contrast, *always* reads phonetically, sounding out most words as if they have never seen them before. *Word slamming* (11 excerpts) is not a theme I have seen in the literature; it is my own term for a decoding behavior that I observed in four of the students. When they came to a word they did not know, they made rapid guesses or "slams" at the word, looking at my face for nonverbal cues to see if their guess was correct instead of using phonetic or contextual cues. The final decoding need indicates that two of the participants were at an emergent reading level—they still had not mastered the very basic reading skill of letter-sound correspondence (*Needs letter sounds*; 9 excerpts).

Students who are dysphonetic, dyseidetic, confuse letters and words, and have not mastered basic letter sounds are naturally not good spellers (*Spelling*; 133 excerpts; see "Writing Needs" in Figure 11). Three of the participants hated writing because they thought of their own handwriting as "bad" or "dumb" and another girl perseverated on letter formation, taking as long as ten minutes to write a simple sentence (*Handwriting*, 19 excerpts). Struggling to grip a pencil and print letters neatly also affected writing

Fluency (28 excerpts), and so did expressive language difficulties and memory problems. If a child had problems coming up with original ideas, it impacted his ability to write fluently. Students who lacked emotional intelligence or awareness also did not have a lot of voice and detail in their writing, especially at the beginning of the intervention, when they wrote sentences like this: "I am mad sad."

The behavioral and academic need profile of the participants in this sample is forbidding, but the strength profile, presented in the next section, offers hope that these children, with the proper intervention, may still be able to make valuable contributions to our society.

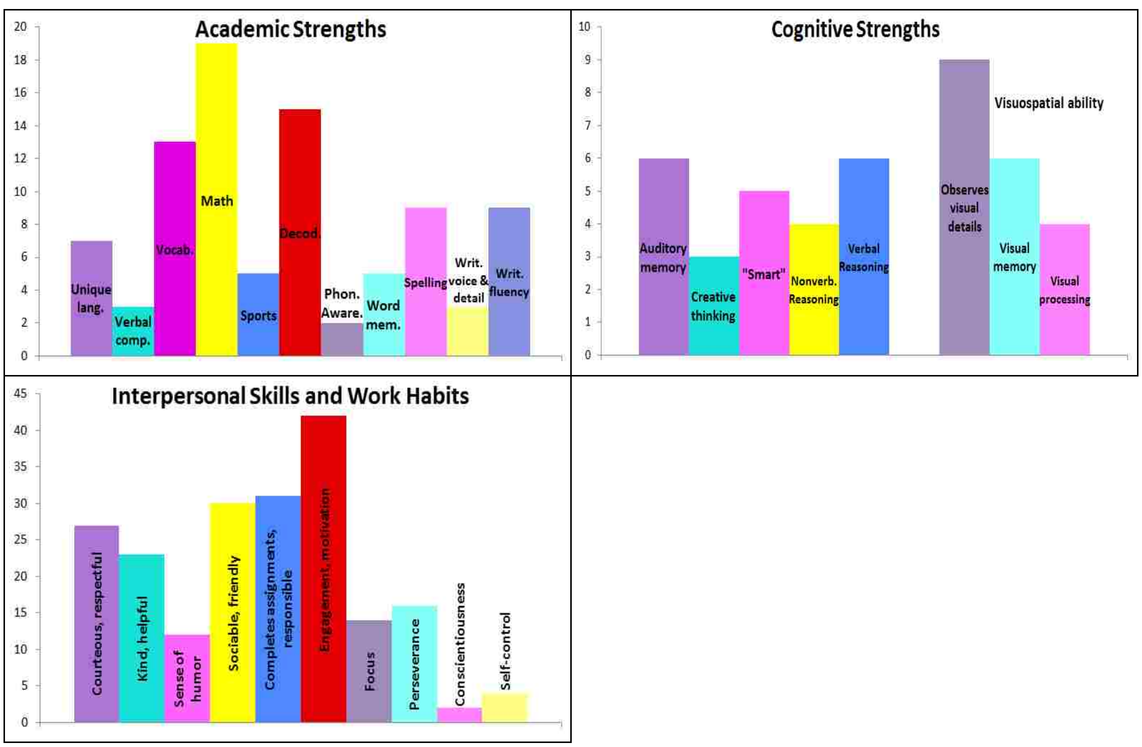


Figure 12. Academic, cognitive, interpersonal, and work habit strengths (Unique lang. = unique language; Verbal comp. = verbal comprehension; Vocab. = vocabulary; Decod. = decoding; Phon. Aware. = phonemic awareness; Word mem. = word memory; Writ. =

writing; Nonverb. = nonverbal reasoning).

Student strengths. Many people—scholars as well as lay people—associate DYS with creativity (Wolff & Lundberg, 2002), especially within the fine arts—music, dance, painting, acting, etc. They are said to have talents for seeing patterns in noise and pulling novel ideas out of the mundane (Chakravarty, 2009). In other studies comparing dyslexics with a control group, dyslexics have been found to be better at visuospatial tasks, at unusual or creative thinking measures like the Alternative Uses task, and at artistic tasks like the Picture Production task (Attree, Turner, & Cowell, 2009; Everatt et al., 1999; von Károlyi, 2001). Dyslexics also see themselves as more innovative than adaptive—as more flexible and original in their thinking than an "adaptive" person, who is methodical and generally conforms to the accepted way of doing things (Everatt et al.).

The work of Dr. Casanova, M.D., a psychiatrist, neurologist, and neuropathologist, supports a view of DYS as a different pattern of different brain organization, with corresponding strengths and weaknesses. Over the course of twenty years of examining a large variety of normal and abnormal brains, Casanova has become focused on the cell minicolumn, a vertical arrangement of 80 to 100 neurons having a common response pattern to stimulation. Williams and Casanova proposed (2010) that there is a continuum of cognitive styles, defined by the degree of spacing between minicolumns. It is the connectivity within and between these modular cortical circuits that may explain many of the behavioral and cognitive traits of individuals with autism and dyslexia. Autistics have tightly spaced minicolumns and thus are biased towards local connections, which are especially good at processing fine details. Dyslexics, on the other end of the spectrum, have broadly spaced minicolumns, and so are biased toward long-range connections, which are weaker in processing details but are strong in more global tasks, like creative synthesis and application, perceptual gestalts, problem solving, and unusual insights.

Strengths identified by the school district, by the parents, and by the children themselves correspond with some of these findings regarding talent in DYS. Many of the participants indicated that they liked *Math* (where visuospatial skills are important) and were better at it than reading and writing (19 excerpts; see "Academic Strengths" in Figure 12). Cognitive tests by the school district often indicated strengths in "Nonverbal Ability" (i.e., visual processing and fluid intelligence). Six of the students had average nonverbal ability (a relative strength in comparison to their areas of cognitive weakness) and three had *above* average nonverbal ability. Strengths in visuospatial ability (*Observes visual details*, 9 excerpts; *Visual memory*, 6 excerpts; *Visual processing*, 4 excerpts; see "Cognitive Strengths" in Figure 12) and *Nonverbal reasoning* (4 excerpts) were observed in this sample by teachers, district evaluators, and myself. "I like all the rainbow colors!" said one participant when she first walked into my classroom and looked around at all of the posters and decorations on the wall. Many of the children's visuospatial talents could be seen in the detailed drawings they made in their journals (see the next chapter entitled "Qualitative Results: Individual Level").

Academic and cognitive strengths not usually associated with DYS (e.g., *Decoding*, 15 excerpts, and *Spelling*, 9 excerpts, see "Academic Strengths" in Figure 12) were relative strengths for some of the participants, who struggled more with reading comprehension and writing fluency than with decoding. *Auditory memory* (6 excerpts; see "Cognitive Strengths" in Figure 12), or the ability to remember, process, and recall auditory information was a strength that one participant relied on to help him with academic tasks. Reading the story aloud to him, for example, enabled him to later read the text more fluently on his own. It would be interesting to research whether other children with DYS with significant deficiencies in phonological processing also relied on their auditory memory.

While many participants struggled with off-task, hyperactive, aggressive, defiant, unmotivated, and withdrawn behavior within the stress-filled, test-oriented, and pressurized environment of the regular or special education classroom, they demonstrated more positive behaviors at home or after MF practice during the intervention. Parents told me about or I observed children exhibiting *Engagement, Motivation* (42 excerpts), being *Sociable, friendly* (30 excerpts), and *Completes assignments, responsible* (31 excerpts). One student, who was completely shut down in his classroom, refusing to do any work, said one day when we picked him up from class, "I love what you guys do!" Other students were *Courteous, Respectful* (27 excerpts) to adults, and *Kind, helpful* (23 excerpts) to other children in many environments, both at school and at home.

Interviewing children and parents in their own homes gave a more balanced picture of the participants. While teachers and evaluators in school records tended to portray students in a more negative light, parents talked about their child as a unique individual with both strengths and needs. They also offered valuable insight into the environmental influences on the child's behavior and development.

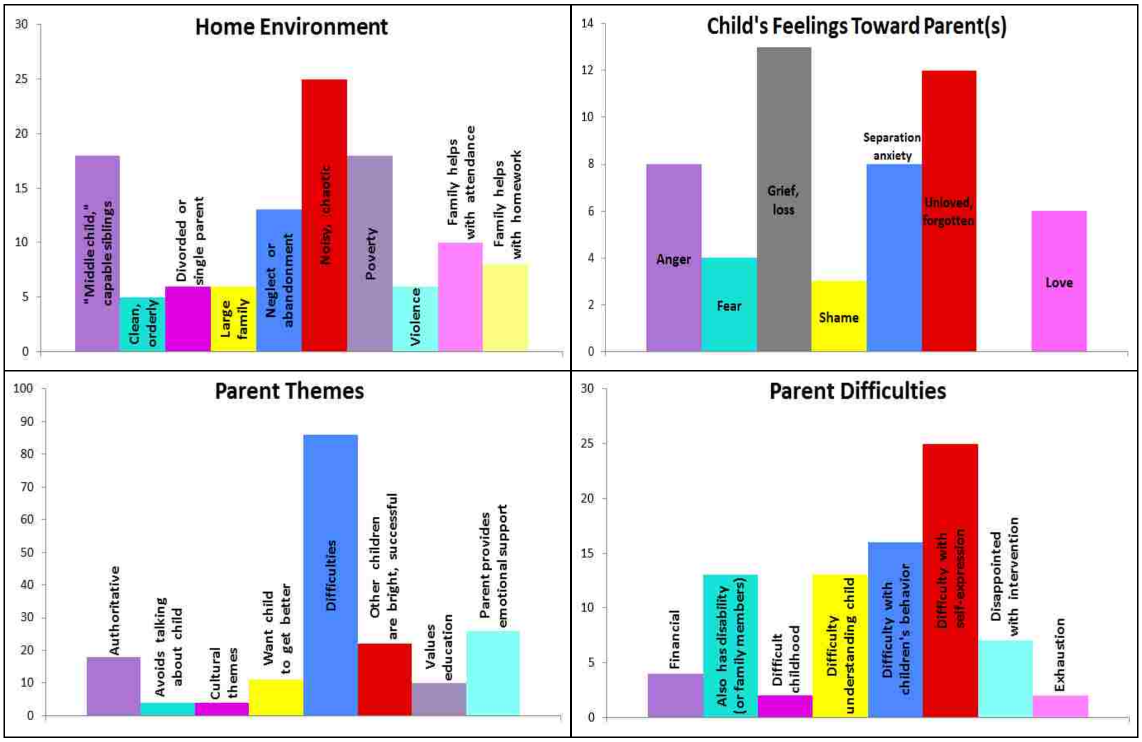


Figure 13. Home environment, child's feelings toward parent(s), parent themes, and parent difficulties.

Family themes. All of the students in this study came from low-income homes. Family themes from interviews with five participants and parents in their own homes reveal difficulties that are consistent with low socioeconomic status. The most frequent "Home Environment" theme (see Figure 13) was *Noisy, chaotic* (25 excerpts). In three of the interviews, there was a lot of background noise—fire alarm batteries constantly beeping, younger siblings screaming for their mother's attention, dogs barking, the TV blaring… This noise was distracting to us, the interviewers, but the families did not seem to notice it. The theme of *Poverty* (18 excerpts) emerged in two of the interviews.

In the heat of the summer, one home did not have air conditioning and the family did not have reliable transportation. The mother expressed embarrassment about the condition of her house as we were leaving. "Sorry about this house," she said, although it was apparent that the family had tried to clean up the home. This was also the home with a *Large family* (6 excerpts), who crowded onto the couch to face us as we interviewed the participant and his mother—four siblings, an unknown amount of cousins, two aunts, and a grandmother out on the porch. Other participants in the study also had large families with at least four siblings. In addition to the themes of constant noise and poverty, themes of *Neglect or abandonment* (13 excerpts) and *Violence* (10 excerpts) also indicated some instability in the home environment. One boy, who seemed to have only one blue-striped shirt, came to summer school late on a number of occasions because his parents did not wake him up; he subsequently learned how to get himself up and feed himself breakfast. One Spanish-speaking mother told me—through an interpreter—that she had a very difficult life when her son was a baby because he had been exposed to "domestic violence." One of the girl participants told me that one time her father had beat her mother up, breaking her nose.

But there were also some positive themes in "Home Environment." Even though their lives were difficult and they were struggling to survive financially, family members—sisters, grandmothers, mothers—tried to help the participants with their homework (*Family helps with homework*, 8 excerpts) and get them to school on time every day (*Family helps with attendance*, 10 excerpts). Not all of the homes were in disarray; three of the houses were *Clean, orderly* (5 excerpts) and the children were also clean and dressed neatly.

Children expressed mostly negative feelings toward parents (see "Child's Feelings Toward Parent[s]," see Figure 13) in their journals and personal communications to me during the intervention. The most frequent emotion they expressed was *Grief, loss* (13 excerpts). Two of the participants had fathers in jail; one had a father who had abandoned him as a baby; one girl's father had died when she was four years old; one boy missed his mother who he had not seen for two years. Losing a parent also contributed to participants' feelings of being *Unloved, forgotten by parent* (12 excerpts) and, especially in the case of the girl whose father had died, increased her *Separation anxiety* (8 excerpts). When her mother had to suddenly leave town during the summer to work at a temporary job, the girl became very sad and worried. She wrote in her journal, "I am sad because my mom left I didn't wont [want] my mom to leve." Losing a parent also increased the child's attachment to the remaining parent. The boy whose father had left when he was a baby often expressed *Love* (6 excerpts) for his mother.

In parent interviews, *Difficulties* (86 excerpts; see "Parent Themes" in Figure 13) was the predominant theme and the difficulties they conveyed are broken into smaller themes in "Parent Difficulties." Another predominant but very positive parent theme was *Parent provides emotional support* (26 excerpts). Parents of the two most severely disabled children listened to them when they were upset, trying to help them sort out their feelings. These parents also talked about wanting their child to improve (*Want child to get better*, 11 excerpts). One father said that he and his wife were "willing to do every program out there and willing to do everything to get our kids every tool that they need." This father and two of the other parents also strongly valued education (*Values education,* 10 excerpts), one father voicing pride in his two older children, both of whom had gone to college.

"Parent Difficulties" (see Figure 13) included *Difficulty with self-expression* (25 excerpts). Just like their children, who had problems communicating their thoughts and feelings, all of the parents also had some difficulty with expressive language. One father, when asked what his son needed to work on at school, responded: "Well, just, you know, his overall economics on, on, uh, just getting better on, on, on wanting [emphasis] to go to school and learning it." They also indicated having *Difficulty with children's behavior* (16 excerpts) because of defiance or aggression. During one interview, the mother pulled a flyswatter away from a younger son who was trying to hit the participant with it. "You almost hit him in the eye," she said with exasperation. One single father expressed irritation with his two sons because they often would not stop playing their video games and do chores or homework. Although five of the six parents interviewed revealed that they or close family members also had a learning disability (*Also has disability, or family members*, 13 excerpts), they usually did not understand why their child had difficulties in school (*Difficulty understanding child*, 13 excerpts), believing that their child was lazy or immature instead of disabled. Two parents worried about money (*Financial Difficulties*, 4 excerpts) one of whom was exhausted (*Exhaustion*, 2 excerpts) from working long hours and getting little sleep so she could keep her job. At the post-interviews, three of the parents conveyed

Disappointment with Intervention (7 excerpts) because they were hoping the intervention would continue in the fall or, in one case, because the father had seen little change in their child. "Yeah, he seems to pay attention a little better, but he's still the same old lazy kid," said this parent.

Having learned a lot about the participants' home environment and family backgrounds from the pre-interviews, I was able to design a more comprehensive intervention for these five students. I also had more insight into the cause of their feelings—both negative and positive—that they wrote about or I observed during the intervention.

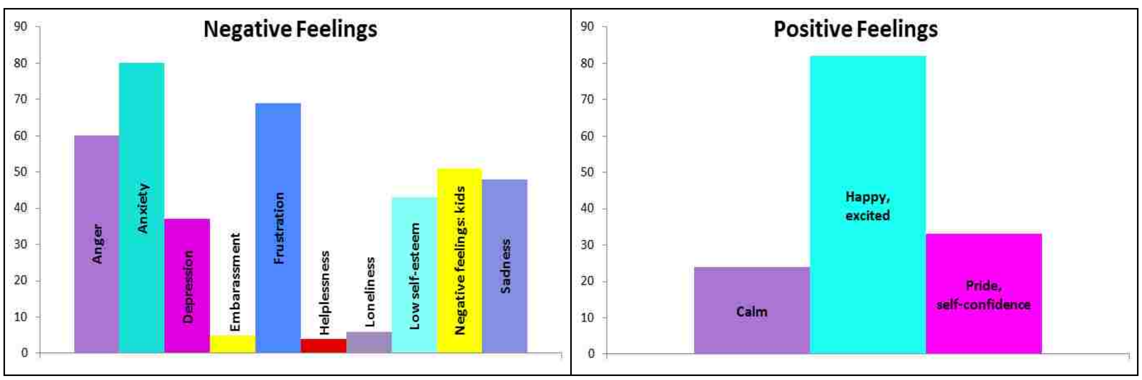


Figure 14. Negative and positive feelings.

Student feelings. Students with learning disorders often experience higher levels of trait and state anxiety than students without learning disabilities (Fisher, Allen, & Kose, 1996). *Anxiety* was the most frequently observed and/or reported negative feeling in this sample (80 excerpts, see "Negative Feelings" in Figure 14). I observed anxiety in nine of the experimental participants, especially during reading and writing tasks, but only four of them self-reported being "worried," "scared," or "nervous because I can't read it." The other participants displayed anxious behaviors such as fidgeting, speeding up during reading, mumbling or whispering, looking at me frequently when they were reading for reassurance, or breathing too fast during MF practice. *Frustration* (69 excerpts) was the next most frequent negative feeling, and may be a reflection of the increased effort (and corresponding overactivation in anterior brain regions) made by dyslexics during tasks that require phonological processing (Maurer et al., 2007; Shaywitz et al., 1998). Parents and teachers (and the students themselves) often reported a child becoming frustrated when a task was too hard and they could not do it, sometimes crying, hitting their heads, or putting their heads down on their desks and refusing to do anything else. "Frustration level seems high," or becoming frustrated when reading difficult words was noted in the school records of eight of the students. *Anger* (60 excerpts) is a direct and common response to frustration. During the intervention, one boy was frustrated and angry because his regular teacher had not let him write about his favorite video game. I asked him to write about his feeling. "I am not gub [good] at writing. and I suke [suck] at writing." He turned his anger inward because of *Low self-esteem* (43 excerpts). The earlier theme of *Poverty* also seemed to contribute to angry feelings; since the participants did not have many personal belongings, they became angry when siblings broke or took their toys or messed up their "stuff" (*Negative feelings: kids*, 51 excerpts). One girl with four siblings said she felt sad because, when their mother took them shopping, her younger sister got "more pretty things" than she did (*Sadness*, 48 excerpts).

In contrast to the variety of negative feelings children expressed or demonstrated during the intervention, interviews, or in school records, the "Positive

Feelings" (see Figure 14) they displayed or talked about were simple: *Happy, excited* (82 excerpts), *Pride, self-confidence* (33 excerpts), and *Calm* (24 excerpts). Interestingly, only 7 out of the 139 positive feelings excerpts came from school records. Teachers and evaluators were more likely to report negative feelings and behaviors than positive ones. Many of the positive feeling excerpts (e.g., 35/82 or 43% of *Happy, excited*) came directly from the students' journals or from their conversations with me. One boy wrote that he felt happy, good, excited, and "Craze" [crazy] about playing his video game. Expressions of *Pride, self-confidence* came more towards the end of the intervention and often after they had completed a difficult task successfully. "I can read all day!" exclaimed one severely disabled reader during his thirteenth session.

Understanding the Intervention: Instructional Strategies

Understanding the Intervention includes the three subthemes of *HeartMath*, *Academic*, and *MF Instructional Strategies.* After examining the school records of the participants, taking notes on their cognitive, academic, and behavioral needs, and after collecting background information from parents and children on their strengths, needs, likes, and dislikes during the pre-interviews, I researched and created individual intervention plans for each student. The instructional strategies I implemented that summer are described in this section.

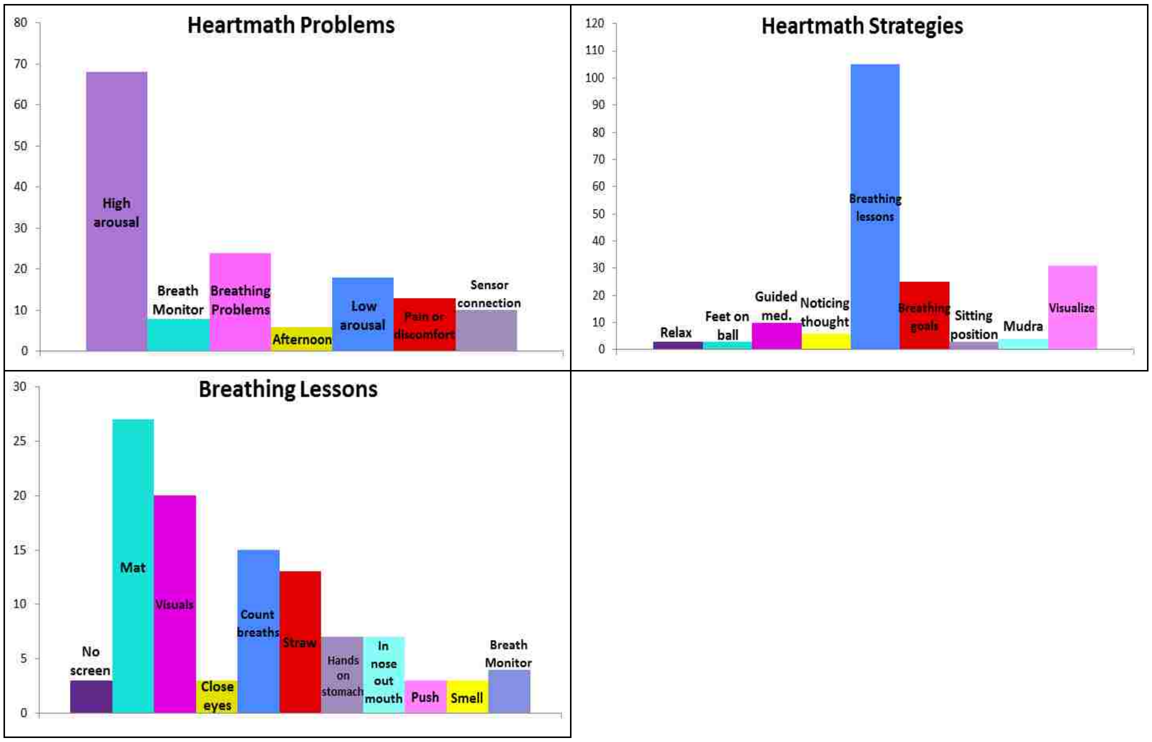


Figure 15. HeartMath problems, strategies, and breathing lessons (Guided med. = guided meditation).

HeartMath instructional strategies. I used the HeartMath program to teach students how to focus on their breathing and to collect data on whether or not their breathing practice was improving their physiological state of coherence. During each student's first session, I introduced them to the program, showing them how to put the ear sensor on their ear (to get heartrate information from their pulse). I talked to them about how the display of their HRV pattern became smoother as they focused on taking deep breaths or became "jagged" when they started talking or got distracted (see Figure 16).

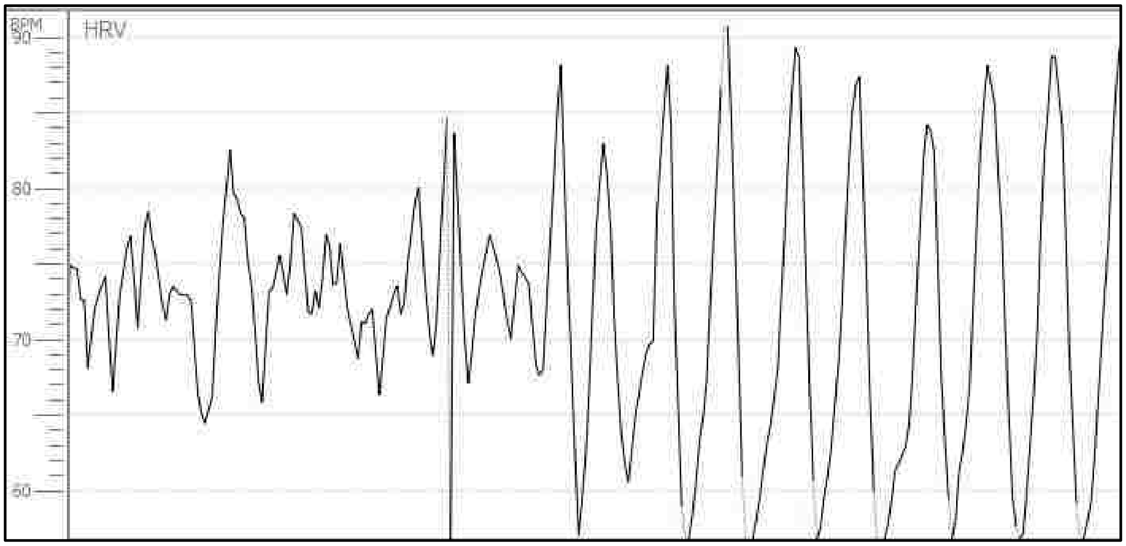


Figure 16. Example of a heart rate variability pattern becoming more coherent over time.

It is not easy to teach a child how to concentrate on their breathing. The most frequent difficulty that participants had during HeartMath was caused by *High arousal* (68 excerpts; see "HeartMath Problems" in Figure 15). When students were excited or silly (13/68 excerpts included in *High arousal*), restless or distracted (46/68 excerpts), or had a high average heartrate (9/68 excerpts), they found it difficult or impossible to increase their coherence level and tended to fidget, disrupting their ear *Sensor connection* (10 excerpts). It was also difficult for them to concentrate during periods of *Low arousal* (18 excerpts)—when they were mind-wandering or daydreaming (3/18 excerpts in *Low arousal*) or tired (15/18 excerpts). Using the *Breath monitor* (8 excerpts; see Figure 17) and watching their coherence levels rise and fall (see Figure 17) was initially motivating to students and slowed their breathing down as they tried to make their in-breaths and out-breaths match the rising and falling of the blue bar on the breath monitor. But the screen display quickly became distracting or stressful, causing one boy to push his breath in and out too forcefully and too quickly, so I told him not to look at it anymore.

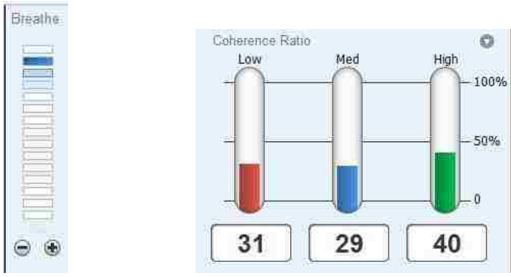


Figure 17. Breath monitor and coherence ratios displayed on the HeartMath screen during MF breathing.

Breathing problems (24 excerpts; see "HeartMath Problems," Figure 15) included holding their in-breath (4/24 excerpts), shallow breathing through their chest instead of deep breathing with their stomach (8/24 excerpts), taking fast, short breaths instead of longer ones (3/24), and having a cough (2/24) or a stuffy nose (7/24). Two students who normally came early in the morning and were very good at reaching high levels of coherence had more difficulty focusing on their breath when they occasionally came in the *Afternoon* (6 excerpts), perhaps indicating a relationship between circadian rhythms and coherence levels.

I tried a variety of strategies to address these problems (see "HeartMath Strategies, Figure 15), the most common of which was *Breathing lessons* (105 excerpts; see "Breathing Lessons" in Figure 15). The second strategy I used frequently was *Visualize* (31 excerpts) and included having subjects visualize bubbles (14 excerpts), floating on water—sometimes as an otter (11 excerpts; this was also the most popular *Guided meditation*), their mother's smiling face (5 excerpts), and being kind to another child (5 excerpts). I asked the youngest children, who were not able to concentrate for more than a minute at a time, to set *Breathing goals* (25 excerpts) every day. "How many breaths can you do today? 10? Or 20?" A good *Sitting position* (3 excerpts)—getting back support or sitting up straight—was helpful to some students. One boy with ADHD found it was easier to focus with his *Feet on a ball* (3 excerpts) and, without any instruction from me, put his thumb and middle finger together in a classic *Mudra* (4 excerpts) or finger position. I used progressive relaxation, or tensing and relaxing the muscles (*Relax*, 3 excerpts) with two students who had trouble reaching high levels of coherence; this practice seemed helpful. One boy said it felt "like [getting] a shot but my arms not numb."

The daily collection of HeartMath data allowed me to monitor and adjust the MF instructional plan I had for each student and to try various "Breathing Lessons" (see Figure 15) with them. Many of the students, who were initially intrigued watching their HRV and coherence levels on the HeartMath, became stressed about their performance. So I began to have students lie on a *Mat* (27 excerpts) and *Close eyes* (3 excerpts) so they could not see the screen (*No screen*, 3 excerpts). One girl wrote in her journal that when she was lying on the mat, she was calm, not thinking about anything and not "more worried because I was goin to get more red." Using breathing *Visuals* (20 excerpts)—blowing bubbles (6 excerpts), blowing on a pinwheel (3 excerpts), moving a cotton ball to a "goal" by blowing through a straw (5 excerpts), and breathing with a stuffed animal on their stomach (6 excerpts)—visually demonstrated to students the effects of making their breath more powerful or more gentle. For example, if one blows on a bubble too forcefully, it pops. Asking students to *Smell* a fragrant flower (3 excerpts) encouraged them to breathe in more deeply. Pushing their breath out (*Push*, 3 excerpts), breathing *In nose out mouth* (7 excerpts), and placing their *Hands on stomach* (7 excerpts) helped them become more aware of their in-breaths and out-breaths. I asked the two youngest students to *Count breaths* (15 excerpts) out loud as they breathed in and out through a *Straw* (13 excerpts) that I was holding my hand over so I could feel their out-breaths as I helped them count.

Every session during the intervention began with HeartMath. After focusing on their breathing for a few minutes, we then began to work on academic tasks and here is where I used academic instructional strategies.

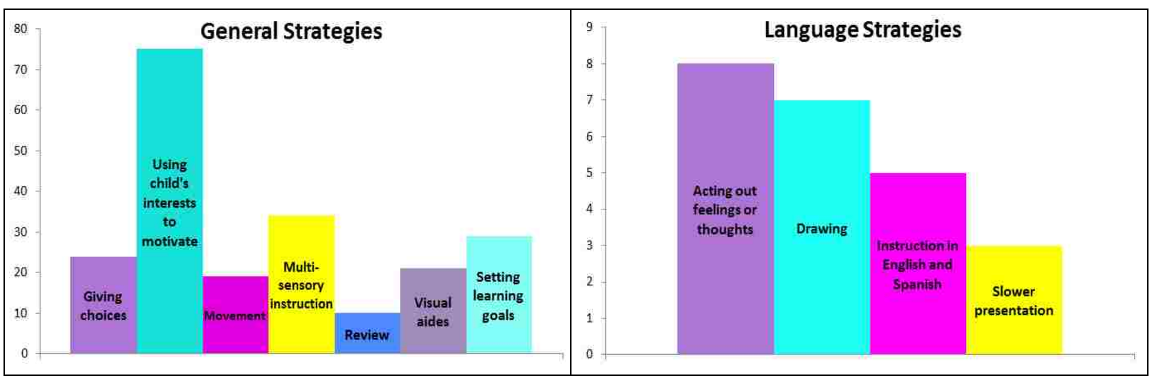


Figure 18. General and language instructional strategies.

Academic instructional strategies. The academic strategy I used most frequently with this group of students was *Using child's interests to motivate* (75 excerpts; see "General Strategies," Figure 18). At the beginning of the intervention, I asked each child to fill out an interest inventory asking them what they liked to learn about, what they liked to do for fun, and their favorite sports, TV shows, animals, and foods. Then I ordered books and materials in the areas of their interest. For example, for a boy who liked making things and airplanes, I ordered a paper airplane kit, with a book of instructions and diagrams. For a girl who loved clothes and shopping, I ordered "A Smart Girl's Guide to Style" and "Paper Fashions." I wanted to motivate children to read and write by giving them stimulating materials in the areas of their interest.

Another intervention strategy that is commonly used with special needs children is *Multisensory instruction* (34 excerpts)—using more than just the visual and auditory channels when presenting and practicing new concepts (i.e., using sense of smell, taste, or touch) to deepen the level-of-processing and so strengthen the memory traces. For example, in learning to spell words, I asked students to write the word in a variety of mediums like colored sand and shaving cream. *Setting learning goals* (29 excerpts) included teaching one girl how to ignore distraction by making it into a game—can you ignore me stomping around the room and slamming doors while you write a sentence? With this same girl, who took as long as ten minutes to write six or seven words, I asked her how long she thought it would take her to write her sentence that day and then set a timer. The rapidly decreasing seconds on the timer's display gave the child the feeling that she was "racing" the clock and helped to speed her up.

Giving choices (24 excerpts) is a technique I have learned over the years for dealing with resistant and *Defiant* children, a behavioral theme discussed earlier in this chapter. For example, with students who were reluctant to read or write, I gave them choices. "What do you want to write about today? What book do you want to read?" I used *Visual aides* (21 excerpts) because many of them had a relative strength in visuospatial processing. To help them remember to use metacognitive strategies while they were decoding, I asked them to create cards with their own illustrations; e.g., they drew a frog to remind themselves to "hop over" an unknown word in order to read the remainder of the sentence for context clues (*Leapfrog*, 11 excerpts, see "Decoding Strategies," Figure 19). For students who had been diagnosed as having ADHD, I incorporated *Movement* (19 excerpts) like yoga or throwing a ball back and forth while spelling a word.

Language strategies. Since many of the participants had receptive and expressive language problems, I incorporated four "Language Strategies" (see Figure 18) into my instruction. The ones I used most frequently were *Acting out feelings or thoughts* (8 excerpts) and *Drawing* (7 excerpts). One boy was especially quiet and withdrawn, very rarely showing affect until I asked him to act out the excitement he felt when he got presents on Christmas. Other students had trouble expressing themselves in words, but could show successfully draw or demonstrate their feelings with facial expressions, gestures, and by using toy figures to "act it out." For one ELL boy who spoke Spanish at home, I ordered a visual Spanish-English dictionary of 1400 words pictorially defined in the context of towns, homes, and classrooms. So when this boy became confused about English words, I showed him how to look up the object in the dictionary and find the Spanish word (*Instruction in English and Spanish*, 5 excerpts). And finally, the last language strategy that I used was *Slower presentation* (3 excerpts) with a very withdrawn child who responded well when I spoke slowly and quietly to him.

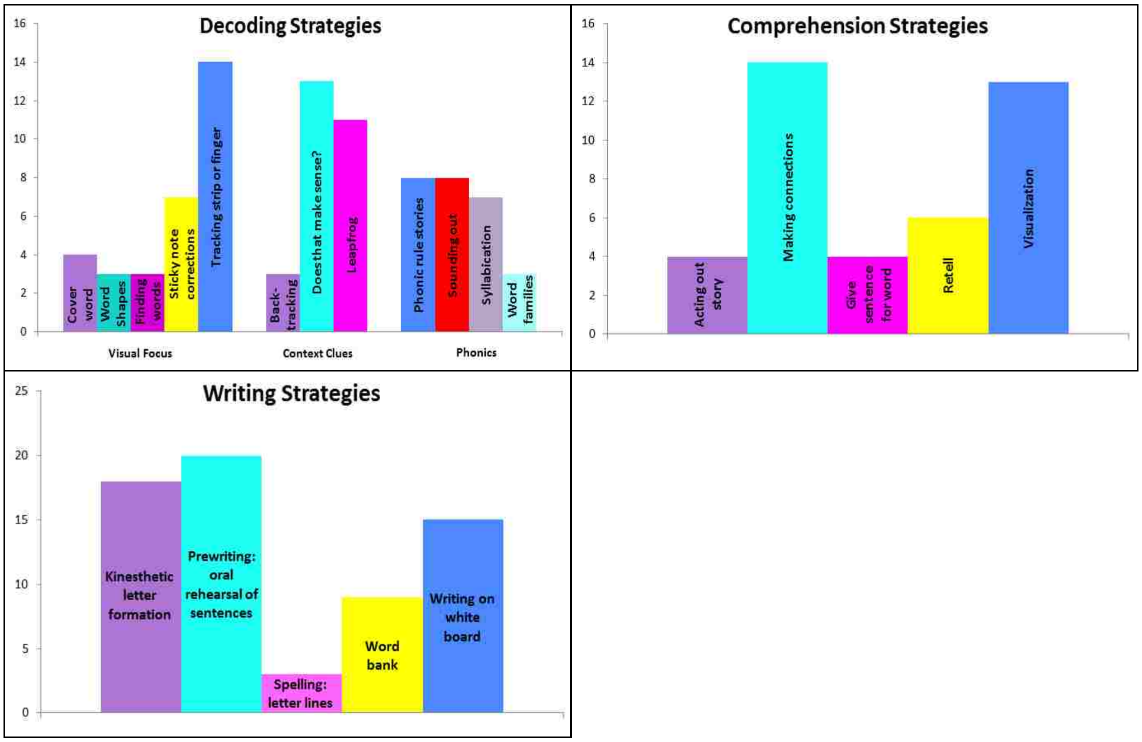


Figure 19. Decoding, comprehension, and writing strategies.

Decoding, comprehension, and writing strategies. "Decoding Strategies" (see Figure 19) were divided into three types: *Visual Focus* (31 excerpts), *Context Clues* (27 excerpts), and *Phonics* (26 excerpts). Because of difficulties noted earlier in "Decoding Needs" (*Word Blindness*, *Letter or word confusion*, and *Word slamming*), I used five different *Visual focus* strategies to help students focus on the words. The one I used most frequently was *Tracking strips or finger* (14 excerpts), where I directed children to use their finger to "point to the words" or use a piece of paper under the words in order to block distractions and guide their eyes to the print. For students that repeatedly miscued on a word (e.g., reading "bears" as "babies"), I wrote the word they were saying (e.g., "babies") next to the word in the text so they could see that they were saying something different (*Sticky note corrections*, 7 excerpts). "It's okay if you read the word as 'babies,'" I would tell them, "but you have to point to the sticky note instead of the word on the page." For some reason, they did not like doing this; they were motivated to correct themselves so they could pull the sticky note off of the page. Sometimes I would *Cover word* (4 excerpts) and say, "You're saying the word 'could' instead of 'can.' What letter would be at the end of 'could'?" *Finding words* (3 excerpts) meant asking students how often they could find a high-frequency word in a book and *Word shapes* (3 excerpts) meant drawing a box around the letters in a word so that the student could see the word's shape.

Does that make sense? (13 excerpts) was the most common of the *Context Clues* I used (see "Decoding Strategies," Figure 19). When they came to a word they did not know, I prompted students to look at the words around it and think about what they knew. In one of my post-interviews, a boy remembered this strategy as thinking "it doesn't sound right." *Phonics* strategies included *Phonic rule stories* (8 excerpts; e.g., "when two vowels go walking, the first one does the talking"), the traditional *Sounding out* (8 excerpts) strategy used widely in schools, breaking up long words into syllables (*Syllabication*, 7 excerpts) and looking at *Word families* (3 excerpts) or groups of words that have a common pattern that makes them rhyme. All of these decoding strategies—*Visual focus*, *Context clues*, and *Phonics*—involved training children to slow down, look carefully at the word and surrounding words, and think about what they knew to decode the word.

I also used other reading strategies (not included in Figure 19). When introducing a new book to subjects, I *Pretaught vocabulary or background knowledg*e

(29 excerpts) in order to activate background schema and prime students to expect and successfully read vocabulary normally difficult for them. To increase reading *Fluency* (5 excerpts), I encouraged students to practice reading books at home or I used echo reading—I read the text while the children followed along, echoing me. Three times I *Dictated* a child's language about a favorite video games and then had him read the dictated writing. A final reading strategy was using the traditional method of having children learn *Sight words* (5 excerpts).

Some of the participants struggled more with reading comprehension than with decoding, so I used "Comprehension Strategies" (see Figure 19). *Making connections* (14 excerpts) is the strategy I used the most. This involved having students draw on their episodic memory (autobiographical memory) and semantic memory (what they know about the world) to make personal connections with the text. For example, one girl began to yawn when starting to read a book with unknown words like "haystack." I asked her if she had ever been on a farm, and she began telling me about her grandpa's farm in Mexico. Using *Visualization* (13 excerpts) with her, I asked her to visualize this farm and describe the picture she saw in her head. She told me she saw some yellow squares and then she realized that these were the haystacks in the book. I pointed out that she was not yawning anymore. *Acting out story* (4 excerpts), similar to the language strategy of *Acting out feelings or thoughts*, helped students understand the thoughts and feelings of characters in story, thus increasing their subsequent textual connections and comprehension.

All of the students had difficulty with writing, especially with spelling. Two

"Writing Strategies" (see Figure 19) that I used with some of the most challenged spellers were *Word bank* (9 excerpts)—favorite words were kept in a "bank" of index cards and these words were drawn from the bank when needed in a sentence—and *Spelling: letter lines* (3 excerpts); I wrote a dash for each letter in a word and asked the student what letter-sounds they heard in the word. Eight of the participants had trouble with writing fluency; they often forgot what they wanted to write in mid-sentence. So I used *Prewriting: oral rehearsal of sentences* (20 excerpts) to aid their recall; I asked them to first say the sentence they wanted to write, holding up a finger for each word. Since handwriting was a significant problem for two of the students, and one boy with poor fine motor skills had a lot of trouble with letter formation, I focused on *Kinesthetic letter formation* (18 excerpts) with these two boys. I asked them to form letters with their entire bodies or write "the biggest letter you can" on the white board or roll letter shapes out of clay. *Writing on white board* (15 excerpts) with dry erase markers was also helpful with one of these boys and to another girl because they both struggled with the mechanics of writing with cheap district materials—pencils that broke easily and erasers that smudged easily and often ripped holes in the paper. In addition to these academic strategies, I often incorporated MF instructional strategies while they were reading and/or writing in order to help them become more aware of the anxiety that arose during academic tasks.

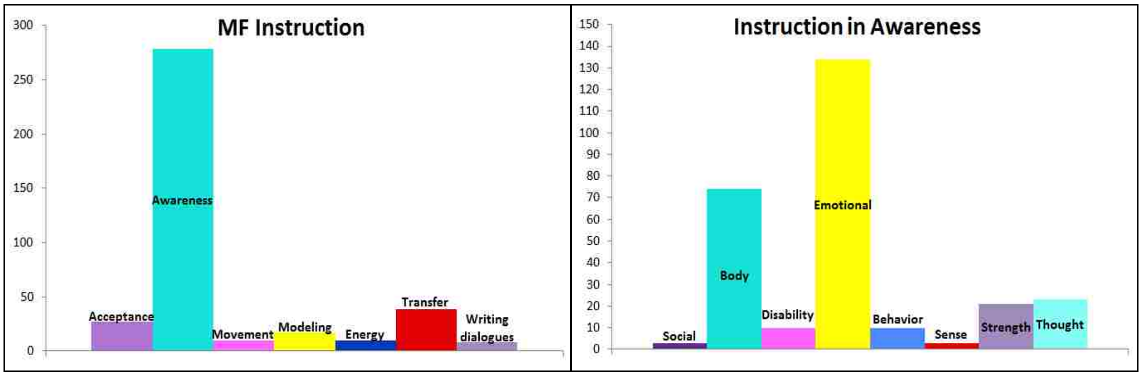


Figure 20. MF instructional strategies (Neg. = negative).

MF instructional strategies. The great majority of the MF instructional strategies that I used can be categorized as *Awareness* (278 excerpts; see "MF Instruction," Figure 20), of which there were eight types (see "Instruction in Awareness," Figure 20). Instruction in *Emotional* awareness (134 excerpts) is an important theme in this study. As stated earlier in this chapter, children with learning disorders often experience higher levels of anxiety than non-LD peers, especially during difficult academic tasks. Many of the participants in this study also lacked *Emotional intelligence* about their emotions; before the intervention started, they knew that some parts of school were "hard," but were not aware of their anxiety while reading and/or writing. One way I worked on emotional awareness was having participants choose a feelings flashcard; each card colorfully illustrated a cartoon character feeling "happy" or "disappointed" or "sad," etc. Then I asked the children to write about that feeling in their journals. Another way I increased their emotional and *Body* awareness (74 excerpts) was to point out that they were yawning, fidgeting, tightening their jaw, or displaying other signs of emotion while they were working on a task. Sometimes I asked them what they were thinking during breathing practice or I asked them to explain reasons for their feelings to increase *Thought* awareness (23 excerpts).

I worked on *Strength* (21 excerpts) and *Disability* (10 excerpts) awareness because of the Raskind et al. (1999) study discussed in the literature review; they found that one predictor of success in adults with learning disabilities was greater self-awareness and self-acceptance of both their strengths and needs. In both the pre- and post-interviews, I asked students what they were good at and what was hard from them. During the intervention, I told students when they were doing something well and gave them nonverbal, visuospatial opportunities to express themselves creatively (e.g., drawing or making things with clay). With one student who became very tired when attempting to read, I told him that his brain was working very hard and that was why he took frequent "brain breaks" by talking to me about his game.

Another "MF Instruction" strategy (see Figure 20) that I used was nonjudgmental *Acceptance* (27 excerpts), a key component of MF practice. Instead of becoming angry or irritated with students when they displayed some negative behaviors, I tried to express compassion and understanding. For example, when one boy was so depressed that he could not even draw an emotion flashcard, I said, "Is it hard to think sometimes?" He nodded his head to indicate "yes." When students were trying to decode a word, remember something, or telling me about a distressing home situation, I instructed them to *Transfer* (39 excerpts) MF breathing to help them with academic and home situations. I used *Modeling* (17 excerpts) to show children when to breathe (by taking a loud in-breath when they became nervous) or how to talk about their feelings or thoughts. I asked one girl with low self-esteem, "Do you think that *I* ever think that

I'm not smart?" "No," she said. "Well I do, when I do something wrong," I said, and she smiled. I used *Energy* (10 excerpts) strategies to wake up tired students by showing them how to breathe quickly and energetically. Finally, I used *Writing dialogues* (8 excerpts) with three of the more capable students during the last few days of the intervention. Students who had trouble verbalizing their emotions but could write fluently enjoyed answering my questions about the color, shape, size, temperature, intensity, and thoughts of their emotions by writing a few words or drawing a picture.

Understanding the Participant's strengths and needs helped me to design and implement individual instructional plans for each child. *Understanding the Intervention* or the instructional strategies I used may serve to help in *Understanding the Improvements* observed and/or documented in participants.

Understanding the Improvements

Understanding the Improvements includes the subthemes of *Academic, Cognitive, Self, Social, Reading, Writing,* and *MF Improvements.* In this section, I will discuss how our predictions were supported by study data, observations, and interventions.

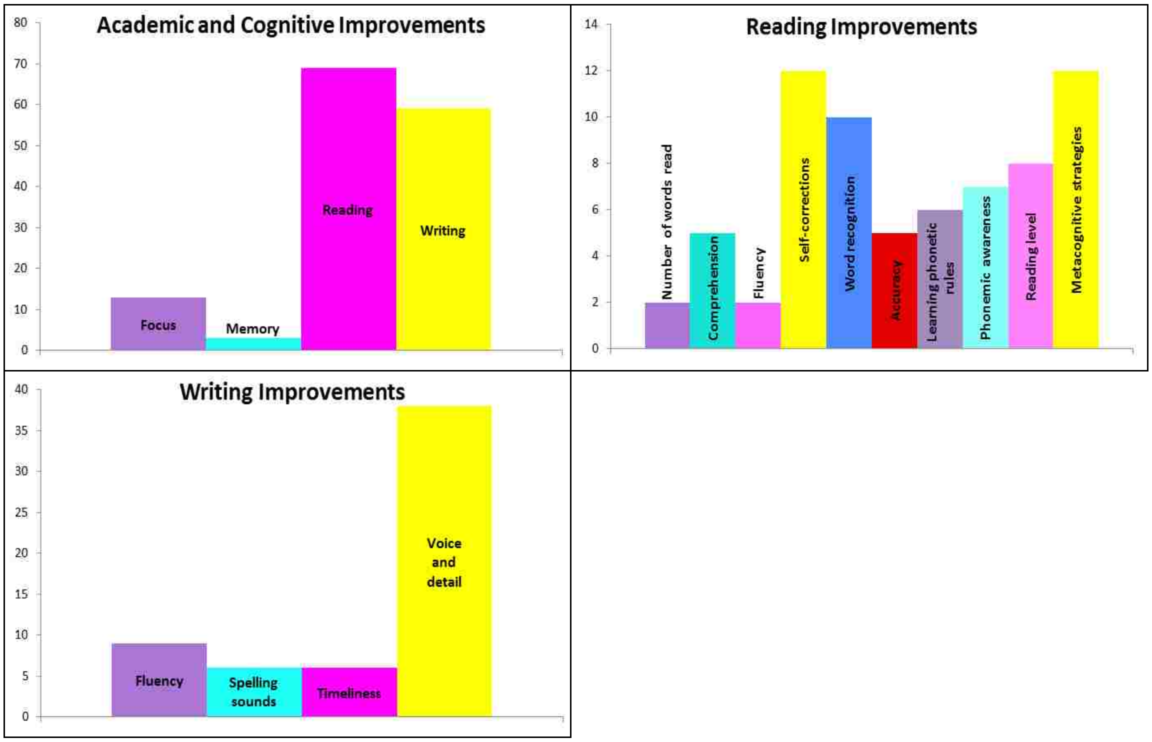


Figure 21. Academic, cognitive, reading and writing improvements.

Improvement in academic engagement. We predicted that MF instruction would improve academic engagement during instruction. Evidence that supports this prediction is found in "Academic and Cognitive Improvements" (see Figure 21) and in "Self and Social Improvements" (see Figure 22). Two cognitive improvements that support academic engagement are *Focus* (13 excerpts) and *Memory* (3 excerpts). Allowing students to set their own learning goals enabled them to gradually increase their focus and concentration during MF breathing and academic tasks. For example, at the beginning of the intervention, one young boy chose to count between 10-20 breaths during MF breathing. By summer's end, he was confidently choosing to count 40-45 breaths in a session. This improvement in focus during MF breathing carried over into longer engagement during academic tasks (see "Noah" in the "Qualitative Results:

Individual Level" chapter). Improvement in memory could be seen in one girl; using visualization techniques helped her to both remember and comprehend text. Improvement in focus is also related to increases in self-control (12 excerpts). One boy with ADHD told me that during MF breathing he noticed that he had a song stuck in his head, so he talked to himself and started breathing.

Another indication of academic engagement is *Motivation* (32 excerpts; see "Self and Social Improvements" in Figure 22). In one post-interview, the mother of a boy who was extremely shut down in his special education class, refusing to work and often becoming aggressive and defiant towards his peers and teacher, said about the intervention that "he loved it, that he loved you and everybody who was there teaching him. When he would go to his other classroom, he would be excited and say he was happy to go…"

Reading improvement. We predicted that experimental participants' accuracy, fluency, self-corrections, reading level, and use of metacognitive strategies would improve over the course of the intervention. Evidence that supports this prediction can be found in "Reading Improvements" (see Figure 21). Improvements in *Self-corrections* (12 excerpts) or when a student realizes a decoding error and corrects it without prompting, *Reading level* (8 excerpts) and *Accuracy (5 excerpts)* are supported by evidence from Running Records data (see Qualitative Results: Individual Level chapter) for participants who needed to work on decoding skills. Improvement in use of *Metacognitive strategies* (12 excerpts) occurred when I observed students using context clues—looking at words before and after the unfamiliar word, looking at picture clues on the page, or looking at the reading strategy card they had made in order to figure out a word. I observed improvement in *Fluency* (2 excerpts) when students read a text fluently after practicing it at home.

There were other reading improvements not predicted by us, such as an improvement in *Word recognition* (10 excerpts). For example, a boy who repeatedly confused "with" and "what" finally learned to read these words correctly. Improvement in *Phonemic awareness* (7 times) could be seen when students who were very reluctant to "sound out" words began to do so on their own. Students also demonstrated that they were *Learning phonetic rules* (6 excerpts) like the "silent e" rule. A participant who had difficulty with *Comprehension* (5 excerpts) began to make some inferences about the text—drawing on his own experience to understand how characters in the story might feel or think. A boy who could barely read ten words correctly at the beginning of the summer tripled the *Number of words read* (2 excerpts) accurately in a book by the end of the intervention.

Writing improvement. We predicted that participants' writing skills would improve. Evidence that supports this prediction can be seen in "Writing Improvements" (see Figure 21). The greatest writing improvement was in *Voice and detail* (38 excerpts). Improvements in *Self-expression* (43 excerpts, see "Self and Social Improvements in Figure 22) transferred into use of more vivid detail in their writing. One girl wrote about how she felt while she was reading. "The thing that is happens in my body is my head start to tingol. I am thinking about if I get the wards [words] wron I fill nervous." Another student who hated his own writing and wrote very little independently showed improvement in writing *Fluency* (9 excerpts) during a post-interview where he showed me that he had begun drawing and writing about his life at home. Improvement in *Timeliness* (6 excerpts) was evident in one girl who took as long as ten minutes to write a short sentence (because of her concerns with spelling and handwriting and because she was easily distracted); she was able to reduce this time to less than eight minutes by the summer's end. Improvement in *Spelling sounds* (6 excerpts) was especially noticeable with one boy whose writing was unreadable at the beginning of the summer. At the end of the intervention, he was able to spell out most of the sounds in this sentence without any help: "Im shy mi frst day uv hl klas" [I am shy of my first day of my whole class].

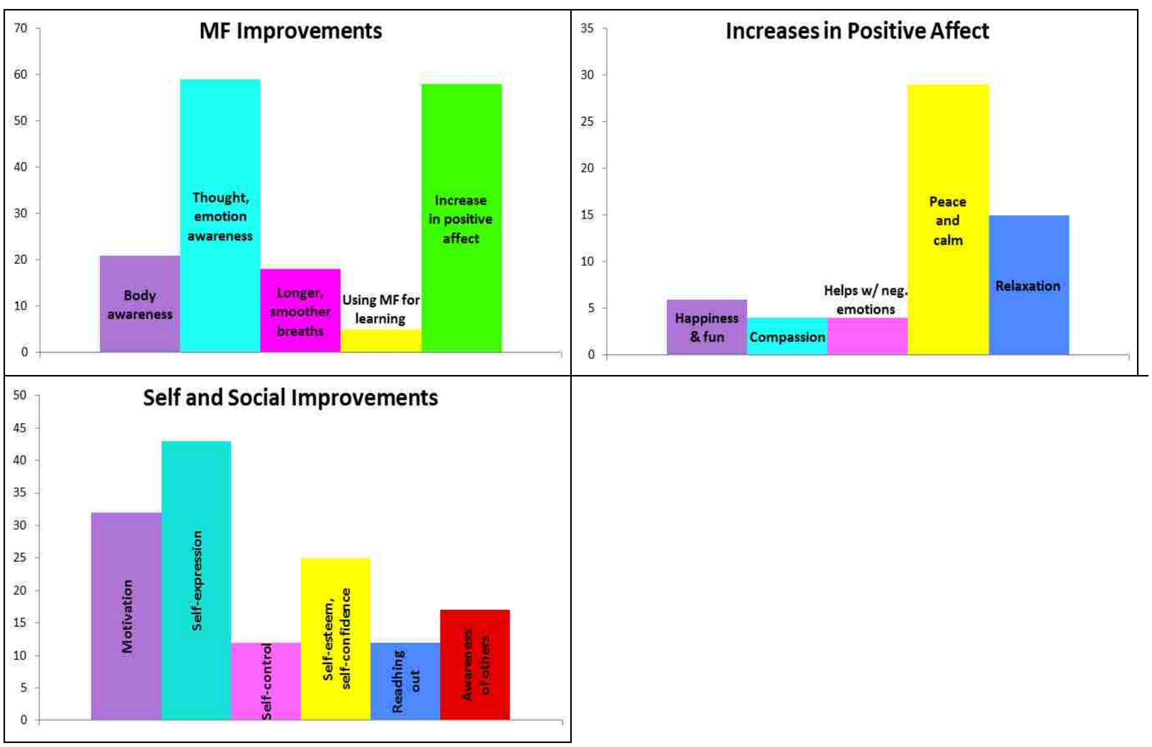


Figure 22. MF improvements, increases in positive affect, and self and social improvements.

Affective improvement. We predicted that participants' positive affect during instruction would increase while negative emotions like anxiety and frustration would decrease. Evidence that supports this prediction comes from the theme *Increase in positive affect* (58 excerpts; see "MF Improvements" and "Increases in Positive Affect," Figure 22). After filling out self-report scales, students practiced MF breathing for 1-4 minutes, and I observed or they often wrote about a positive emotion, including *Peace and calm* (29 excerpts), *Relaxation* (15 excerpts), *Happiness and fun* (6 excerpts), and *Compassion* (4 excerpts) that came during the HeartMath session. One girl wrote that when she was breathing, she was singing a Katy Perry song in her mind "and I felt come [calm] lik [like] if I was sliping [sleeping]." Another boy wrote that he was thinking about being a bubble when he was breathing. "I was ploing [blowing] bopos [bubbles] and I was afing [having] olot [a lot] of fun." A different boy wrote about being an otter sleeping in the water while he was breathing, taking deep breaths and floating. "It would be relaceind [relaxing]… you coud just heaier [hear] the water making wafes [waves]." This same boy, who was very detached and indifferent at the beginning of the intervention, also discovered a strong feeling of compassion when visualizing someone from his class that had no friends. Participants also found that MF breathing *Helps with negative emotions* (4 excerpts). At the end of the intervention, one girl wrote that she had learned how to breathe when she was mad. Another boy told me he used breathing to help him when he was feeling sad at home.

Improvement in self-awareness and self-acceptance. We predicted that participants' self-awareness and self-acceptance of their disability would improve over the course of the intervention. If the term "of their disability" is included in the prediction, there is no supporting evidence for it. In my first two pre-interviews, I asked children what the words "learning disability" meant to them. The first boy just shook his head to indicate "no." The second girl said, "I know learning. What's the disability?" In my notes after these two interviews, I wrote that I did not want to stigmatize children or make them feel disabled by using the term "learning disability," so I stopped asking these questions of the children.

However, if the words "of their disability" is dropped from the prediction, there *is* evidence of improvement in self-awareness and self-acceptance (see "MF Improvements" and "Self and Social Improvements" in Figure 22). Improvement in self-awareness can be seen in *Thought, emotional awareness* (59 excerpts) and *Body awareness* (21 excerpts). In a post-interview, in showing his father his coherence scores on HeartMath, one boy said: "On these two [days], I got really good because I was really excited. Right here I had a lot of blue because on the first day I was pretty nervous so I had some red here." Improvement in self-acceptance or *Self-esteem, self-confidence* (25 excerpts) was evident in many of the participants as the intervention progressed. When I asked one boy why his coherence levels were high that day, he said, "because I'm proud of myself."

MF, self, and social improvements not predicted by us were improvements in *Self-expression* (43 excerpts). Many of the participants had difficulty with self-expression at the beginning of the intervention, but by the end of the summer, they were speaking much more freely. For example, in his pre-interview, Juan's answers to my questions were very brief—mostly one-word answers. "Yeah." "Kind of." "Uh-huh." "Not much." In his post-interview, when I asked him what he remembered doing with me that summer he said, "To, to practice reading and, and focusing and not -- and to take deep breaths and when I'm sleepy. Yeah, and what else? Oh, and helping me reading and, and getting prizes if when I read a book stack."

Also not predicted by us were improvements in *Using MF for learning* (5 excerpts). In one post-interview of a Spanish-speaking mother, the interpreter said: "She said he, he, told mom that when he thinks about her and concentrates, he gets better at reading." *Awareness of others* (17 excerpts), and *Reaching out* (12 excerpts) were two more unpredicted social improvements. One shy and withdrawn girl began to become aware of me as a person, asking me one day, “Are you cold?” because I was wearing short sleeves on a rainy day. Another boy was happy to do an “experiment” at recess—finding a boy he did not know and asking him to play. Reporting on this experiment, he said it “felt good" with a little smile. He wrote that his friends "said that was nice of you to Include [include] that kid and I said yes it was and the kid said thank you and I said your walcome."

Summary of Most Frequent Themes

Looking at the most frequent themes under each of the three general themes, *Understanding the Participants* entailed the understanding that they had significant behavioral difficulties, including being hyperactive, withdrawn, and off-task, and it was difficult for them to express their thoughts and feelings. Three of them were on ADHD medications and others were often tired, making it more difficult for them to focus their attention and remember things. Decoding was their most significant academic need (overall), made especially difficult because they often confused letters and words. Decoding problems also made their spelling difficult to read. However, they also had strengths in math and visuospatial abilities and, during the intervention, they became engaged and motivated to learn. Many of the participants came from noisy, chaotic, and impoverished homes, and their parents often had learning disabilities themselves and difficulties expressing themselves as well. Children often felt angry, anxious, and frustrated in their lives, but, like all children, still found things to be happy and excited about.

Understanding the Participants leads to *Understanding the Intervention*—the instructional strategies used to target their strengths and needs—and helps to *Understanding the Improvements*, which flowed from the strategies used. Their high arousal (hyperactivity) and low arousal (sleepiness) made it difficult for them to concentrate on their breathing, but learning to relax by lying on a mat, closing their eyes, and visualizing something peaceful and relaxing helped to improve their positive affect. Using the children's interests to motivate them increased their ability to focus and engage in tasks because of an increased level of motivation and self-confidence. Using decoding strategies like visual focus, context clues, and phonetic clues, improved their use of metacognitive strategies and self-correction rates. Increasing their emotional and body awareness increased the voice and detail they used in their writing. It is hoped that this study will help other interventionists and educators to better understand children with learning disabilities and how to design effective interventions for them that will improve their lives and academic futures.

Qualitative Results: Individual Level

Qualitative data is much more than an explanation of the quantitative data. The aim of qualitative research is to provide in-depth procedural descriptions, produce accurate reports of individuals in their natural settings, and to gain insight into difficult problems (Sullivan & Ebrahim, 1995) like the nature and etiology of DYS, for example.

Denzin and Lincoln (1994) describe the qualitative researcher as being like a quilt maker. "The quilter stitches, edits, and puts slices of reality together. This process creates and brings psychological and emotional unity to an interpretive experience" (p. 5). The purpose of this chapter is to provide a "living quilt" of each participant that "brings to life" their unique participation in and perceptions of this intervention—their strengths and difficulties, their thoughts and emotions, their unique ways of responding to the intervention and their improvements. It also serves to provide further evidence of *how* and *why* the treatment was subjectively valuable to each participant and to describe the intervention in enough detail that other researchers could replicate this study. Also, data from running records is provided in this chapter to support reading improvement made by specific individuals in the areas of reading accuracy, self-corrections, and number of words read daily.

In this study, a large amount of qualitative data was collected that helped to answer the questions: *How did the intervention work? Why did it work (or not work sometimes)?* The chapter on Qualitative Results: Group Level answered these questions at a high level—from a 50,000 foot perspective as it were. This chapter endeavors to "zoom in" and take a much closer look at the data—to put it under the microscope in order to discover finer and more granular patterns. Who are these participants? Would this intervention work with other children who have learning disabilities? Does the researcher, interventionist, or educator "recognize" these types of children? It is hoped that this type of granular detail can enrich the dialogue and make a valuable contribution to the ongoing inquiry on the etiology and amelioration of DYS and learning disabilities.

Experiments and case studies are two types of research designs that answer *how* and *why* questions (Yin, 2009). While the research design of this study can be considered an experiment (because of its control over behavioral events), the term "case study" was not used in the Methods section. Yet there are some similarities to the case study method—there was an effort "to examine the individual… in depth… [in order to understand] why the individual does what he or she does and how behavior changes as the individual responds to the environment" (Ary, Jacobs, & Razavieh, 1990, p. 451). A simple case study of each of the ten experimental participants is presented in this chapter in order to more deeply understand their response to the intervention and to come up with ideas for further refinements in method for future research.

As the one who implemented the intervention, I was necessarily a *participant observer*, one who tries to maintain a position of objectivity and detachment while participating and simultaneously observing (Merriam, 2009). In an effort to provide the best intervention possible, I was continually asking myself *how* and *why* a participant was or was not responding to the instructional strategies I was using. That is, I studied each individual in depth—probing their past [through school records], their family history [through interviews], and their emotions and thoughts [during the intervention] in order to gain insights into their behavior and to individualize the intervention for them.

While the benefit of looking closely at the individual level is *depth,* this level of analysis has been criticized for lacking *breadth* or generalizability (Ary, Jacobs, & Razavieh, 1990). To this criticism, Yin (2009) replies that "the short answer is that case studies, like experiments, are generalizable to theoretical propositions, and not to populations or universes" (p. 15). Another criticism of the participant observer stance is that there is also a tendency for the researcher to become biased. With this in mind, in this chapter I present my observations with support from school records, quotes from interviews, and excerpts from student journals. The participants' names have been changed to maintain confidentiality. The original spelling and punctuation of the children has been preserved (with bracketed corrections) when excerpts from their journals are cited.

Qualitative data analysis is different from quantitative data analysis in that it requires the researcher to find *meaning* beyond the facts by pondering and reflecting on the data collected (Hunter, Lusardi, Zucker, Jacelon, & Chandler, 2002). This process, according to Hunter et al., involves integrating intuition and imagination—a process that uses creative expressions (e.g., metaphors, plays, pastiche [imitative art], poetry, quilt making and design) to transform dry results into elegant insights. As one who has published poetry in the past, I sometimes wrote a poem or a poetic phrase to find meaning during my qualitative data analysis.

In my research design (included in the Methods chapter), I said I would use quantitative and qualitative data to examine/describe process at the individual level. This chapter contains a detailed description of each child and their intervention history. Each participant's description begins with a table containing information about their age, sex, ethnicity, English Language Learner (ELL) status, their special education label, the level of special education they received from the school district, their cognitive abilities, and their scores on the quantitative tests presented in Chapter Four (Quantitative Results). The reader will also find a poem in this chapter, and, after each participant's pseudonym, there is a poetic pneumonic that is helpful in understanding each child's story.

Ana: The Girl Who Dressed in Rainbow Hearts After Stepping out of Her Shell

Table 9

Ana's General and Cognitive Information and Quantitative Test Scores

Age	Sex	Ethnicity	ELL	Label	Level	IQ	Nonverbal Ability	Proc. Speed	WM
10 yrs., 7 mos.	F	Hispanic	Yes	SLD	B	76 Low	85 Below Average	60 Very Low	85 Below Average
Mood Average	**Reading Attitude Average**	**Reading Confidence Average**							
4.9	4.9	3.0							
Test	**Pre**	**Post**	**PrePost DIF**	**Fol**	**PreFol DIF**				
Oral Rdg. Average	59	68	9	68	9				
Retell Average	24	41.3	17	27.3	3.3				
Phonics Test	3	5	2						
Writing Voice	5	4	-1						
Wtg. Word Choice	4	5	1						
LD Nonword Accuracy	90%	95%	5%						
LD Nonword RT	1002.41	959.12	-43 ms						
LD Word Accuracy	80%	84%	4%						
LD Word RT	1042.93	1078.87	36 ms						

Note: Nonverbal Ability includes nonverbal fluid reasoning, spatial processing, and visual perception. Proc. = processing speed or speed and efficiency in performing automatic or simple cognitive tasks. WM = working memory. PrePost DIF: Difference score (Time 2 minus Time 1). PreFol: Difference score (Time 3 minus Time 1).

Ana was an ELL student with significant cognitive difficulties, who was reading at a second-grade level at the end of fourth grade. She had the second-lowest IQ (76; see Table 9) of all of the participants, the lowest processing speed (60; very low) and her verbal intelligence—verbal inductive reasoning, vocabulary, verbal development, logical and abstract thinking, and ability to distinguish between essential and superficial features—was extremely low (66). She was the only one of the experimental students with below average *<u>non</u>*verbal intelligence—especially in the area of nonverbal reasoning. However, nonverbal intelligence was still an area of relative strength for Ana, with Spatial Ability (visuospatial perception, mental imagery, mental rotation ability, and visuomotor integration) as her highest cognitive subtest (97; average). By the end of the intervention, she improved in oral reading fluency (+9 words at the follow-up), retell average (+3.3 words), phonics (+2), writing word choice (+1 or 17%), and accuracy on the lexical decision test (+5% on the word subtest and +4% on the non-word subtests). She decreased by one point on the writing voice test. Her response time (RT) on the lexical decision word subtest also increased a little (36 ms), while her RT on the nonword subtest decreased a little (-43 ms).

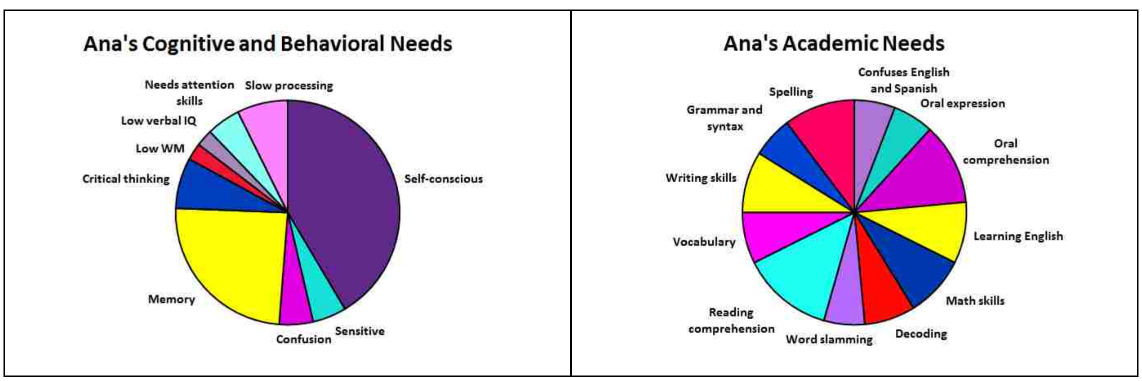


Figure 23. Ana's cognitive, behavioral, and academic needs.

Ana's cognitive and behavioral needs. There were two experimental participants who were entering puberty—Ana, who was 10½ years old at the beginning of the intervention, was one of them. Neuroimaging research demonstrates that self-consciousness peaks during adolescence in social-evaluation contexts (Somerville et al., 2013). This may be why *Self-conscious* (17 excerpts; see "Ana's Cognitive and Behavioral Needs" in Figure 23) was Ana's largest behavioral theme. She often appeared shy and she got embarrassed (hiding her face) when she missed words during reading. Developmental changes might also cause an increase in being *Sensitive* (Somerville et al; 2 excerpts). In my field notes, I wrote that Ana and I had talked about people who were "critical" because I noticed that "a cloud passed over her face" when I told her that getting more red in HeartMath was not good. That day, she wrote about her sister criticizing her—saying she could not cook. "One day I was cooking with my mon [mom] my sister came and told me tha [that] I don't now [know] how to cook and it jort [hurt] my felings [feelings]." Having cognitive difficulties also increased her self-consciousness. In a summary of an observation in her school records an evaluator wrote, "Ana was shy and did not want to answer any questions. She looked confused and did not understand what she read."

Confusion (2 excerpts) is another one of Ana's cognitive problems. In her school records, her parents reported that their daughter was confusing English and Spanish while reading and writing and requested that she be removed from the bilingual classroom and receive instruction only in English. *Memory problems* (10 excerpts) also contributed to her confusion and shyness. Ana often could not remember what happened in a book she had read the previous day or she could not remember the answer to a question. She wrote about this in her journal. "When I am in class I feel like when we are doing math I got the answer and it just fly oway [away] out of my moind [mind]."

Ana's academic needs. Cognitive limitations, pubescent self-consciousness, and her ELL status created significant academic challenges for Ana, especially in language-related skills like *Oral expression* (4 excerpts; see "Ana's Academic Needs" in Figure 23), *Oral comprehension* (8 excerpts), *Reading comprehension* (9 excerpts), *Decoding* (5 excerpts), and *Writing Skills* (6 excerpts). Ana's literacy skills in both English and Spanish were limited. When she was reading, I observed that she was *Word slamming* (4 excerpts). For example, she read "wife" as "fear" and then she got flustered, "slamming" into the word again and again, making the same guesses over and over while she looked at my face for cues to tell her if she was guessing correctly.

Ana's home environment. Ana came from a large family, with two older siblings--a brother (20) and a sister (19), and two younger sisters (ages 7 and 2). In her journals, she wrote about her siblings a lot. She had to look after the baby, who ruined her clothes and her younger sister stole her stuff. In her writing sample a month before the intervention began, she wrote about getting mad because her sister stole her makeup. "It was speashel [special] for me because me day [my dad] give it to me in my Birthday went I was 6 year old. went they destroy my thing my bothy [body] dosent have energy to do things. Went [when] I so made (mad) I take a shawer and go to sleep." Her writing demonstrates that she had an initial *Body awareness* (7 excerpts; see "Ana's Strengths" in Figure 24) that other participants did not have.

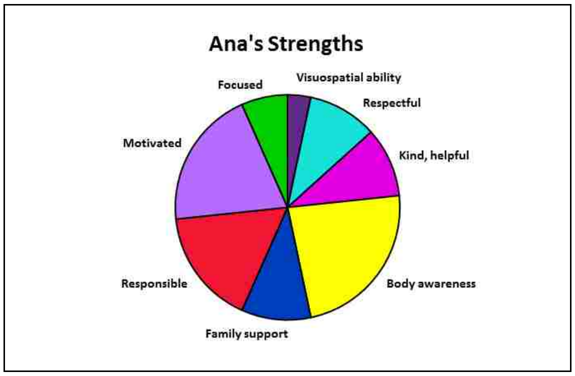


Figure 24. Ana's strengths.

Ana's strengths. In addition to *Body Awareness,* Ana was also *Motivated* (6 excerpts; see "Ana's Strengths" in Figure 24), *Responsible* (5 excerpts), and *Kind, helpful* (3 excerpts). Her school records described Ana as a kind and motivated student who completed assignments and homework and exhibited time management skills. Even though reading was difficult for her, the evaluators noted that she tried hard and was helpful to teachers.

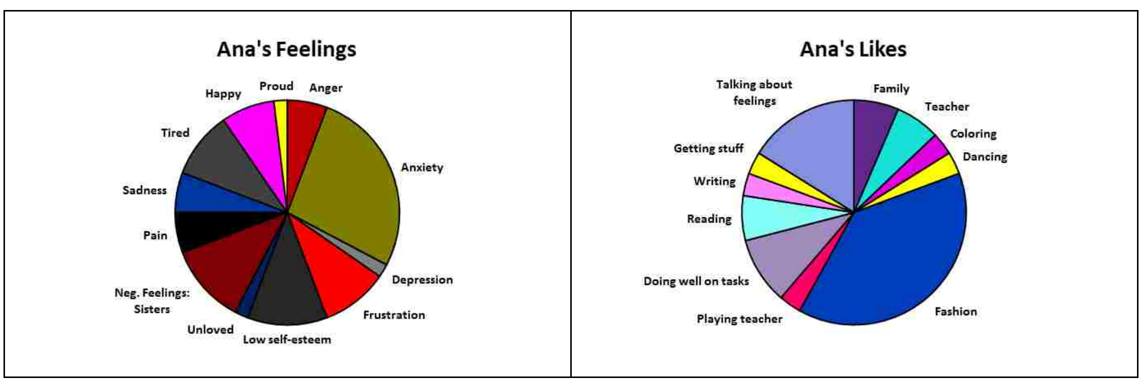


Figure 25. Ana's feelings and likes.

Ana's feelings. *Anxiety* (14 excerpts; see "Ana's Feelings" in Figure 25) was Ana's most frequently expressed feeling. She wrote about being unable to sleep at night during a rainstorm. "I get frar [afraid] wen it rains hared [hard] and I get fear." One day she picked the "safe" emotion flashcard and said that she felt safe with her family. I asked her, “Do you feel safe at school?” “Not that much,” she said. She also exhibited *Low self-esteem* (6 excerpts), calling pictures that she had drawn "horrible" one day. Her school records noted concerns about her attention and interest in school because she felt "lower than the rest of the class." She often cried when she couldn't do class work or homework.

Ana's likes. *Likes fashion* (12 excerpts) was a major theme with Ana during the intervention. She loved the children's fashion books that I ordered for her. When she bought new clothes later that summer, they were colorful and she seemed to feel good wearing them--although she shrugged when I asked her if she felt pretty. She wrote in her journal that the "best things" was to get clothes and pants. When she got a new iPhone, I showed her how to find and use a color analysis app on her phone. The app asked her to choose the picture that best matched her hair color, skin color, etc. and then made recommendations on what colors would look best on her.

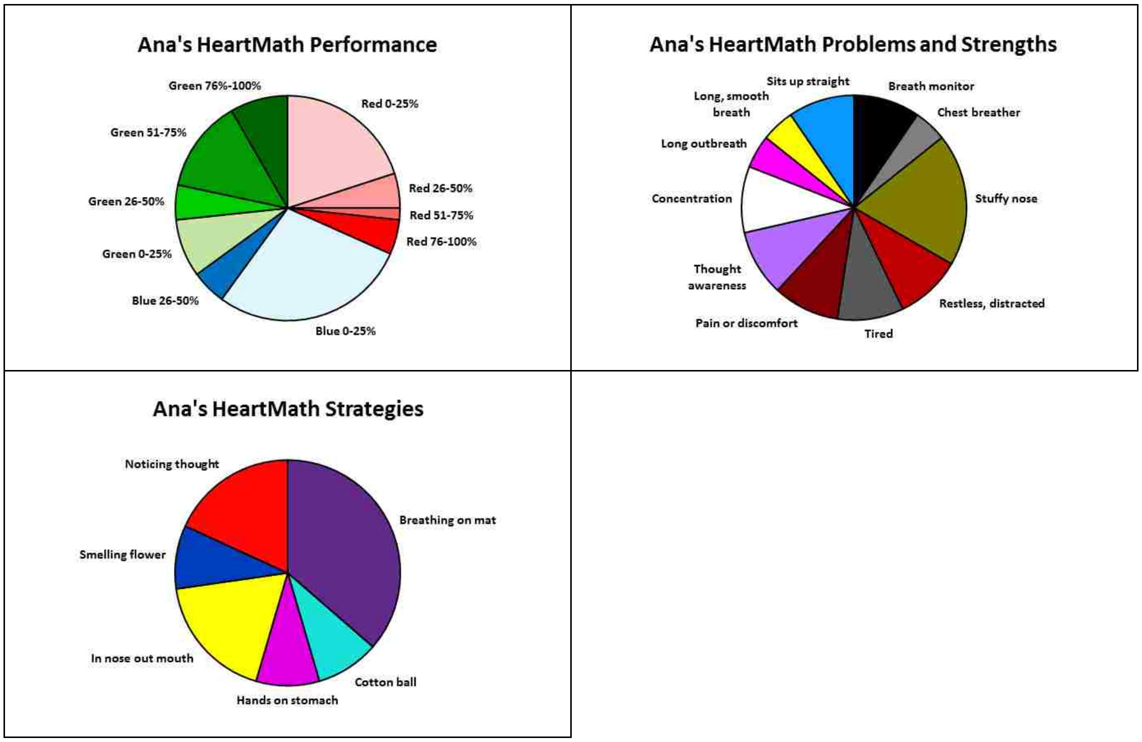


Figure 26. Ana's HeartMath performance, problems, strengths, and strategies.

Ana's HeartMath performance, problems, strengths and strategies. In her initial sessions, looking at the HeartMath screen caused Ana to become anxious about her performance. When I had her start *Breathing on mat* (referred to in 4 excerpts; see "Ana's HeartMath Strategies" in Figure 26), her levels of high coherence (green) improved dramatically. In fact, she was one of the participants with the highest coherence levels—in 13 of her sessions, her high coherence was between 51-100% (*Green 51-75%,* 8 excerpts; *Green 76-100%,* 5 excerpts; see "Ana's HeartMath Performance" in Figure 26). One of Ana's HeartMath strengths was *Thought Awareness* (2 excerpts). I gave her a "thinking card," asking her to hold it up when she became aware she was thinking during a HeartMath session. She held it up four times in one session, putting it up and putting it down as if she were very clear on when her thoughts started and ended. After one session, she wrote about being aware of how her emotions changed as a result of what she was thinking. "When I was brading [breathing] I was come [calm] I haset [wasn’t] thikin [thinking] about nothing [and] ather [after] I was more worried becaus I was goin to get more red and I did got red."

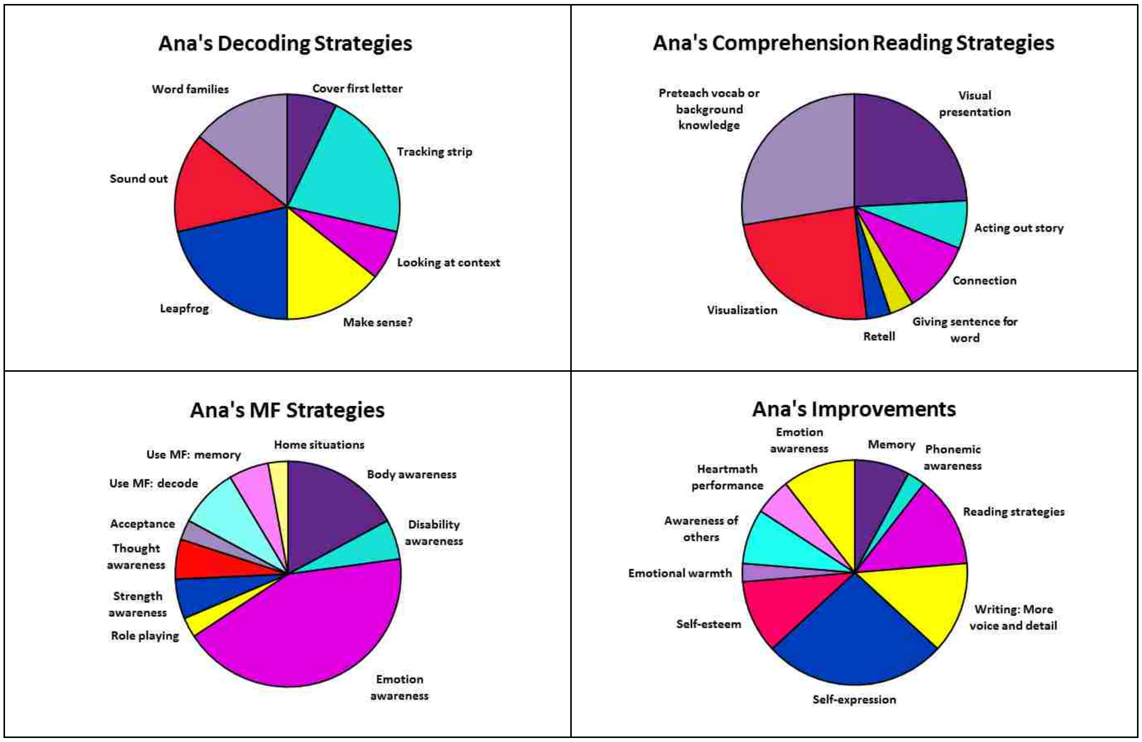


Figure 27. Ana's decoding, comprehension, and MF strategies and improvements.

Ana's decoding strategies. I worked on developing Ana's metacognitive strategies—e.g., *Leapfrog* (3 excerpts; see "Ana's Decoding Strategies" in Figure 27), and using a *Tracking strip* (3 excerpts) so that she could begin relying on herself to figure out words, instead of looking at my face when she was trying to figure out a word. “Why do you look at me?” I asked her, and when she did not answer I said, “To see if it’s correct?” Her hands covered her face. “How does it feel when I don’t answer you?” She shrugged her shoulders. "That means you don't want to answer," I said. “Do you feel happy, excited?" She finally said, "Sad."

Ana's comprehension reading strategies. We read books very slowly because I concentrated on developing comprehension strategies with her after reading a page of the text. To encourage her to develop a *Connection* (3 excerpts; see "Ana's Comprehension Reading Strategies" in Figure 27) with the text, I asked her one day to draw 12 pictures about the book she was reading. She yawned in response. I pointed that out to her and said, "Do you not want to draw that many?" She said in a rush of whispered words, "No, I don't want to do that many." "How many then?" She chose to draw five pictures. I said the pictures needed to be about her—she needed to develop a personal connection to these stories. The next day, she was very proud of herself for bringing back her homework. She had enjoyed drawing herself and connecting herself to the story. She had even called her grandmother to find out what her father used to do for a living—baking cakes and bread. This *Visualization* (7 excerpts) strategy—drawing and imaging techniques—helped both with her comprehension and retention of written material. I used *Acting out story* (2 excerpts) to help her comprehend a Chinese fable about an old couple who wanted to move a mountain. She was not able to guess why the old couple hated the mountain, so she "made" a mountain outside in the dirt outside my door and placed two toy figures next to it. Then she understood instantly why they did not like being close to the mountain. "It could fall on them," she said.

Ana's MF strategies. As with all the other participants, I worked most on *Emotion awareness* with Ana (15 excerpts; see "Ana's MF strategies" in Figure 27). She seemed to enjoy talking and writing about her feelings. She wrote again about being angry when her sisters wanted to take her things. "I get so so Angry and my body dosent wants to do nothing and I am thinkin mean things to my sisters and I cria [cry] wen I get made and my stomek stard's to hort [hurt]." After she wrote that, I showed her the difference between her writing that day and her writing the day before. "See how much more detail you have today?" Here I was working on *Strength Awareness* (2 excerpts)—making her aware of her successes.

Ana's improvements. Ana's improved in her use of *Reading strategies* (5 excerpts; see "Ana's Improvements" in Figure 27) and this improved her self-correction rate (see Figure 28) while decoding and her reading accuracy.

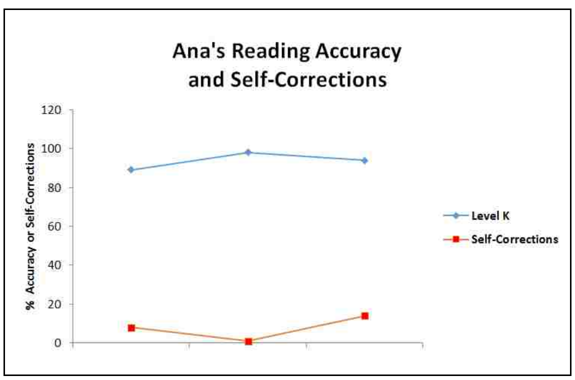


Figure 28. Ana's reading accuracy and self-corrections.

Her *Emotion awareness* (4 excerpts) also increased throughout the intervention. She wrote of going camping that summer with a friend's family, of being "neves [nervous] because I dien't no nobory [didn't know nobody] of her family and that [then] I got just [used] to et [it]." She became aware of nervousness and then she also noticed that it disappeared after a while (getting used to it). Building emotional intelligence with Ana seemed to help with her self-consciousness and anxiety. I also guided her to use mindful breathing frequently while she was reading new text as she became nervous and self-conscious at those times.

Additionally, I observed improvements in Ana's *Self-expression* (10 excerpts). One day I touched her head to give her an "egg-cracking-on-head" feeling and this disturbed some of her hair. She made a little "erg" sound and I asked her what she felt when I did this. At first she shrugged, reluctant to answer. "Were you just a little, little, tiny bit mad?" "Yes," she said. "And you didn't want to tell me?" She said sometimes she got a little "shy" when her hair got messed up.

She also exhibited improvements in *Self-esteem* (4 excerpts), dressing in more colorful clothes by the end of the summer. "Wow, look at your accessories!" I said once. "Your red bracelet and belt." The day before I commented on the pleasant smell of her shampoo. She smiled and asked, "What does it smell like?" Her *Emotional warmth* (1 excerpt) and *Awareness of others* (3 excerpts) also increased. She started asking me questions during the last week. “How many students do you have?” “How old are you?” “Do you have a husband?” “Does he know your age?” And one rainy day when I was wearing a short-sleeved shirt she asked, "Are you cold?"

On Ana's last day, I asked her to write about what she learned this summer. "Wat I lare [learned] is that to breat [breathe] wen I ame made [mad] and to help me scap [skip] I word that I don’t know this strategy was got [good] for me. I rade [read] my rading and I feld [feel] god [good] because I could kipe [keep] them in my memory and expland [explain] theme to my family. that I lear [learn] with Ms Keller is that… [it was] fun to tak (talk) about my filing [feeling]."

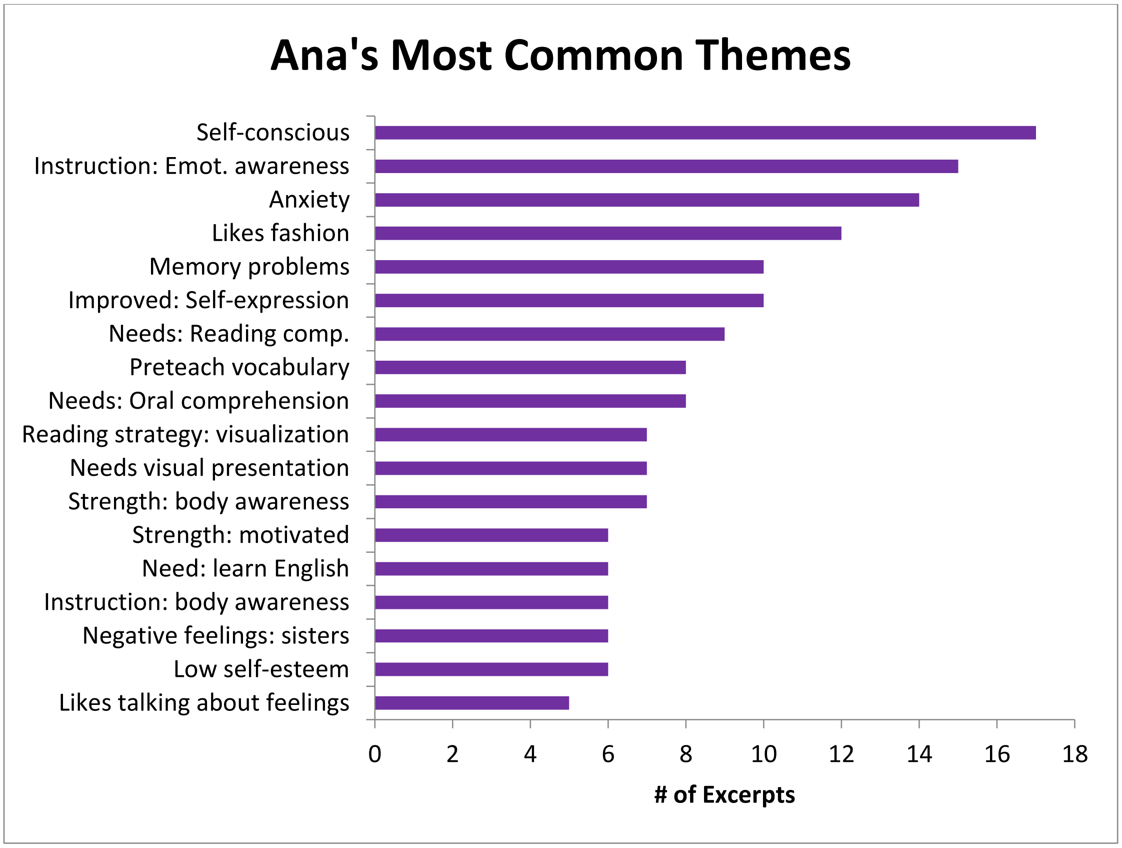


Figure 29. Ana's most common themes (Reading comp = reading comprehension; Emot. awareness = emotional awareness).

Ana was a preteen who had low self-esteem and was very self-conscious, sensitive, and anxious; these emotions were compounded by her cognitive limitations, her ELL status, and the poverty of her home (see Figure 29). The instruction in MF emotional awareness as well as encouraging her to express her feelings and develop her love of fashion increased her self-confidence and self-expression. The last time I saw Ana, she was wearing a dress with rainbow hearts and waving to me exuberantly across the playground.

Paz: The Boy Who Drew Himself Without a Mouth but Flourished in the Garden of Acceptance and Love

Table 10

Paz's General and Cognitive Information and Quantitative Test Scores

Age	Sex	Ethnicity	ELL	Label	Level	IQ	Non-verbal Ability	Proc. Speed	WM
9 yrs., 8 mos.	M	Hispanic	No	1. ED 2. SLD	D	75 Borderline	92 Average	70 Borderline	65 Very low

Mood Average	Reading Attitude Average	Reading Confidence Average
4.9	4.9	3.0

Test	Pre	Post	PrePost DIF	Fol	PreFol DIF
Oral Rdg. Average	8	10.7	2.7	11.7	3.7
Retell Average	0	0	0	11.7	11.7
Phonics Test	7	8	1		
Writing Voice	2	5	3		
Wtg Word Choice	2	3	1		
LD Nonword Accuracy	50%	56%	6%		
LD Word Accuracy	27%	47%	20%		

Note: ED = Emotional disturbance.

Paz is the only one of the participants with an ED (Emotional Disturbance; see Table 10) label because of "a general pervasive mood of unhappiness or depression" (New Mexico Public Education Department, 2011, p. 60). On the Children's Depression Inventory (CDI), he scored in the clinically significant range—an 81 (very much above average) for emotional problems and a 74 (very much above average) for functional problems. He also had significant intellectual limitations and so he had a secondary label as SLD (Significant Learning Disability). Out of the entire sample (both experimental and control groups), he had the lowest IQ—a 75, which is a borderline mental disability—not low enough to be categorized as having an intellectual disability (<70 IQ) but considered as a "slow learner." His processing speed was also borderline (70) and he had the lowest WM (65; very low). He did have an average (92) ability in Perceptual Reasoning (Nonverbal Ability)—a relative strength for him—in Block Design (putting red-and-white blocks in a pattern), Picture Concepts (deciding how a series of pictures go together) and Matrix Reasoning (selecting the picture that fits into a missing square of an array of pictures). While exhibiting depression within other settings, his mood in the intervention setting was "very good" according to his daily self-reports (Mood Average: 4.9; one day he gave himself a 2: "I feel a little bad"). He improved on every quantitative test: +3.7 words on the oral reading test, +11.7 words on the retell test, +1 on the phonics test, +1 or 17% on the writing word choice test, +6% on the LD nonword accuracy subtest, and he improved the most on the LD word accuracy subtest where (+20%) and on the writing voice test (3/6 possible points or 50%). Most likely due to his slow processing and his emerging reading ability (he was reading at a kindergarten level at the end of second grade), 75% of his RTs on the LD pretest and 67% of his RTs on the posttest were too slow (2 SDs above the mean) and so were deleted.

Paz's first interview

poor little neighborhood
cars on blocks
trash under trees
river with mosquitoes
"gated" community across the street
kids stare at wealth through bars

and plate glass windows every day
white house
dirt yard
someone's fluffing a pillow at the window
when we drive up
our old truck—with almost 150,000 miles on it—
still must look "nice" compared to theirs
inside it looks like
they made an effort to clean a space for us
no air conditioning
on a hot summer day
large TV
no books anywhere
older woman on the couch
right next to the TV
"my sister, she's special, she don't talk much" says mom
we asked if they could turn down the TV
they are a little reluctant
smell of cooking in the air
banging pots
fire alarm beeping
another aunt in the background
7 kids at least
clearly this interview is
an important event for the household
as more and more of the family
gathers around
cousins, brothers, sister, aunts, mother
an old woman on the porch
turquoise Mexican blanket
on the couch
where they sit across from us
someone pulls up a chair for Paz
"he has a very low voice," says mom
dark circles under his eyes
thick layer of dirt
around his neck
there are no ground rules
they live from minute to minute
"hyper" little brother is center stage
constantly interrupting
trying to grab all the attention
break dancing
whirling around a fly swatter

mom pulls it away
”you almost hit him in the eye"
baby brother in diapers
screaming "Mom! Mom! Mom!"
over and over
ignored by all
"how has his disability affected his life?" I ask
mom, long pause
tears
"I struggled too, when I was little
I had that and I still do, you know
I don't know how to spell very well…
it hurts because of my kids
and I want them to succeed
and what they want to do
I want them to grow up
and have a healthy life
and no problems
and seeing my kids struggle
it hurts me
there are a lot of things
on my mind
that I don't even know…"
(whispers)
"just, just do what you can
sorry about this house"

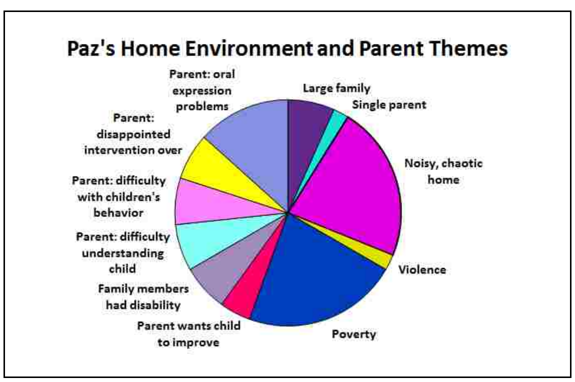


Figure 30. Paz's home environment and parent themes.

Paz's home environment and parent themes. *Poverty* (10 excerpts; see Figure 30) was a significant theme with Paz that summer—in his interviews and during the intervention. Because they had no transportation, he was not able to go to the movies with the movie card I gave him as a prize. When he told me he had been absent because it was his brother's birthday, he also said his mother had no money to buy presents so his little brother just got cake and ice cream. His school records mention that he was sometimes hungry and during his first interview, his mother refers to his small size. "To me he seems like a sad little boy 'cause he's the skinniest one [laughs]. He's the teeniest." The home environment, as demonstrated in the poem above, was *Noisy, chaotic* (10 excerpts) and his school records reported that Paz' parents had split up five years before and that Paz had witnessed his parents fighting (*Violence*; 1 excerpt). His mother had recently remarried, but his stepfather was in jail. Paz's mother very much wanted him to improve (*Wants child to improve*; 2 excerpts), but she struggled to understand him (*Difficulty understanding child*; 2 excerpts). She told me, "And sometimes I don't know, I don't know what's in his head that he, what he thinks or, I don't know. I would like to know [laughs]. I would like to know."

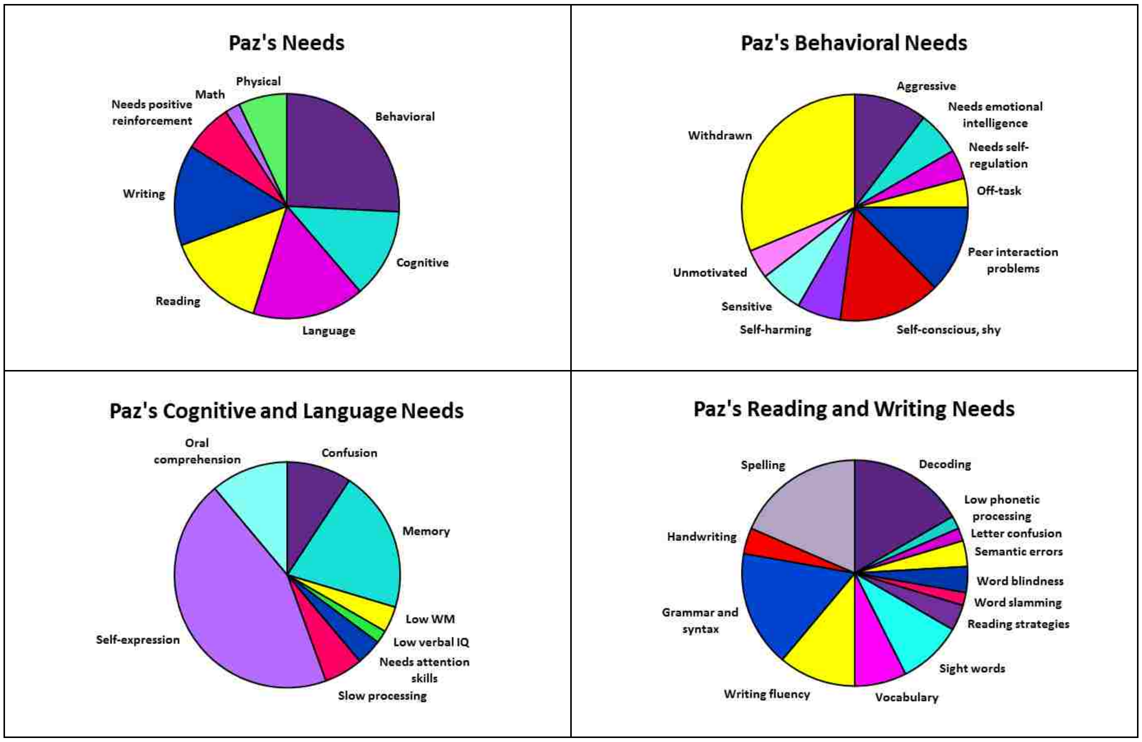


Figure 31. Paz's behavioral, cognitive, language, reading, and writing needs.

Paz's overall, behavioral, cognitive, and language needs. Paz had significant *Behavioral* needs (48 excerpts; see "Paz's Needs" in Figure 31). In first grade, he had been assessed by the school district as:

> "clinically significant" in hyperactivity, attention problems, depression (being lonely, complaining about not being liked, getting easily upset, being pessimistic, crying easily), conduct problems (breaking rules, stealing, using others' things w/out permission, lying) and aggression (keeping temper, respecting authority, speaking kindly to others, treating others kindly). When Paz is undergoing a significant transition at home or school his behaviors change significantly—falls asleep, shuts down, is angry, is sensitive, or more hungry.

So, from an early age, Paz was observed to be *Withdrawn* (15 excerpts; see "Paz's

Behavioral Needs" in Figure 31), *Aggressive* (5 excerpts), as having *Peer interaction problems* (6 excerpts), and *Needs attention skills* (2 excerpts; see "Paz's Cognitive and Language Needs" in Figure 31). His school records also documented *Self-harming* (3 excerpts; see "Paz's Behavioral Needs") behavior—hitting his head and leaving class without permission when he became frustrated. One of the school's goals was for Paz to develop *Emotional intelligence* (3 excerpts)—identifying his feelings using feeling cards or charts.

Paz had *Physical* needs (13 excerpts; see "Paz's Needs" in Figure 31) that also interfered with his academic progress. He often had difficulty sleeping, was frequently tired at school, and he had pink eye for most of the summer. He may have used sickness to escape school. In his school records he is quoted as saying, "I like being sick so I won't have to go to Spanish."

Another one of Paz's needs was *Needs positive reinforcement* (13 excerpts). After many years of failure at school, Paz seemed to be hungry for positive attention and encouragement and he responded very well to gentle humor and teasing. This is also how his mother dealt with Paz when he was depressed. During the first interview, she told me about a time when Paz had said, "I'm gonna go jump off a cliff and die." She said she responded to this by saying jokingly, "Good luck. There's no mountains here."

Paz's reading and writing needs. Because of his cognitive difficulties, and exacerbated by a pervasive mood of depression, Paz also had significant reading and writing needs. Although he was almost ten years old, he was only in second grade and was still reading at a late kindergarten level. He was dysphonetic, meaning he had difficulty integrating letters and sounds and difficulty sounding or spelling words phonetically (*Decoding*, 9 excerpts, see "Paz's Reading and Writing Needs" in Figure 31). His nonphonetic writing was unintelligible. Sometimes there was no correspondence between the word and what he wrote (e.g., "roesreeheit" as "starts the problem"). He often made *Semantic errors* (2 excerpts) while reading (e.g., he read "couch" for "chair"). He demonstrated *Word blindness* (2 excerpts) reading "holes" as if there was a "ch" at the beginning of the word. One of the school district's goals for him was to begin using *Reading strategies* (2 excerpts) such as context clues to increase his ability to recognize words and self-correct miscues.

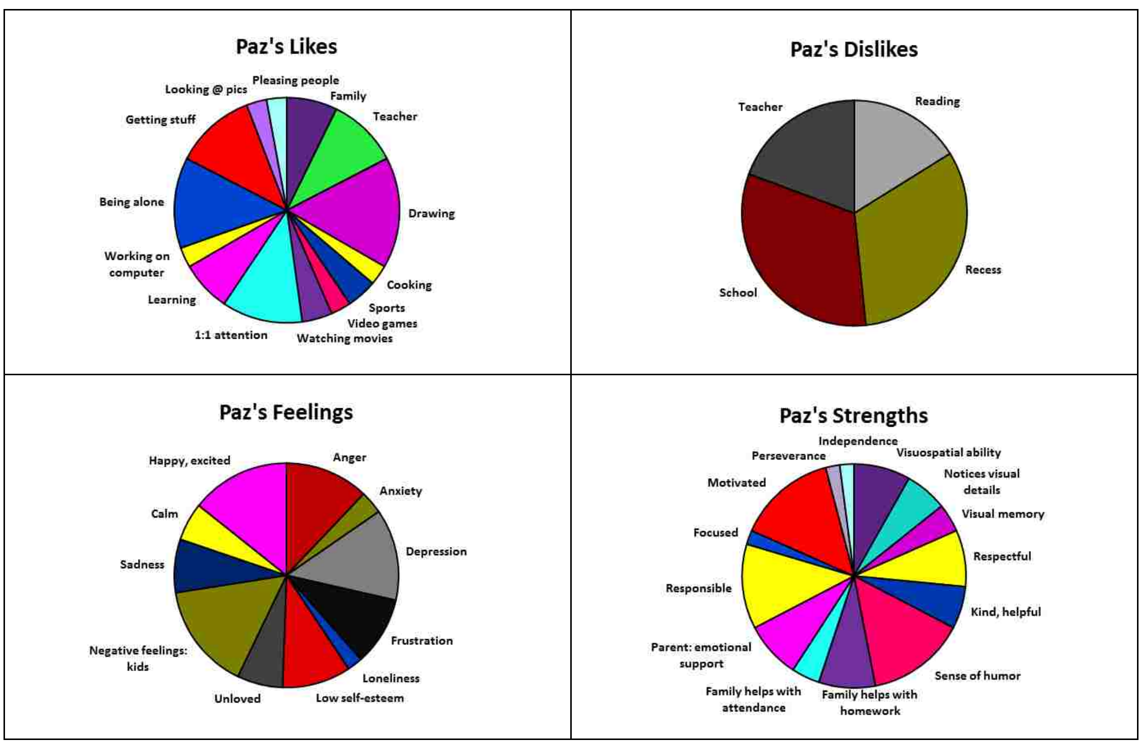


Figure 32. Paz's likes, dislikes, feelings, and strengths.

Paz's likes and dislikes. Paz loved to have *One-on-one (1:1) attention* (8 excerpts; see "Paz's Likes" in Figure 32). My research assistant said Paz was usually in a bad mood when she picked him up from his special education class every day. She described his face as a "sad little robot" and he would not talk to her. Then, after getting one-on-one attention from her while he worked on the phonics intervention, he became very cheerful and he was usually very happy with me during our sessions. "Comes running to my door every day," I wrote in my field notes. "He loves adults," said his mom during the first interview.

As a member of a large family where privacy was difficult to find, he liked *Being alone* (9 excerpts). "When no one's around you are calm," he told me one day. He later said that he did not feel safe at home. One reason was because his brothers took his toys. He also liked getting up early in the morning before his brothers were awake—maybe so he could be alone.

In his first interview, Paz's answers were very short, but it was clear that he did not like reading (1 excerpt; see "Paz's Dislikes" in Figure 32), recess (2 excerpts) or school in general (2 excerpts). "Do you like any of your teachers?" I asked. Paz said, "Mmm... not that much." When I asked him what he was good at, Paz first said that he was good at nothing, then later said he liked to *Draw* (11 excerpts; see "Paz's Likes" in Figure 32).

Paz's feelings. Many of Paz's feelings have already been mentioned, such as *Depression* (12 excerpts; see "Paz's Feelings" in Figure 32) and *Frustration* (9 excerpts). He also felt *Unloved* (6 excerpts) telling me one day that his "real dad doesn't care about us. He cares about other kids." He also had *Low self*-esteem (9 excerpts). Only once did he ever express confidence in his abilities. "How much green will you get today?" I asked him before his HeartMath session. “How much is 1?” he said. “A tiny bit. 100 is all the way up,” I said. “Yeah, 100,” he said.

Paz's strengths. With positive reinforcement, Paz demonstrated strengths that were not seen in his special education classroom. He was *Motivated* (7 excerpts; see "Paz's Strengths" in Figure 32), *Focused* (1 excerpt), *Respectful* (4 excerpts) and he showed *Perseverance* (1 excerpt) and *Independence* (1 excerpt). He had a good *Sense of humor* (7 excerpts), joking with me, clowning around, and sometimes falling off his chair to make me laugh.

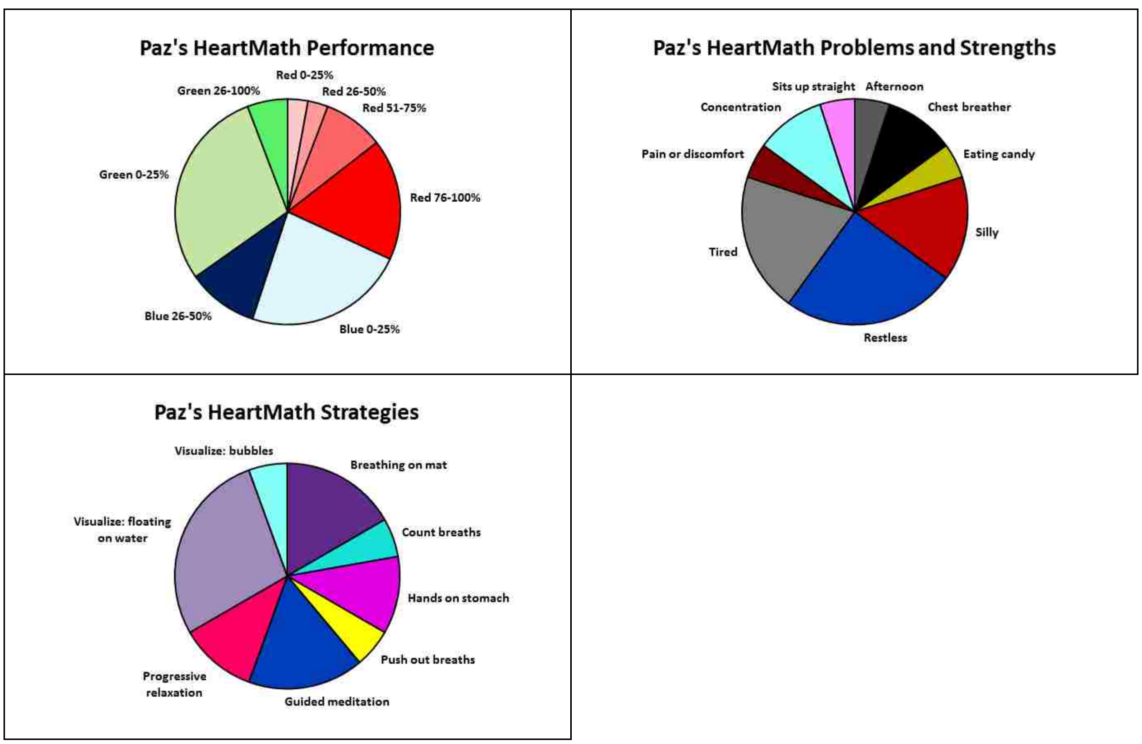


Figure 33. Paz's HeartMath performance, problems, strengths, and strategies.

Paz's HeartMath performance, problems, strengths, and strategies. Paz did not achieve high levels of coherence; mostly his coherence was in the low range (*Red 76-*

100%, 12 sessions; see "Paz's HeartMath Performance" in Figure 33), even though he often appeared more peaceful, calm, and relaxed after the HeartMath session. One day I wrote, "Paz lay down on the mat and listened to a guided meditation—he looked serene—peace radiating out of his face like an angel's—yet his HeartMath performance was very low." On the day he got the highest level of coherence, I wrote that he "held breath at top"—perhaps that pause was helpful to him. He was often *Tired* (4 excerpts; see "Paz's HeartMath Problems and Strengths" in Figure 33) so I encouraged him to yawn in HeartMath, telling him it meant his body was tired—expressing a nonjudgmental acceptance of his tiredness. Pink eye (*Pain or discomfort;* 1 excerpt) was uncomfortable for him--he was itching his eye during HeartMath (*Restless*, 5 excerpts).

Progressive relaxation (2 excerpts; see "Paz's HeartMath Strategies" in Figure 33) helped improve Paz's coherence level on two occasions. “It feels good,” he said afterwards and described the process of tensing and relaxing as “like [getting] a shot but my arms not numb.” During one session, I had him *Visualize* blowing *bubbles* while breathing (1 excerpt). When I asked him to give me a number from 1 to 10 to describe his feeling of calmness, he said he had a 10 before the HeartMath session, but was "less" calm with "two ones" afterwards. However, his level of coherence that day was 15% blue, a high level of coherence for him. *Visualizing* an otter *floating on water* (5 excerpts) also seemed to help him. He said he visualized the otter "going back and forth, slow like a turtle, like a crazy man.”

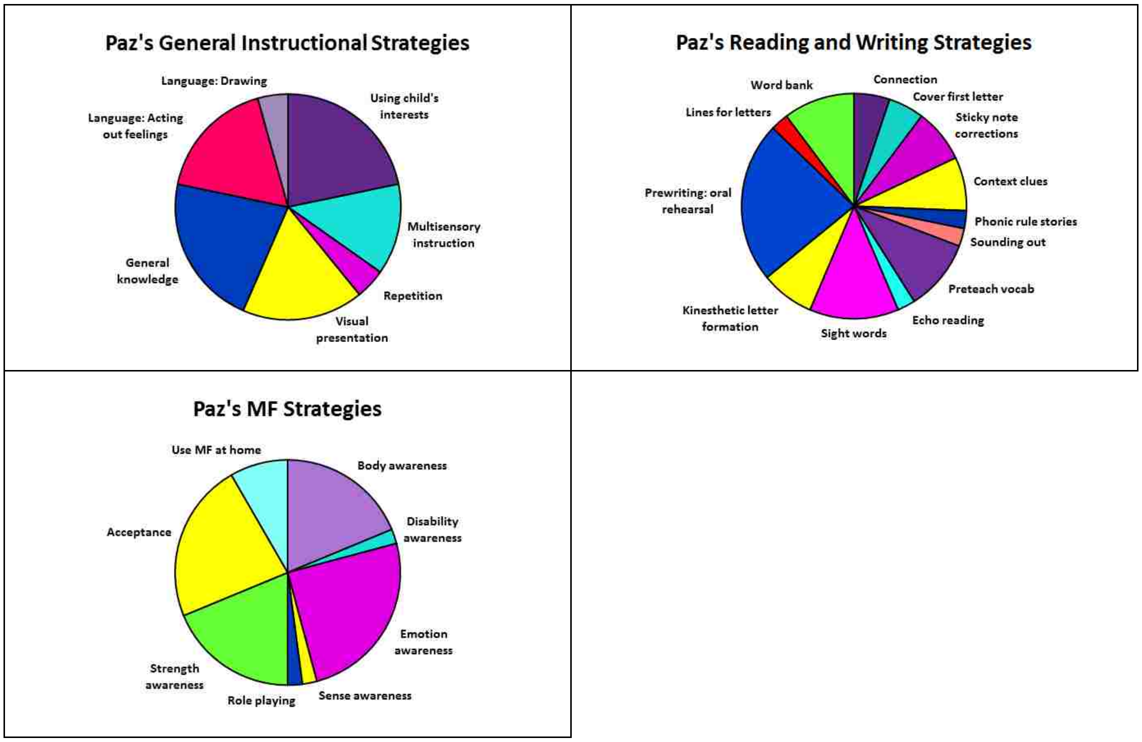


Figure 34. Paz's general, reading, writing, and MF strategies.

Paz's general instructional strategies. *Using child's interest* (5 excerpts; see "Paz's General Instructional Strategies" in Figure 34) was an overall strategy that was successful with Paz. Early on in the intervention, I started giving him drawing as a homework assignment. In one of his first sessions, I asked him when he got up—because he said he got up earlier than his brothers. Instead of giving me a numerical time, he tried unsuccessfully to tell me where the sun was in the sky, so I asked him to draw a picture of it. Then, instead of just drawing a circle with lines coming out of it—the typical person's representation of the sun—he drew a specific memory of the sun with clouds over it and rays coming out. The next day, after I told him his homework assignment was to look out the window to see where the sun was in the sky, he said, "There was no cloud in front of it today." Again, this was a specific visual memory, not a generalized one, indicating a relative strength in visual memory. Then I gave him a very large sketch pad, some colored pencils, and a sharpener to use at home. He told me later that drawing kept him out of trouble at home and it made him feel calm.

Paz's reading and writing strategies. Paz was motivated to read a Spiderman book I had ordered for him, even though it was a little challenging for him to read. One of the strategies I used with Paz to help him during decoding was *Sticky note corrections* (3 excerpts; see "Paz's Reading and Writing Strategies" in Figure 34). When Paz repeatedly miscued on a word (e.g., saying "not" for "nest"), I would write the word he was saying on a sticky note and place it next to the word on the page. This allowed him to see that what he was saying did not match the word on the page. This practice helped remind him to correct himself and he found it very motivating to remove the sticky note when he got it right.

Prewriting: oral rehearsal (9 excerpts) was a writing strategy where I would ask Paz to tell me what sentence he wanted to write, asking him to count the words on his fingers as he said the sentence. I also started using a *Word bank* (4 excerpts) with him to encourage him to learn sight words and to improve his spelling skills. I would let him write the little words in his sentence by himself (e.g., "a," "the") and then I would write down the rest of the words he needed on separate index cards. Since he frequently used the same words in his sentences, he would look through the cards in his "word bank" to find the words he needed that day. On his last two journal entries, he wanted to write ***all*** of the words in his sentence by himself.

Paz's MF strategies. Paz was usually in a good mood with me, but during one session we talked about his angry feeling before and after HeartMath (*Emotion awareness*, 12 excerpts; see "Paz's MF Strategies" in Figure 34). He told me his mad feeling was a "5" before the session and, responding to my questions about his feeling, he said that it was in his heart, was small, looked like a fist, and was red and cold. After the HeartMath session, his mad feeling had decreased to “1,” "but still there," and the feeling had become bigger, the fist had opened, the red had changed to green, and cold had turned to warm.

Acceptance (11 excerpts)—in the form of playful rapport with Paz instead of criticism or reproof—was a very successful strategy with Paz. During the first interview, I asked him, "Can you tell me some things you like to do that you're good at?" Paz gave a brief, depressed answer. "Um. . .nothing." I said, "Nothing?!" expressing playful astonishment. He smiled and started saying he was "a little" good at things--he worked hard a little, he was a little bit good at writing. He was not sure he could get better at math and reading, but he wanted to get better. In the post-interview, I continued to develop *Strength awareness* (9 excerpts) when he brought me the drawing pad I had given him, now full of drawings and writing. "Look, you're writing!" I exclaimed. "I'm so proud of you. … Wow, you wrote all those names."

I encouraged Paz to *Use MF at home* (4 excerpts). In his journal, Paz drew himself making pancakes as his Still Quiet Place—a place at home where he felt safe and calm (see Figure 35). He drew himself as having a long upper body and long arms, with very short leg lines, and a small head with no mouth or hair. There is much more detail in the kitchen items he drew—the cabinet, the griddle, the hood over the oven—and he drew a cartoon bubble with some S's inside to represent the sizzling sound of the pancakes.

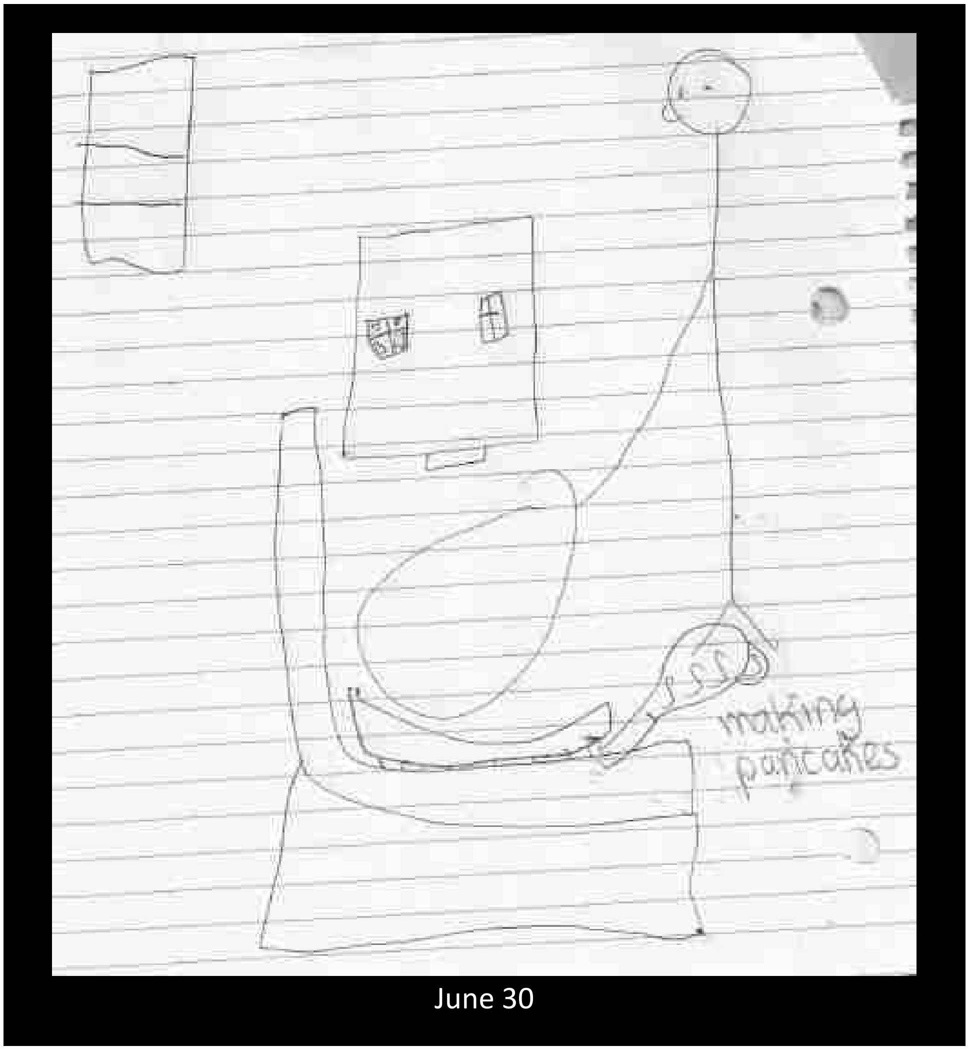
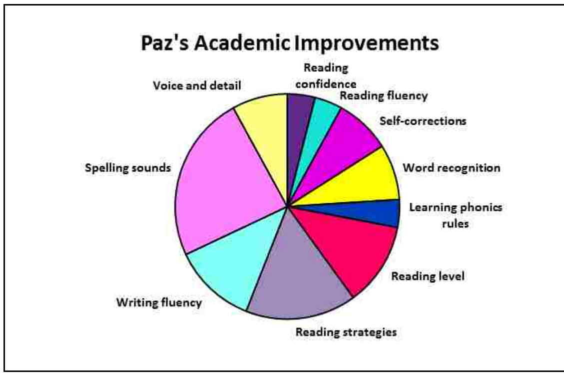


Figure 35. Paz's drawing.



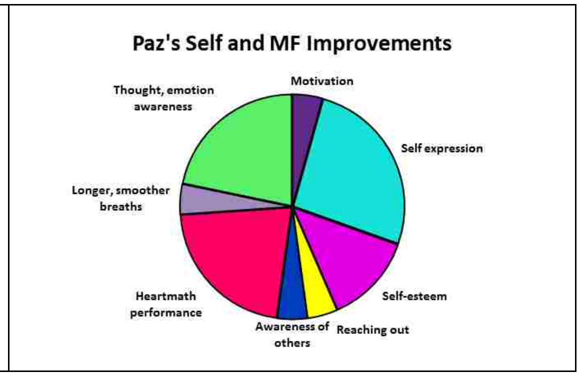


Figure 36. Paz's academic, self, and MF improvements.

Paz's academic improvements. In his post-interview, I asked Paz's mother how he felt about reading after the intervention. I asked her, "How about reading the little books, what was that like?" She responded, "It was fun. He enjoyed it. He, he kept telling me that I need to get little books. And I'm like, 'Well, you have *big* books.' 'No, ones that have at least like 19 pages or something but small little paragraphs and stuff like that.'" While Paz's mother did not understand (or accept) that Paz was still reading at an early level, Paz was aware of the kind of books he needed to read to be successful.

His mother also said she saw improvement in his reading skills (*Reading strategies*, 4 excerpts; *Reading fluency*, 1 excerpt; *Word recognition*, 2 excerpts; see "Paz's Academic Improvements" in Figure 36). "He knows a lot more of the sounds and everything like that on his letters and I was all happy because some of the words he just flies through them… Before, it was like he would stop where he didn't know the word. He sounded out, finished the sentence, and then go back, got stuck again. And now, it’s like he gets stuck, he says it, but then he goes back and he reads the whole thing without stopping." Paz's reading level improved from "C" to "D" that summer (see "Paz's Reading Accuracy and Self-corrections" in Figure 37). He started the intervention reading 30 words correctly in a Level C book and finished the summer reading 90 words correctly in a Level D book (see "Paz: Number of Words Read" in Figure 37). His improved accuracy score on the LD nonword posttest (+6%) and the word posttest (+20%) also demonstrates an improvement in reading ability.

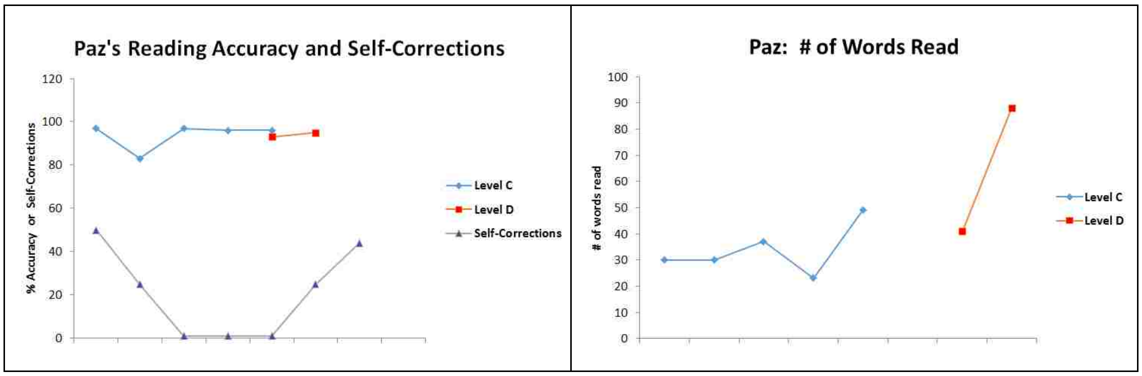


Figure 37. Paz's reading accuracy, self-corrections, and number of words read.

Paz's self and MF improvements. In his pre-interview, Paz barely spoke, perhaps out of shyness. His depression and memory problems were evident too. However, he began to open up to me during the intervention as I expressed nonjudgmental acceptance (*Self-expression*, 6 excerpts; see "Paz's Self and MF Improvements" in Figure 36). One day Paz said he did not like his Spanish teacher because "she does Spanish and everybody understands her except me." I said, "I understand that…that must be hard."

Back in his home environment, during Paz's post-interview, his answers were again brief and flat—not the way he was with me at school. "Do you still feel like you read better?" I asked. "I don't feel like reading." When I asked, "Are you doing better in writing?" "Um, not—kind of." I did not see the happy boy I saw at school, but the depressed, withdrawn, reluctant-to-speak boy I had seen at his pre-interview. Mom tried to explain his behavior, saying he was "nervous, nervous, nervous." She also said he "was very excited to be going to summer school. He really enjoyed it. Um, he had a lot more to say about summer school than what he does about the regular school."

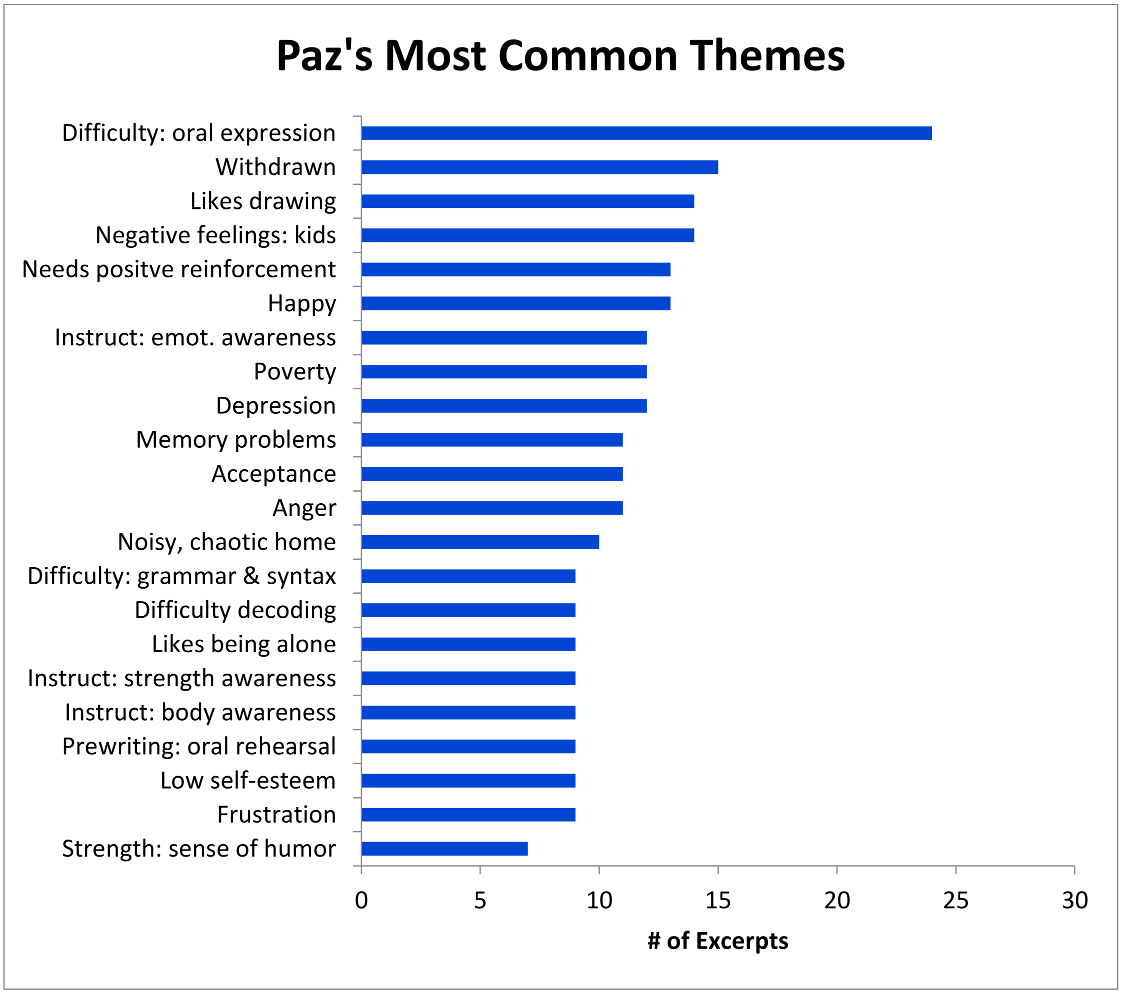


Figure 38. Paz's most common themes.

Paz was a depressed and withdrawn boy who had trouble expressing his thoughts and feelings, especially in his home environment—where there were a lot of other children competing for space, attention, and a limited amount of material things—and in his special education classroom—where his cognitive difficulties made academic tasks especially frustrating for him (see Figure 38). In an environment of unconditional acceptance, love, and encouragement, where he was encouraged to develop his drawing ability, he became a happy, laughing boy who was motivated to do his best at reading and writing and whose ability to express emotion and personality in his writing dramatically improved (+50% on the voice test) . In Paz's last journal entry, he wrote, "Yo hamen me red [you help me read] the book thank you."

Ernesto: The Boy Who Pushed Himself to Do His Best and Relaxed by Blowing Bubbles to the Sun

Table 11

Ernesto's General and Cognitive Information and Quantitative Test Scores

Age	Sex	Ethnicity	ELL	Label	Level	IQ	Nonverbal Ability	Proc. Speed	WM
10 yrs., 7 mos.	M	Hispanic	Yes	SLD	C	89 Below Average	92 Average	89 Below Average	71 Low

Mood Average	Reading Attitude Average	Reading Confidence Average
4.7	5	2.9

Test	Pre	Post	PrePost DIF	Fol	PreFol DIF
Oral Rdg. Average	38.3	30.3	-8	33.3	-5
Retell Average	30.3	19.7	-11	16.3	-14
Phonics Test	10	12	2		
Writing Voice	4	4	0		
Wtg. Word Choice	4	3	-1		
LD Nonword Accuracy	74%	80%	6%		
LD Nonword RT	1446.86	1532.26	85 ms		
LD Word Accuracy	67%	67%	0%		
LD Word RT	1296.8	1032.9	-264 ms		

Ernesto's IQ score (89; see Table 11) and processing speed (89) was considered by the school district to be below average, but because he was not proficient in English, his nonverbal ability (92; average) was thought to be the best estimation of his intelligence. His WM was very low (71), causing him problems when he tried to engage in complex thought processes. He was below average in verbal reasoning ability (86), again partly because he was an ELL student. However, he had difficulties with receptive and expressive language in ***both*** English and Spanish—he had trouble with sequencing and temporal concepts, recalling and reproducing sentences, and understanding relationships between words in both languages. Even when tested in Spanish, according to his school records:

> He demonstrated consistent delays in responses, and often responded with short, simple sentences. He demonstrated several grammar and syntax errors in his speech, and tended to use basic vocabulary. When asked to describe a video game, he was able to provide some details, but did not elaborate, or provide enough information for listener understanding.

However, Ernesto had a relative strength (100; average) in spatial ability (visual-motor integration, non-verbal problem-solving, spatial reasoning, and visualization) which helped him compensate for his low verbal skills. He was reading at the second-grade level at the end of fourth grade. He improved slightly on the phonics test (+2 points) and on LD nonword accuracy (+6%), but his scores decreased on the oral reading test (-5 words on the follow-up test), the retell test (-14 words), and on the writing word choice test (-1). His RT on the LD nonword subtest increased a little (+85 ms) and decreased more on the word subtest (-264 ms).

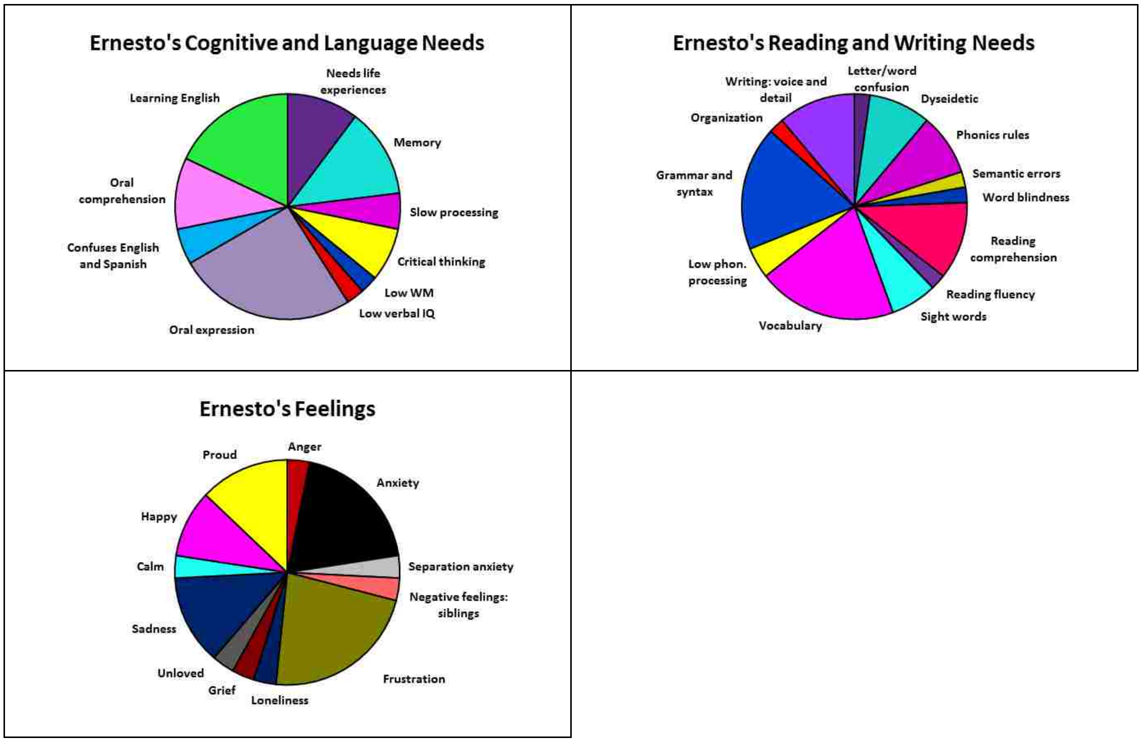


Figure 39. Ernesto's cognitive, language, reading, and writing needs and his feelings.

Ernesto's academic needs. As noted above, Ernesto had significant language needs (*Learning English*, 7 excerpts; *Oral expression,* 10 excerpts; *Oral comprehension*, 4 excerpts; and *Confuses English and Spanish,* 2 excerpts; see "Ernesto's Behavioral, Cognitive, and Language Needs" in Figure 39) and cognitive difficulties (*Memory*, 5 excerpts; *Slow processing,* 2 excerpts; and *Critical Thinking*, 3 excerpts). However, he was the only one of the experimental participants who did not have behavioral problems.

Ernesto's reading and writing needs were consistent with a student who has speech and language disabilities (*Vocabulary*, 9 excerpts; *Grammar and syntax,* 8 excerpts; see "Ernesto's Reading and Writing Needs" in Figure 39). He also seemed to be *Dyseidetic* (4 excerpts)—someone who always reads phonetically, sounding out most words as if they had never seen them before. Before the intervention began, his special education teacher told me that Ernesto "sounds out each letter" when reading. His school records said he was "still in the stage of sounding out each letter in a word before he reads the whole word but he continues to make progress in reading words." During the intervention, I noticed that sometimes he was pretty good at spelling the sounds in a word ("biyck" for bike; "watr" for water), but at other times, it was as if he did not hear all of a word's sounds (e.g., "bobos" or "popos" for "bubbles").

Ernesto's feelings. Ernesto did not often verbalize his emotions, instead demonstrating them nonverbally. He self-reported a "5" on the Mood scale (*Happy*, 3 excerpts; *Proud*, 4 excerpts; see "Ernesto's feelings" in Figure 39) except on two occasions, where he reported a "1" or a "2". The negative emotion I observed him have most frequently was *Frustration* (7 excerpts) which he expressed as yawning, crossing his arms, or frowning when doing a difficult task during reading. I saw *Anxiety* (6 excerpts) in him during HeartMath, when he tried so hard to breathe the right way that he almost hyperventilated. One day he wrote about *Sadness* (4 excerpts). His parents had fought the night before because his father did not go to work and Ernesto thought his mother had left for good. Ernesto came from a poor family where he often seemed to be neglected. He came late to school a few times because he said no one woke him up. After I called his parents about his tardiness, he told me he began to wake himself up in the morning, feeding himself breakfast, and then waking his mom up. He told me once that his father "threw things" when he got mad and that his mom was not home after school; "she's always with her friends." He wore the same blue-striped shirt for many days, perhaps because there was nobody doing the laundry.

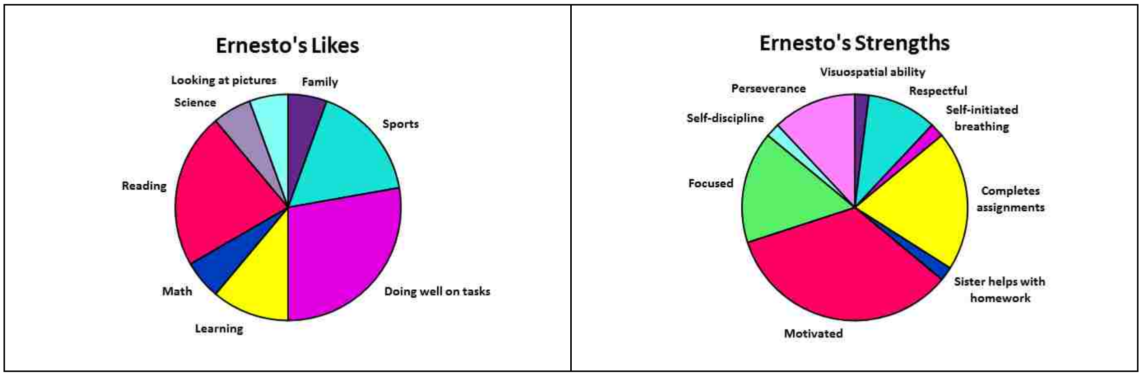


Figure 40. Ernesto's likes and strengths.

Ernesto's likes and strengths. Ernesto liked *Doing well on tasks* (4 excerpts; see "Ernesto's Likes" in Figure 40) and *Reading* (4 excerpts). His school records also said he found "reading exciting and worthwhile to do in class." His parents' goal for him was that "he makes more effort in math and reading. To focus a lot in school. We want him to have a career in veterinary." Ernesto's own goals were to improve in reading and to be ready for middle school and high school. His current special education teacher said that he "loves coming to school and learning new things every day. He is well-mannered and well-behaved in class. He perseveres in learning and makes a sense of accomplishment with himself." Ernesto had a lot of internal motivation and drive to learn and improve (*Motivated*, 17 excerpts; *Focused*, 8 excerpts; *Perseverance*, 6 excerpts, *Completes assignments*, 10 excerpts; see "Ernesto's Strengths" in Figure 40).

Two years before this study began, I completed a research project at Ernesto's school, where four teachers taught MF to their classes. Ernesto was one of my experimental students in second grade. His second grade teacher instructed the class on how to breathe and concentrate, writing in her daily journal that she was teaching her students how to stay "still and silent for 8 minutes." Two years later, in his pre-writing sample before the intervention began, Ernesto revealed that he was still using MF breathing to calm down. "And I go to my bed and bren [breath] and out. wen I bred [breath] and out I feel betr" (*Self-initiated breathing*, 1 excerpt).

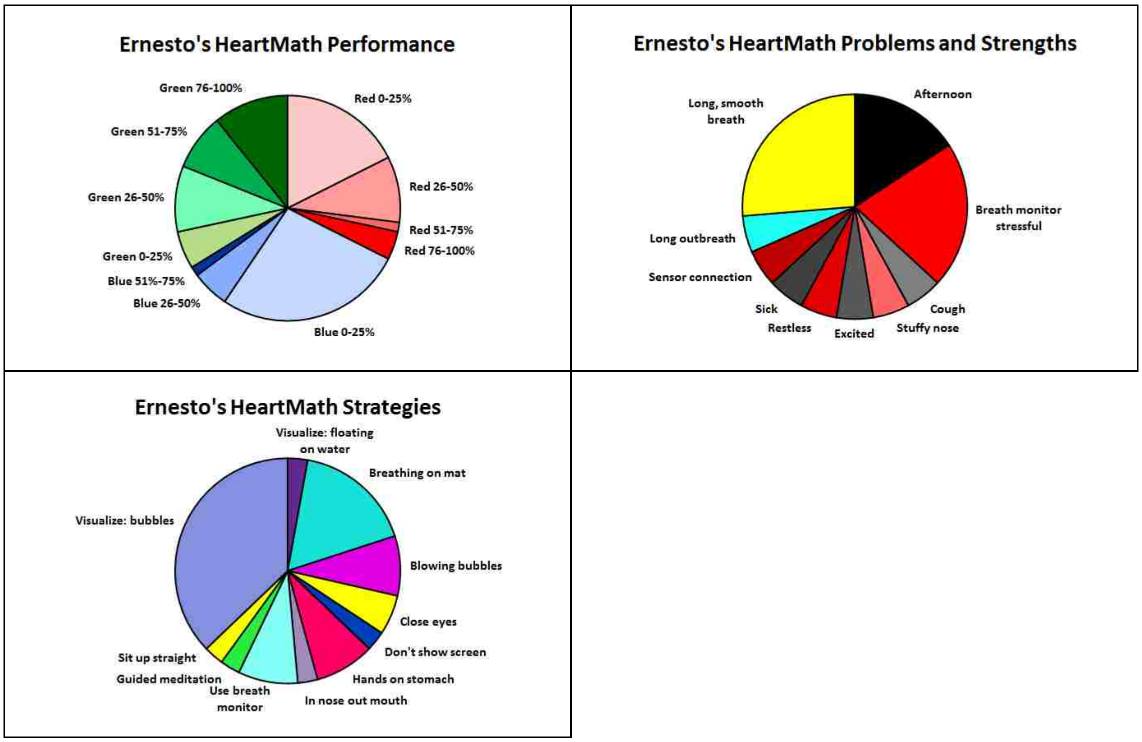


Figure 41. Ernesto's HeartMath performance, problems, strengths, and strategies.

Ernesto's HeartMath performance, problems, strengths, and strategies. As can be seen in "Ernesto's HeartMath Performance" (see Figure 41), Ernesto was very good at reaching high levels of coherence (*Green 51-75%*, 6 sessions; *Green 76-100%,* 8 sessions). In his very first session, Ernesto's HRV pattern was long and smooth and he achieved a coherence level of 72 after breathing for over five minutes. I showed him to use the breath monitor to slow down his breathing and he was very responsive to this instruction, achieving a high level of coherence (100% on two sessions) for the first five sessions. But then he became over-focused on the breath monitor—on his performance. Ernesto demonstrates both an advantage and a disadvantage of using the HeartMath screen when teaching beginners how to meditate—seeing their performance motivates them at first, but later it begins to be a source of stress. Ernesto, who was strongly motivated to always do his best, seemed to have some performance anxiety. He took my "noisy outbreath" instruction very seriously and began pushing his breath in and out loudly and forcefully, and it was obvious he was straining (*Breath monitor stressful*, see "Ernesto's HeartMath Problems and Strengths" in Figure 41), perhaps even hyperventilating. So I began to have him *Close eyes* (2 excerpts; see "Ernesto's HeartMath Strategies" in Figure 41) so he could not see the screen. However, on his tenth session, he was still trying too hard so I used three different strategies that day, collecting HeartMath data each time. I tried progressive relaxation—his blue coherence level increased a little. I asked him to listen to the Otter meditation (*Guided meditation*, 1 excerpt), but afterwards he told me he had never been to a pool, so he could not see himself floating in the water. Then I asked him to blow bubbles through a bubble wand, asking him afterwards to visualize himself blowing bubbles during HeartMath (*Visualize bubbles;* 13 excerpts). This increased his high coherence level somewhat. The next day, I asked him to lie on the mat (*Breathing on mat*, 6 excerpts). After showing him what happened when he blew too hard on a bubble (it pops!), I asked him to visualize himself blowing "soft and long" bubbles during breathing practice. His coherence level increased to 89% and his green levels stayed pretty high after this—at least 40%--except for an afternoon session when he was excited about seeing a firetruck. He continued to think about blowing bubbles in his future sessions. In his journal, he drew a picture about blowing bubbles up to the sun (see Figure 42).

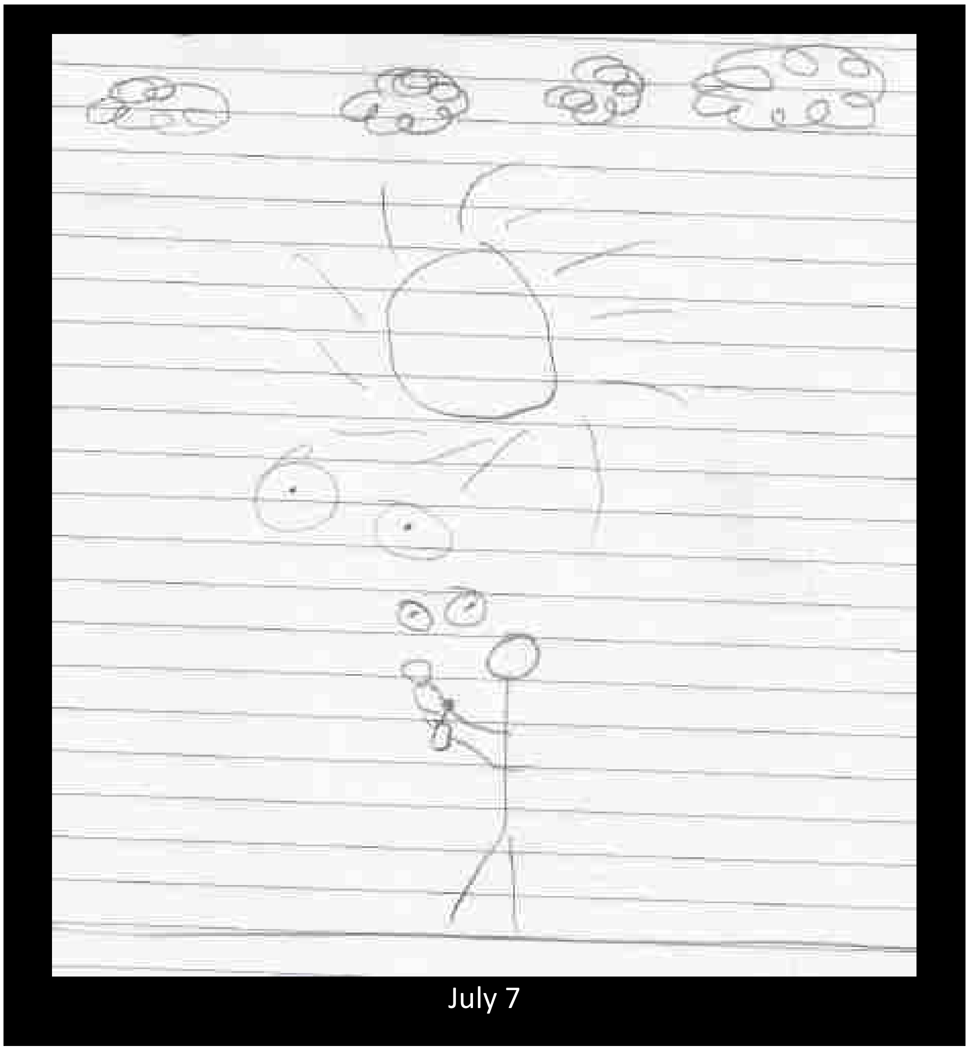


Figure 42. Ernesto's drawing.

Then Ernesto started writing about being a bubble and blowing bubbles—one day he wrote that it was raining bubbles and he was popping them. This evolved into taking a shower and mixing bubbles with his hand, and blowing bubbles under the water. During his last session he drew himself riding a bike while his brother blew bubbles and wrote that he was having fun "and my burtte [brother] was to." Ernesto experienced a lot of positive affect after HeartMath sessions, writing that breathing helped with negative emotions like sadness (2 excerpts), and that he was having fun (2 excerpts) when he thought of himself blowing bubbles while he breathed.

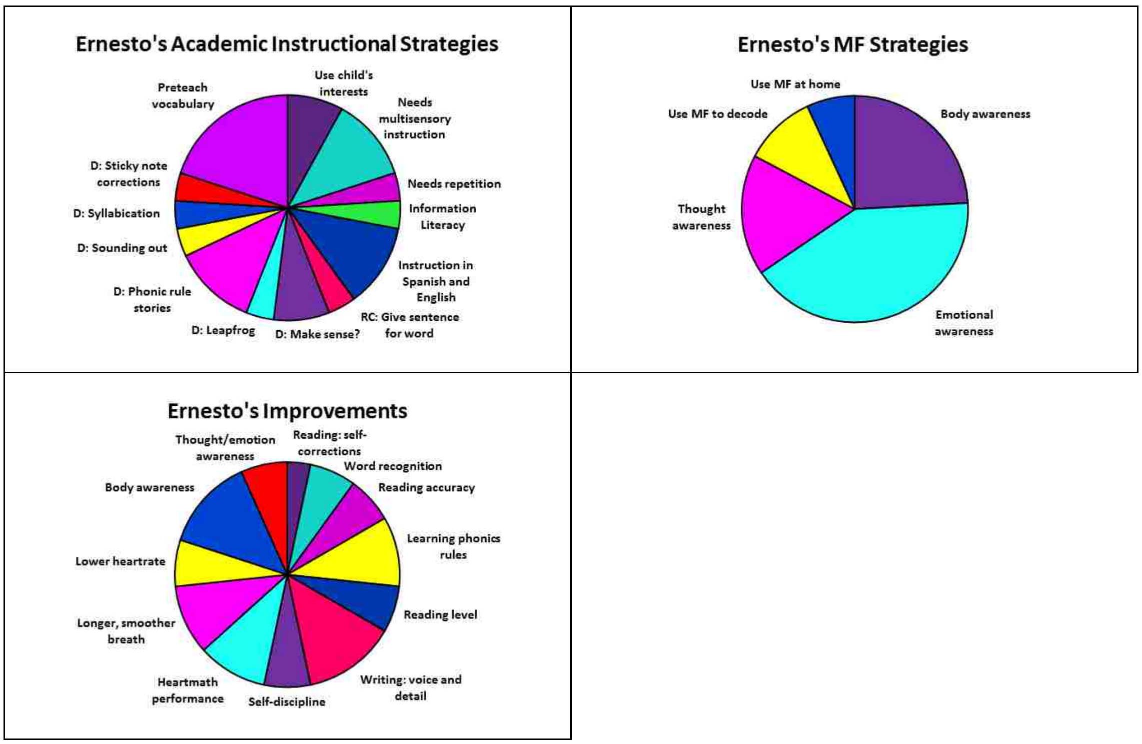


Figure 43. Ernesto's academic and MF instructional strategies and improvements (RC = Reading Comprehension; D= Decoding strategy).

Ernesto's academic instructional strategies. *Instruction in Spanish and English* (3 excerpts; see "Ernesto's Academic Instructional Strategies" in Figure 43) was necessary to help Ernesto understand certain concepts. For example, he needed the Spanish translation of the self-report scales to understand the word "confident." I used a Spanish-English dictionary with him, showing him how to use the index to find words (*Information Literacy*, 1 excerpt). I looked up "artes del cuerpo" so he could understand "part of" in a book entitled "A Buzz Is Part of a Bee." The first time I presented him the dictionary and asked him to read some of the Spanish words, he started to yawn. I asked him why and he said, "I don't know how to read words in Spanish."

I taught Ernesto a few *Phonic rule stories* (3 excerpts), like "when two vowels go walking, the first one does the talking" (e.g., "foal"). I acted this story out with him—walking around the room with him while he held an index card with the letter "o" and I held the "a" card. At my prompting, he would say "Oh!" very loudly. But then he began to confuse the long and short sounds of "o," saying the *short* "o" sound very loudly. So I started talking to him about vowel rules, and he began to yawn. I said, "You're yawning, I know it's hard. Vowels are very confusing, but if you want to be a better reader, you have to pay attention to them." His yawning seemed to indicate some frustration or aversion to the task.

I worked on developing reading strategies with Ernesto. When reading a book called "Polar Babies," Ernesto first read the title as "Polar Bears." So I covered up the word "babies" and asked him, "What sounds do you hear in 'bear?' Do you seen an 'r' in this word ('babies')?" Then he became confused and started to read "polar" as "porter." When I corrected him, he crossed his arms. I mirrored his action by crossing my arms, and said that people did this when they were not happy (*Body awareness*, 7 excerpts; see "Ernesto's MF Strategies" in Figure 43). He responded by knitting his brows, but unfolding his arms. Then, since the word "polar" was on every page of the book, I tried several strategies for correction. First I asked him to repeat it verbally—"No, the word is 'polar.' Say it." This did not work. Then I tried writing "porter" on a sticky note next to the word "polar", telling him, "This is what you're saying"—this did not work (*Sticky note corrections,* 1 excerpt; see "Ernesto's Academic Instructional Strategies"). I tried to cue his memory. "Did you see a polar bear at the zoo? Use it in a sentence" –this did not work. Finally, I started to cover up part of the word before he read it so he could only see the /po/ in "polar." Then he started reading "polar" correctly! Once a word got tangled up in his mind, it was hard to untangle the confusion. But the next day he read the book with 96% accuracy, only stumbling on "polar babies" once.

Ernesto's MF strategies and improvements. The MF strategy I used most with Ernesto was *Emotional awareness* (12 excerpts; see "Ernesto's MF strategies" in Figure 43). During his third session, Ernesto wrote that he wanted to hug his mom and dad because they were his parents. He was afraid that his mom was going to leave and he wrote that he felt sad because his dad didn't go to work (he lost his job) and his mom was angry. Ernesto's writing became more descriptive as he described his feelings (*Writing: voice and detail,* 4 excerpts; see "Ernesto's Improvements" in Figure 43). He often wrote about having feelings "in my hort [heart]." When he was excited, he would write that his hearting was "beeping" or "bumping."

Ernesto's *Reading level* (2 excerpts) improved from a Level E to a Level F (see Figure 44). His *Self-corrections* also improved from 40% on Level E to 80% on Level F. He improved in *Self-discipline* (2 excerpts) by getting himself up in the morning so he could be on time for our session, which started at 8:15 in the morning. In fact, he began to show up early, eager to "do his best."

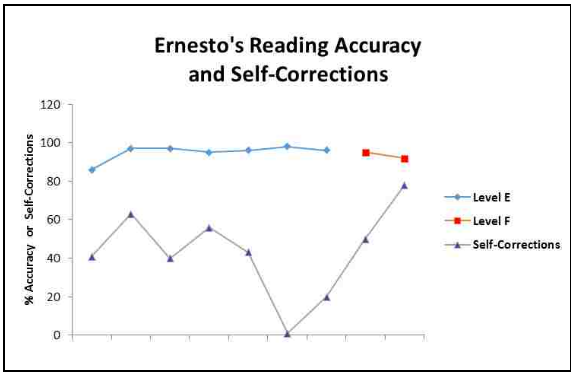


Figure 44. Ernesto's reading accuracy and self-corrections.

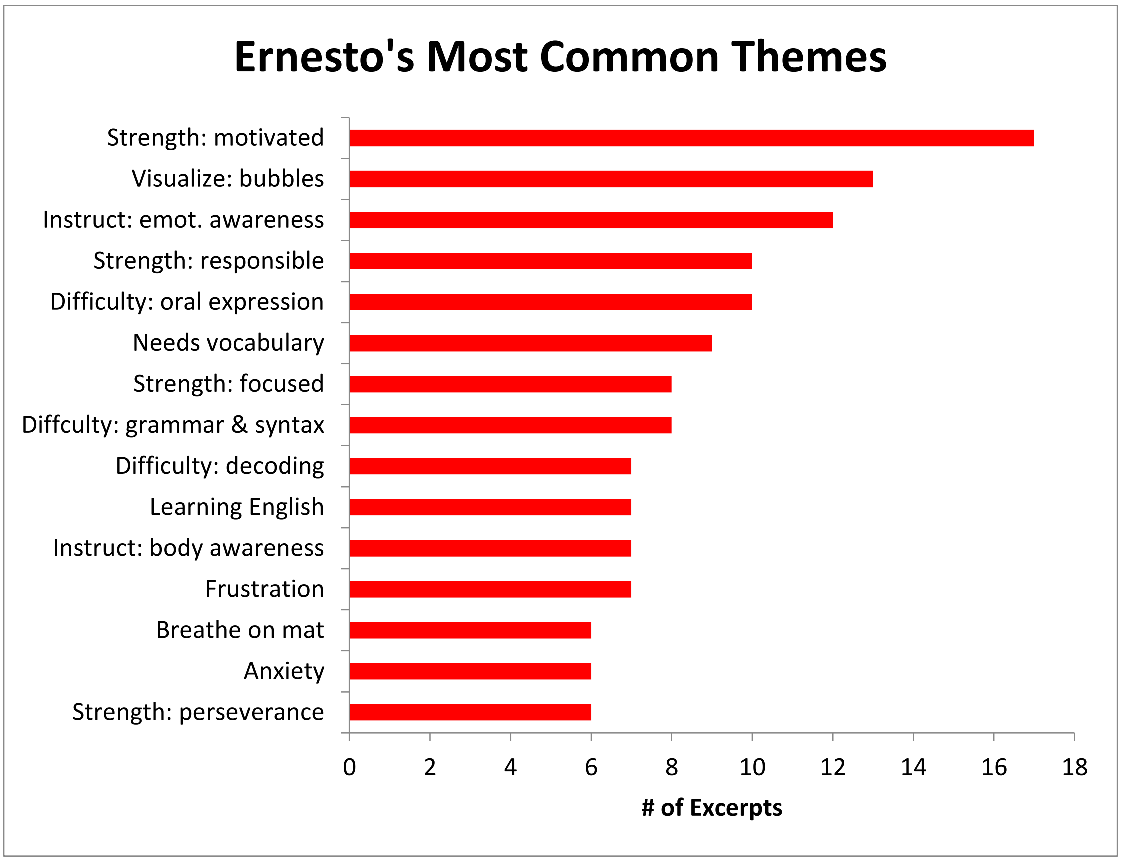


Figure 45. Ernesto's most common themes (Emot. awareness = emotional awareness).

Ernesto was a very motivated, focused, and responsible student whose desire to "do his best" sometimes caused him to become frustrated and anxious about his performance (see Figure 45). This performance anxiety caused him to almost hyperventilate during MF breathing, but breathing on the mat (where he could not see the HeartMath screen) while he visualized himself blowing bubbles helped him to relax and reach high levels of coherence again. When I showed Ernesto his HeartMath performance over the summer, he said, "“In the middle [of the summer] it was red because I was breathing hard- you told me to breathe soft and I was thinking of bubbles.” When I asked him what he had learned that summer, he said he had learned how to "breathe soft."

Sam, the Boy with a Basketball Under His Feet Who Discovered His Heart

Table 12

Sam's General and Cognitive Information and Quantitative Test Scores

Age	Sex	Ethnicity	ELL	Label	Level	IQ	Nonverbal Ability	Proc. Speed	WM
9 yrs., 4 mos.	M	Hispanic	No	SLD	B	97 Average	90 Average	78 Low	70 Low

Mood Average	Reading Attitude Average	Reading Confidence Average
4.3	3.7	2.4

Test	Pre	Post	PrePost DIF	Fol	PreFol DIF
Oral Rdg. Average	90.3	90.7	.3	101	10.7
Retell Average	44	18.7	-25	35.3	-8.7
Phonics Test	8	9	1		
Writing Voice	3	4	1		
Wtg. Word Choice	3	3	0		
LD Nonword Accuracy	78%	98%	20%		
LD Nonword RT	1492.7	1031.93	-461 ms		
LD Word Accuracy	93%	100%	7%		
LD Word RT	1025.07	899.67	-125 ms		

Sam had an average IQ (97; see Table 12) with low processing speed (78) and low

WM (70) who was diagnosed as having ADHD. After rating himself at the top of the Mood, Reading Attitude, and Reading Confidence self-report scales (giving himself a 5, 5, and 3) for his first eight sessions, he began to give himself lower scores on each scale for 8/9 of the remaining sessions, even giving himself a 1, 1, 1 on the 16th session. This may have been because of a growing emotional and physical awareness during the intervention. He improved on the oral reading test at the follow-up (+10.7 words), increased his phonics score by one point, and improved his accuracy on the LD nonword subtest by 20% and on the LD Word subtest by 7%. His RTs decreased by 461 ms on the LD nonword subtest and by 125 ms on the word subtest. Since I did not work on reading strategies with Sam (because he was reading close to his grade level—end of third grade), Sam's improved oral reading fluency, his decreased RTs, and his improved accuracy on the LD test may reflect a growing proficiency with decoding due to practice in other classrooms. It also could have been related to an improvement in concentration over the course of the intervention.

Sam improved by one point (17%) on the writing voice test and his retell fluency score decreased by 25 words on the posttest—this could have been related to his lower affect at the time. His retell fluency follow-up score four months later was only 8.7 points lower.

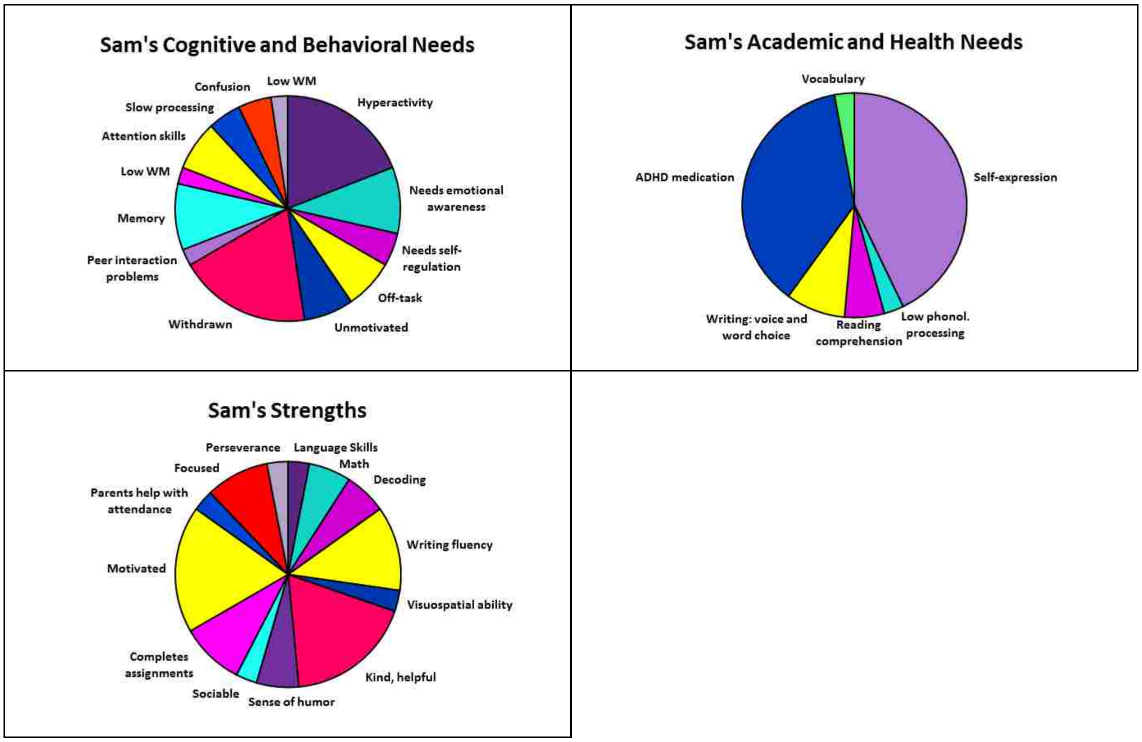


Figure 46. Sam's cognitive, behavioral, academic, and health needs and strengths.

Sam's cognitive and behavioral needs. Many of Sam's cognitive and behavioral problems (*Hyperactivity*, 8 excerpts; *Withdrawal,* 8 excerpts; *Attention skills*, 3 excerpts; *Off-task*, 3 excerpts; see "Sam's Cognitive and Behavioral Needs" in Figure 46) were due to problems from not taking his ADHD medication, as documented in his school records:

> When he doesn't take his meds, has trouble sustaining attention, gets easily distracted, talks excessively out loud, touches supplies repeatedly. Sensory gadgets available when he does ask to use (seat cushion, weighted vest/backpack). Parents stopped meds during summer because of twitching; dosage increased, twitching stopped, behavior has improved.

Sam was also lacking in emotional awareness (*Needs emotional awareness,* 4 excerpts) often telling me that he was not aware of any changes in his emotions or body after a

HeartMath session. In an observation of Sam by the school district's assessment team two years before, an evaluator reported that—in comparison to his classmates—he worked slowly, had poor focus and attention, a higher activity level, average language skills, and "appeared disinterested, less emotional maturity, [and] high frustration level" (*Needs self-regulation*, 2 excerpts; *Unmotivated*, 3 excerpts).

Sam's academic and health needs. Sam had a lot of trouble taking his *ADHD medication* (13 excerpts; see "Sam's Academic and Health Needs" in Figure 46). He often reported feeling "silly" because he took his medication too late that day and on other days he said he had forgotten to take them. Not taking ADHD medication can cause withdrawal symptoms like irritability, fatigue, headache, and changes in heart rhythm (Bailey, 2011). During one particular HeartMath session, when he was extremely restless, his heart rate was erratic, going from a low average of 70 beats/minute to 142 beats/minute. Lacking in emotional awareness and self-regulatory skills and compounded by withdrawal from his medication on many days of the intervention, Sam also had difficulty with *Self-expression* (15 excerpts), often shrugging when I asked him how he felt.

In reading, I worked on Sam's *Reading comprehension* (2 excerpts) because he tested very low in this area (68) on his school records. Although he decoded relatively well at his grade level (third grade), his teachers said he struggled to remember information from stories. And when he had not taken his medication, "it is almost impossible for him to read or comprehend." When I asked Sam to read a book at a late second grade level, he decoded the text with 96% accuracy, but said he could not remember the story immediately after he had read it. When I asked him to describe the picture he saw in his head after reading a sentence, he thought "non-Indian" meant the opposite ("Indian") and he remembered "gunshots" because the text had described geysers as "hot water shot in air." He kept shrugging his shoulders when I asked him about the story, as if he were completely indifferent to and removed from the book about Yellowstone.

I also worked with Sam on *Writing: voice and word choice* (3 excerpts). On his first writing sample, before the intervention began, he wrote ten sentences about being mad at his sisters because they made him do their chores, but his writing lacked detail and was very repetitive. "I do not like doing my sisters chores because I already did my chores. I do not do ther [their] chores because I will have to spend more time doing their chores…"

Sam's strengths. While his writing lacked detail, Sam's *Writing fluency* (4 excerpts; see "Sam's Strengths" in Figure 46), was a strength. He was much more willing to answer my questions about his thoughts and feelings in writing than verbally. He also liked to draw pictures of his emotions. His highest cognitive score was Spatial Ability (103; Average)—ability in spatial imagery and visualization, attention to visual detail, perception of spatial orientation (*Visuospatial ability,* 1 excerpt). His school records described him as being academically competitive (*Motivated,* 6 excerpts) and—when on medication, had excellent "on-task behavior," starting work promptly and turning it in completed (*Completes assignments,* 3 excerpts). His parents described him as considerate and his teacher described him as very *Sociable* (1 excerpt), making friends easily. He enjoyed helping other students (*Kind, helpful*, 6 excerpts).

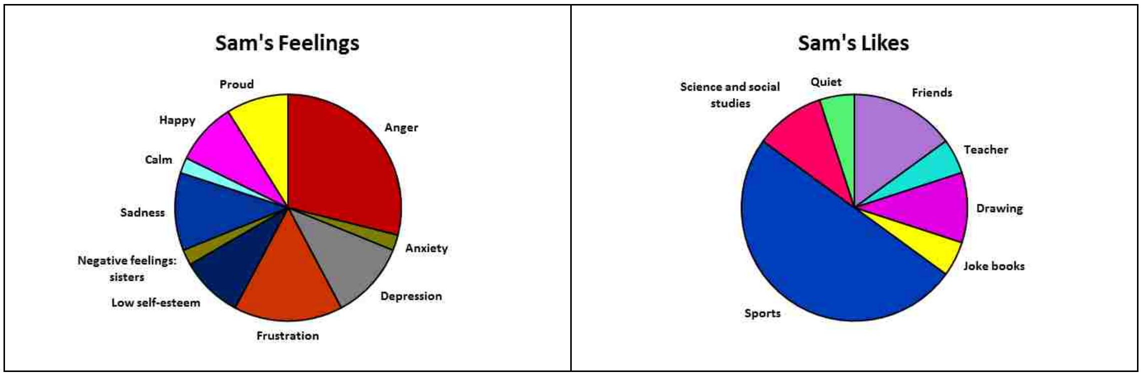


Figure 47. Sam's feelings and likes.

Sam's feelings. Early in the intervention, my RA described Sam as having "no emotion." After my first session with him, I noted that it "didn't seem like he wanted to be there, or was happy to be interacting with me. Emotions are a 'woman' thing was the impression I got from him when I talked about emotions." He did not talk much, shrugged his shoulders a lot when I asked him questions, and appeared to be suffering from *Depression* (6 excerpts; see "Sam's Feelings" in Figure 47). When he did began writing about his emotions in his journal, the emotion he expressed most frequently was *Anger* (13 excerpts) and I often observed *Frustration* (7 excerpts) when he said he had forgotten to take his medication or during difficult academic tasks.

Sam's likes. As a boy who had difficulty staying still, Sam's favorite activity was *Sports* (10 excerpts; see "Sam's Likes" in Figure 47). In his interest inventory, Sam wrote that he enjoyed learning about science and social studies, and his favorite activities were football, soccer, drawing, dodgeball, and kickball. He also wrote about how he liked to play sports with his *Friends* (3 excerpts) at recess.

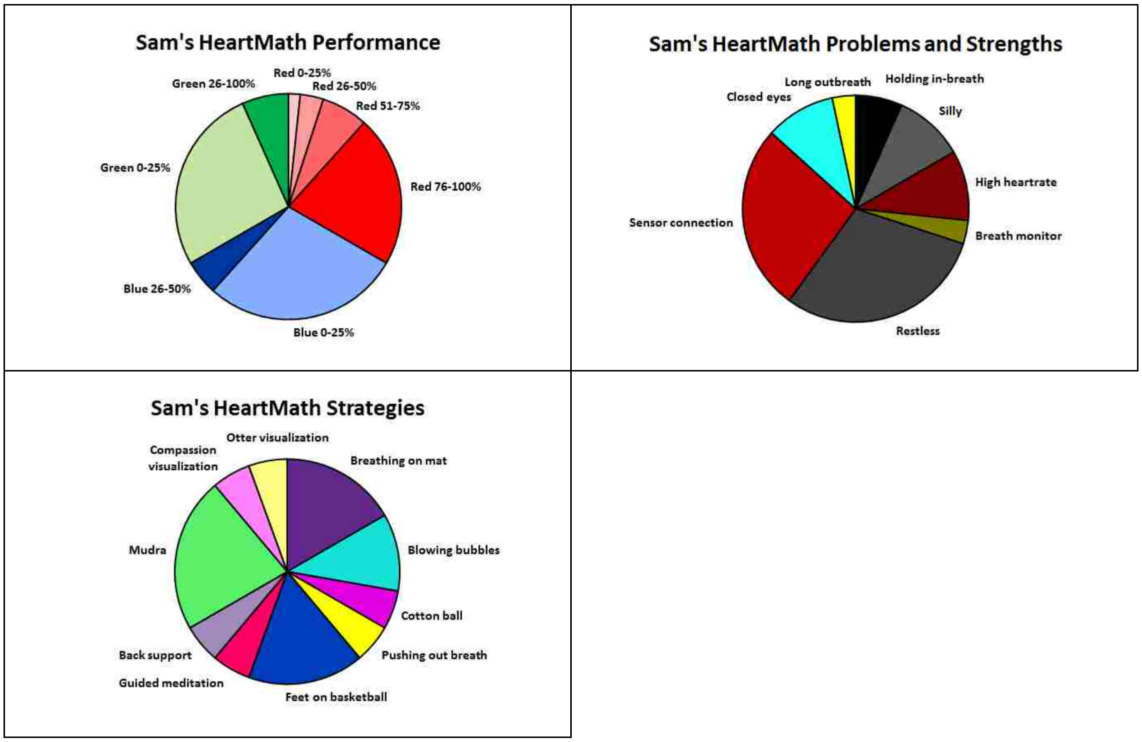


Figure 48. Sam's HeartMath performance, problems, strengths, and strategies.

Sam's HeartMath performance, problems, strengths, and strategies. Sam's HeartMath performance was mostly in the low coherence levels (*Red 76-100%*, 13 excerpts; *Green 0-25%*, 16 excerpts; see "Sam's HeartMath Performance" in Figure 48). He did achieve 100% high coherence on the second session, and he seemed to have had previous practice with meditation—he *Closed* his *eye*s (3 excerpts; see "Sam's HeartMath Problems and Strengths" in Figure 48), put his thumb and forefinger together, and his HRV pattern was long and smooth during that session. Perhaps he had taken his medication on time that day or perhaps it was because he enjoyed the breathing exercise he did beforehand—blowing through a straw to move a *Cotton ball* onto a sticky note goal (1 excerpt; see "Sam's HeartMath Strategies" in Figure 48). He was very focused and concentrated during this exercise. On the following day, I described Sam as "calm" but his coherence level was 81% red and there were seven red lines in the data, indicating problems with the *Sensor connection* to his ear (8 excerpts; see "Sam's HeartMath Problems and Strengths" in Figure 48)—his restless fingers were playing with the wire. The next day, he brought a basketball and I let him put it under his feet and he said it helped him breathe (*Feet on basketball*, 3 excerpts; see "Sam's HeartMath Strategies" in Figure 48). His coherence level was 56% green that day, his second highest that summer. According to Dr. Martha Denckla, ADHD children have challenges *inhibiting* their behavior (Wodka et al., 2007). It is actually easier for them to concentrate if they can move around while they work instead of trying to keep themselves still.

Sam described himself as feeling "silly" three times during the intervention—this was probably a description of what his ADHD felt like to him. HeartMath breathing did not appear to help him. I would ask him to describe his feelings before and after HeartMath—his ratings never changed. He was often very *Restless* (9 excerpts; see "Sam's HeartMath Problems and Strengths" in Figure 48), his hands or fingers moving around. "Was it hard to stay still?" I asked him one day. He shrugged, indicating indifference or depression.

He seemed emotionally withdrawn and detached until his seventh session, when I tried a *Compassion visualization* exercise with him during HeartMath (1 excerpt, see "Sam's HeartMath Strategies" in Figure 48). "Let's try an experiment. Imagine someone else from your class who doesn't have any friends and do something nice for him, like giving him candy." During the session, as he tried this exercise, he wiped tears from his eyes; he began nodding his head vigorously. His coherence level increased dramatically. When he left that day, I touched him on the shoulders and he grabbed my hand quickly.

On Sam's ninth session, he was very restless and I tried another breathing session with him on the floor. He shrugged when I asked him if he felt any differently afterwards, and while his coherence levels were still low, his heart rate did drop dramatically—from an average of 121 beats/minute down to 78. He started talking about his ADHD medication that day; he had not taken them that day. He was angry at himself for forgetting them; he said it was his job to remember them. On his thirteenth HeartMath session, he said he was feeling better because his medication had "just kicked in."

On Sam's fifteenth session, he was angry at me because he had to miss his Physical Education class (P.E.) in order to see me, but he could not tell me this until he wrote about it in his journal. Knowing how important P.E. was to him, I let him go immediately and told him to tell me right away if it happened again. The next day I had him do two HeartMath sessions—the second one was on the floor, listening to the Otter meditation while he was holding a picture of an otter. This improved his coherence level from 0% to 37% on the second session.

During Sam's last three sessions, his coherence level was 0% and he seemed to be in a bad mood every time. On one day, he may have been angry because he was missing a dance practice session, although he did not express this to me. His heart rate was erratic and he could not still on those days either. There were a lot of red lines in his data, indicating problems with the ear sensor connection due to restlessness.

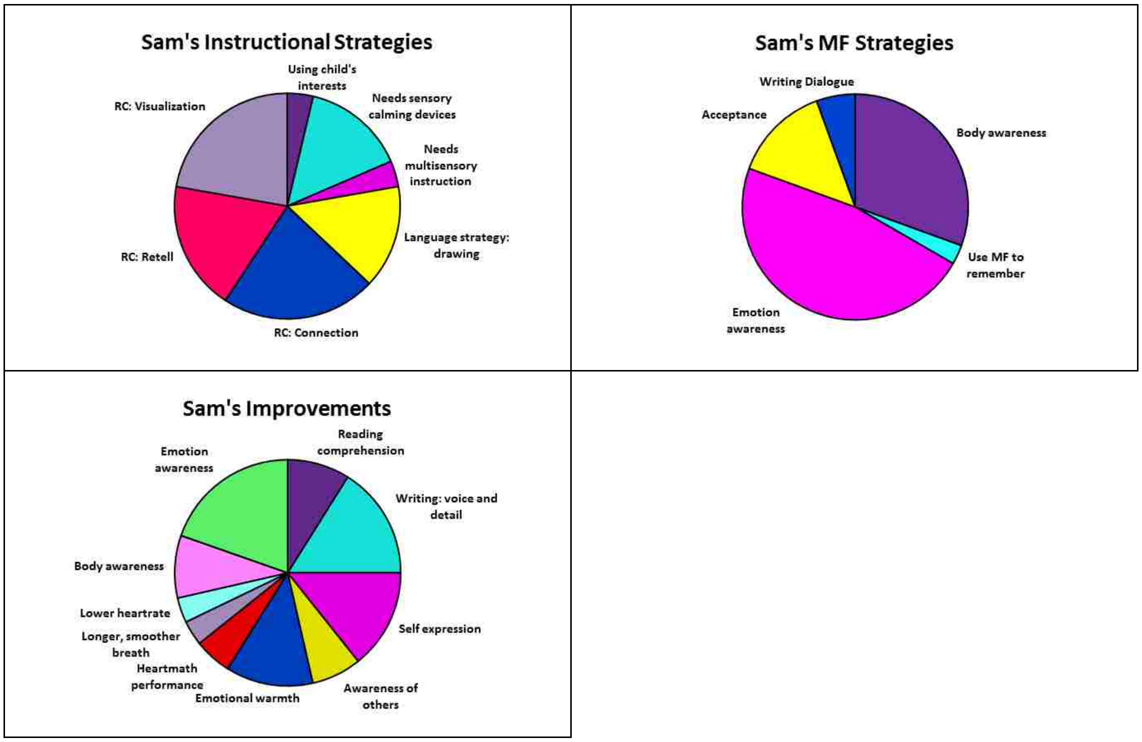


Figure 49. Sam's instructional and MF strategies and improvements (RC: reading comprehension).

Sam's instructional strategies. I used three reading comprehension strategies with Sam—*Retell* (5 excerpts; see "Sam's Instructional Strategies" in Figure 49), *Connection* (6 excerpts), *and Visualization* (6 excerpts). Sam did not seem interested in the first books I asked him to read; when I asked him questions, he shrugged and could not remember the story. However, when he was reading something that he enjoyed (e.g., a joke book), I noted that he "liked most of the jokes—usually got them too." This was an indication that his comprehension may have had a lot to do with his boredom and/or interest level (*Using child's interest*, 1 excerpt). It is much easier to sustain attention and engagement, thereby improving task performance, with high levels of motivation (Posner, Rothbart, Sheese, & Kieras, 2008). Sam also said that reading jokes had brought his "mad" level down from a "10" to a "6."

Sam seemed to enjoy drawing (*Language strategy: Drawing*, 4 excerpts; see "Sam's Instructional Strategies" in Figure 49) and it improved his reading comprehension and engagement with the text, when he had a connection to the storyline. One day I read a story to him while he drew pictures about a girl who was embarrassed about not bringing a gift to a birthday party because her father had lost his job. "What would you do?" I asked. He said, "I'd call her and tell her it doesn't matter." When the main character gave a note to the embarrassed girl that thanked her for being a friend, Sam wrote that she was feeling "good for doing something nice for her freinend [friend] that did not get to bring her a present."

Sam's MF strategies. Journal writing helped Sam develop *Emotion awareness* (17 excerpts; see "Sam's MF strategies" in Figure 49). On July 10th, I wrote in my field notes that "it seems easier for him to write than talk." On his sixth session, I asked Sam to write about a time he felt bad. He began writing very quickly. He wrote that he was feeling bad because a kid wanted to play football with his friends.

> My frend said [said] no you can't and I felt bad so I went to get one of my balls and I said you want to play with me and he said yes so me and him played football by are salefs (ourselves). I said that not faire if I get to play and he do'nt.

He told me that playing with the kid made him feel proud and I talked to him about the meaning of the word compassion. The next day, I tried the compassion visualization exercise with him during HeartMath, and afterwards he wrote enthusiastically about the picture he had visualized. "…I had a big smiel [smile] because it made me fell [feel] good for doing something nice for someone that had no frenides [friends]…"

Then we began to explore his negative feelings of anger and restlessness in his journal. During his ninth session, he wrote about feeling "silly" because he took his ADHD medication late that day. The next day, I asked him to draw "frustration." He drew the flushed cheeks of anger, and it appears that he first drew a straight line for the mouth (grim, determination, holding it in) and then drew a large frown over it (see July 9, Figure 50). The following day he chose the "ants in the pants" flashcard as his feeling for the day. I asked him to draw this feeling for me *(Body awareness*, 11 excerpts). Becoming very concentrated and focused, he drew the ants in his chest and left leg (see July 10, Figure 50). Prior to this time, I had not been successful in getting him to tell me where he felt the restlessness in his body—he would just say "arms" and shrug. He wrote that if the ants could talk they would be saying "we are going to bit [bite] you and you are not going to like it…"

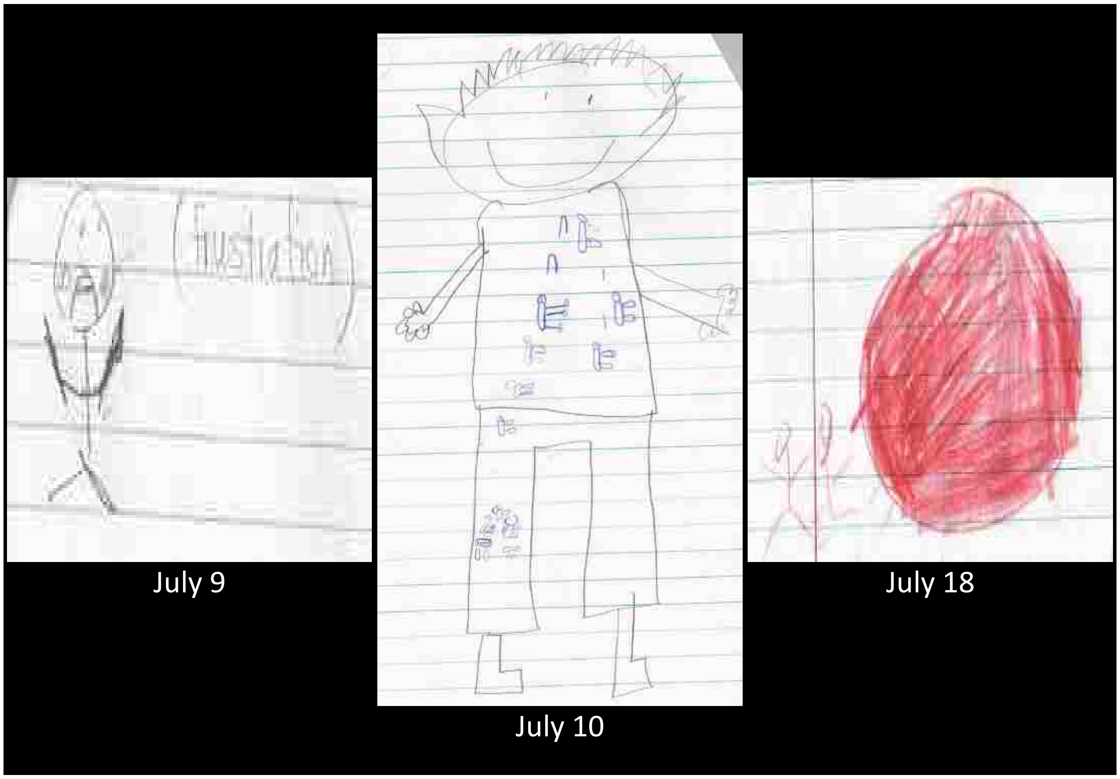


Figure 50. Sam's drawings.

On Sam's tenth day, when it was clear that he could not think straight while reading, I tried several more "experiments" with him. He had described himself as having a frustration level of "7." Breathing did not change the level for him. Bouncing a ball did not help. But after throwing a ball back and forth to me, getting faster and faster at throwing and catching, he said his frustration level had come down to a "3."

The next day, he wrote about his medication again, writing that he felt angry because he took his medication late that day and he needed to take them earlier in the morning when he woke up so he would feel normal. "I will not feel silly or I will not fell [feel] mad I will just fell rite."

During one of his last sessions, Sam looked very withdrawn, holding himself away from me. So I tried a writing dialogue with him about his sad feeling. (*Writing* *dialogues*, 2 excerpts) He became very expressive and fluent during these writing dialogues, describing his feeling as a "big hot red mad ball" that seemed to be chasing two small stick figures (see July 18, Figure 50). During his next session, we had another writing dialogue about being "hyper." He drew a face with a crooked smile that looks as if it is winking at the viewer and began to write in capital letters when I asked him if the feeling was loud or quiet. He wrote that the feeling said "YOU ROCK AND ROLL."

Sam's improvements. On his last day, Sam wrote that he learned "that some days I was sill [silly] good mad bad Just rite and that you can do nice things for people." This was a perfect summary of his self-discoveries that summer—of the full range of his emotions and of how he felt when doing "nice things for people" (*Emotion awareness*, 11 excerpts; *Body awareness*, 5 excerpts; *Emotional warmth*, 7 excerpts; see "Sam's Improvements" in Figure 49).

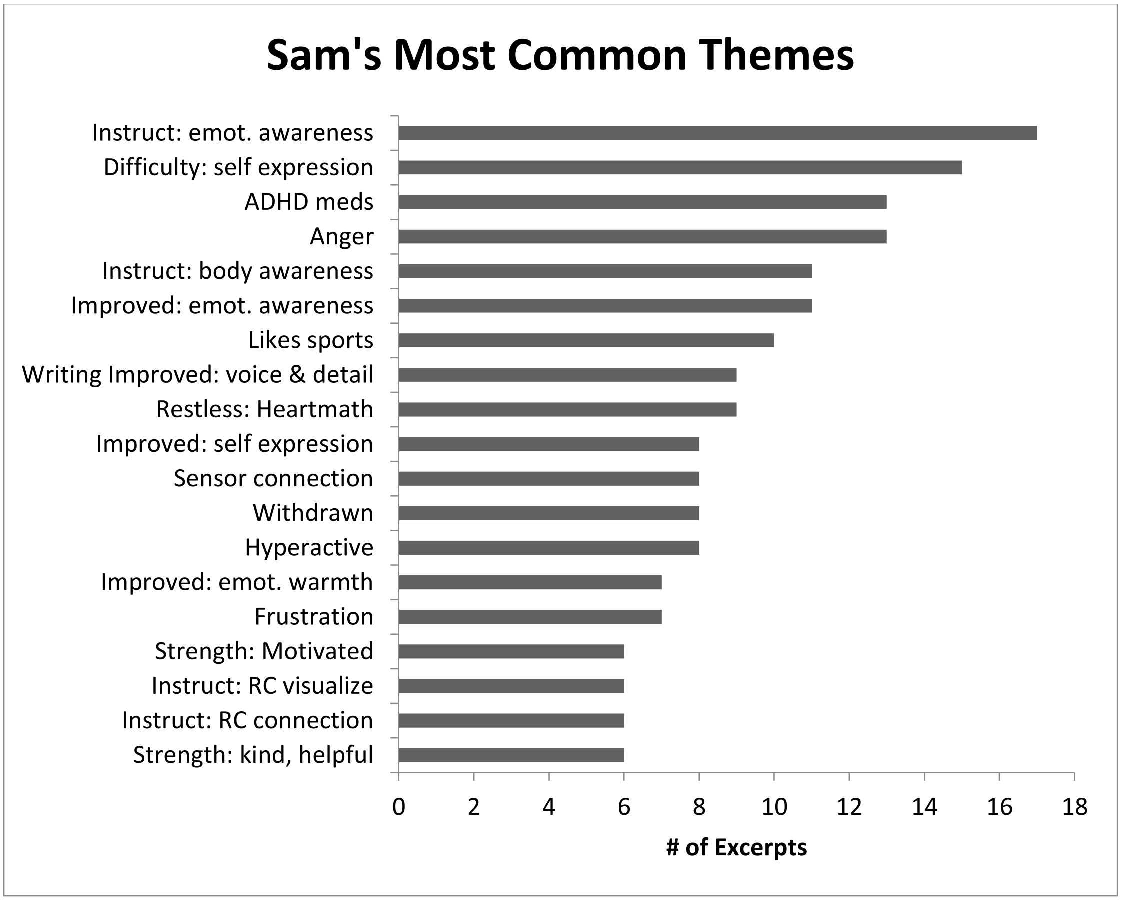


Figure 51. Sam's most common themes (RC: reading comprehension. Emot: emotional).

I spent most of my time on emotional awareness instruction with Sam because he could not express emotions and they seemed to be interfering with his ability to concentrate on academic tasks (see Figure 51). Two more of Sam's major themes were anger and his ADHD medication. Sam's increase in hyperactive behavior and expressions of anger over the summer may have been because he was in the process of discovering his emotions. Also, his hyperactive behavior seemed connected to unexpressed feelings of anger when he had to miss a dance rehearsal or P.E. Sam also discovered the emotion of compassion—that helping other children was something very important to him. In my recommendations for teachers, I suggested that Sam could be a playground monitor, someone who helps resolve conflict or involves loners in play activities, that writing what he was feeling or thinking was a good outlet for him, and that he needed to read stories that were meaningful to him.

Clara: the Girl Who Got Lost in Princess Daydreams but Woke up When the Teacher Stomped Around the Room

Table 13

Clara's General and Cognitive Information and Quantitative Test Scores

Age	**Sex**	**Ethnicity**	**ELL**	**Label**	**Level**	**IQ**	**Nonverbal Ability**	**Proc. Speed**	**WM**
8 yrs., 5 mos.	F	Hispanic	No	SLD	D	84 Low Average	100 Average	73 Borderline	91 Average
Mood Average	**Reading Attitude Average**	**Reading Confidence Average**							
5.0	5.0	3.0							
Test	**Pre**	**Post**	**PrePost DIF**	**Fol**	**PreFol DIF**				
Oral Rdg. Average	18.7	17.7	-1	24.3	5.7				
Retell Average	5.3	0	-5	10	4.7				
Phonics Test	15	17	2						
Writing Voice	2	5	3						
Wtg. Word Choice	2	4	2						
LD Nonword Accuracy	79%	79%	0%						
LD Nonword RT	1791.98	2059.92	744 ms						
LD Word Accuracy	77%	74%	-3%						
LD Word RT	1546.67	2006.16	460 ms						

Clara was the youngest of the experimental students and the only one of the Level C or D students to have an average WM (91; see Table 13), but her processing speed was very low (73). While her IQ was low average (84), her nonverbal ability (visual/spatial processing and problem solving with pictures) was average (100). Her school records indicated that, during her cognitive assessments, Clara struggled "with timed paper and pencil tasks…" Clara improved on most of the quantitative tests—by 5.7 words on the follow-up oral fluency test, by 4.7 words on the follow-up retell test, and by 2 points on the phonics test. She improved a lot on her writing test—by 3 points (or 50%) on the voice test and by 2 points (33%) on the word choice test. Her accuracy on the LD nonword subtest was the same on the posttest; her accuracy on the LD word subtest decreased by 3%. Her RTs on both of the LD subtests substantially increased (+744 ms on the nonword test and +460 ms on the word test). An emerging reader (reading at a first-grade level), I taught Clara to use metacognitive strategies and to increase her focus while reading, so her increased RTs could have been due to increased reflectiveness during decoding.

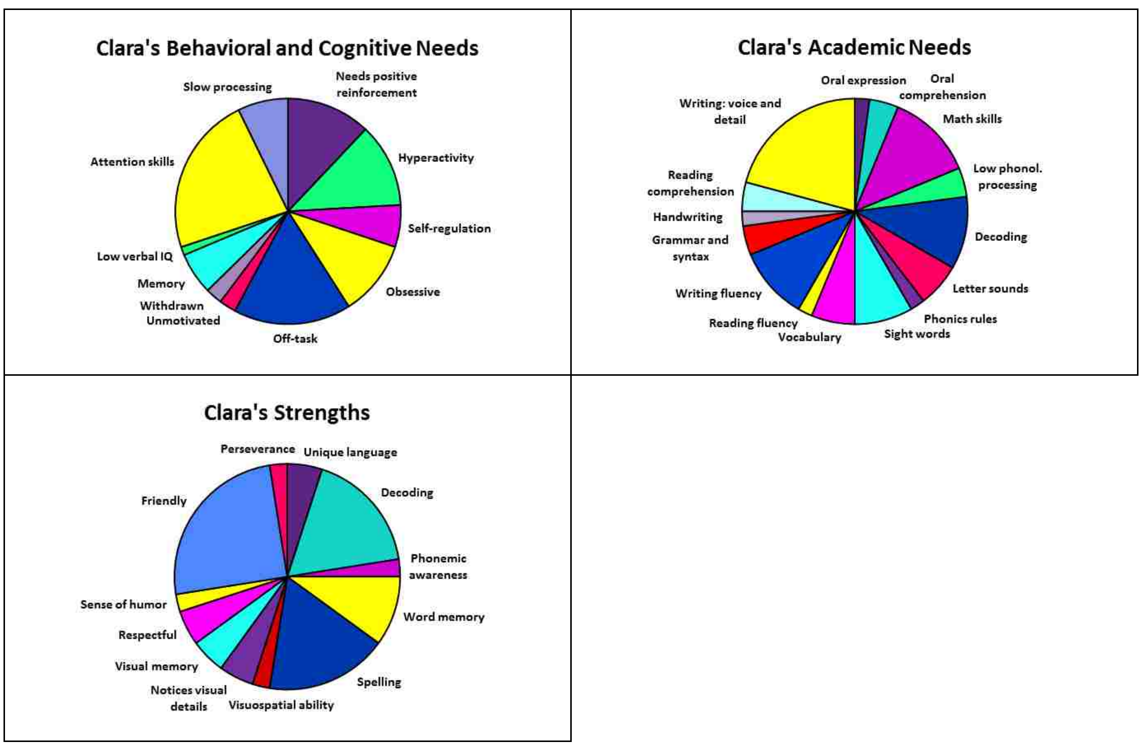


Figure 52. Clara's behavioral, cognitive, and academic needs and her strengths.

Clara's behavioral and cognitive needs. In her school records, Clara's second grade teacher reported that Clara did little or no writing in class, often sitting for as long as 20 minutes and only writing her name (*Off-task*, 14 excerpts; see "Clara's Behavioral and Cognitive Needs" in Figure 52). An observer noted that, "One day Clara did write one sentence with the teacher working with her one-on-one during the entire writing time." She often bothered other students and fixated on things, like moving her fingers back and forth in front of her face. This is reminiscent of self-stimulatory behavior, or the repetition of body movements common in people with developmental disabilities. She also became fixated on objects (*Obsessive*, 9 excerpts). "She will see something on the floor such as a crayon and crawl on the floor going under the table and over people's feet to get to whatever she sees on the floor," reported her teacher in her school records. Her evaluator also observed that Clara found it difficult to sit quietly and would frequently turn around in her chair, lie on her back in the chair, and put her feet on the wall while answering questions (*Hyperactivity*, 10 excerpts). The assessor did not think that Clara was resistant to completing tasks, but rather that she needed encouragement to continue (*Needs positive reinforcement,* 10 excerpts). However, even with one-on-one attention, close supervision, and encouragement, Clara still found it difficult to focus and write short sentences.

Clara's academic needs. It is hard to know how many of Clara's academic needs (namely, *Writing: Voice and detail*, 10 excerpts, *Writing fluency*, 5 excerpts, *Decoding,* 5 excerpts, and *Math skills,* 6 excerpts; see "Clara's Academic Needs" in Figure 52) were caused by her excessive absences. Her school records said she had been absent on 27 out of 146 school days (19%) in second grade, and absent on 29 days (20%) in first grade. However, Clara's life situation had greatly improved recently. Her records reported that, by the of the end of March (three months prior to the intervention), she started "living with her grandma and attendance has gotten much better."

Clara's strengths. The diagnosticians who assessed Clara for her initial evaluation found her to be friendly and outgoing (*Friendly*, 10 excerpts; see "Clara's Strengths" in Figure 52). They reported that "she often had a smile of her face and interacted verbally with ease." *Spelling* (7 excerpts) was a relative strength for Clara. She spelled slapped as "slapt" in her initial writing sample, including the first and final consonant blends (/bl/ and /pt/)—this is unusual for an emerging reader. Her school records said she displayed average skill in *Phonemic awareness* (1 excerpt)—deleting and blending sounds in words. *Decoding* (7 excerpts) was also an area of relative strength. On her first day with me, Clara easily read most of the feeling words on one of my posters. When I told her that I thought she might become a good reader, she said she wasn't a good reader in class. "You may be better than you think," I said. During the intervention, I wrote that she seemed to have a good memory of words and read relatively well, especially when compared to the other Level D students in the study. Clara also had a unique and funny way of expressing herself (*Unique language*, 2 excerpts). One day, when I told her to close her eyes during HeartMath, she said she was "looking at [the inside of] my eyeballs."

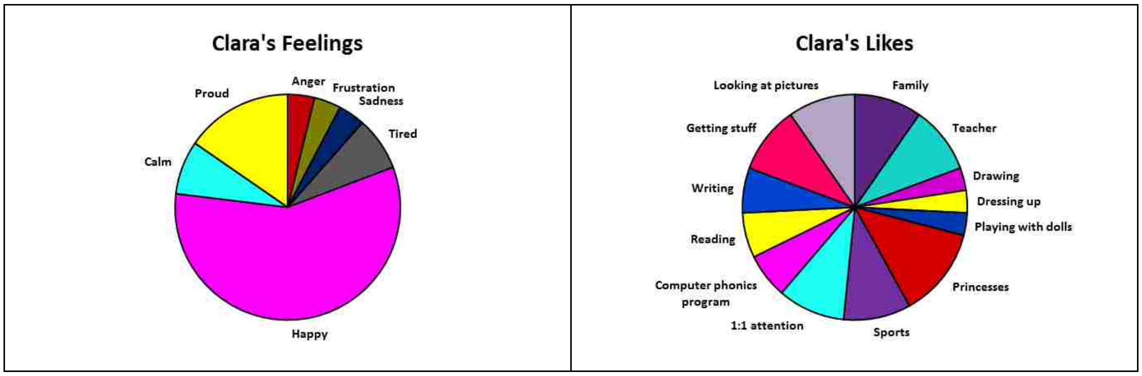


Figure 53. Clara's feelings and likes.

Clara's feelings. Clara liked to use the word "proud" a lot in her writing, even after I explained that it meant you did something special (*Proud*, 4 excerpts; see "Clara's Feelings" in Figure 53). "I like [like] princess bceas [because] they mak [make me] feel proud." Another time she wrote that her grandmother made her feel proud. She was unique from the other participants in that her prevailing emotion was *Happy (*15 excerpts), often laughing and hugging me. She frequently chose emotion flashcards like "happy" or "delighted," writing that she loved bunnies "Becuses [because] they Delight me." However, on her 11th session, she started writing about being mad or sad for getting in trouble for not doing her work. "I feel mad because I dit [didn't] do my math."

Clara's likes. Clara loved to read and write about *Princesses* (4 excerpts; see "Clara's Likes" in Figure 53). According to her grandma, she liked *Reading* (2 excerpts) small books at home and Clara told me on the first day, after saying that she liked "all the rainbow colors" in my room, that she liked *Writing* (2 excerpts). She also loved having *One-on-one attention* (3 excerpts) from adults.

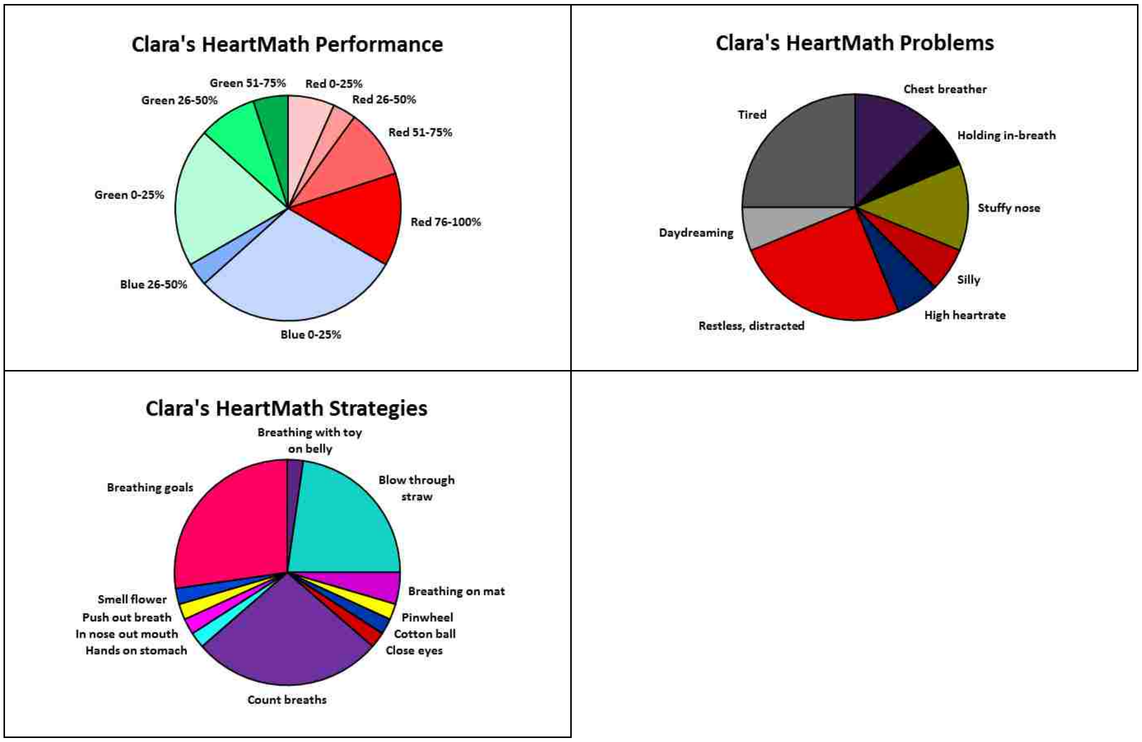


Figure 54. Clara's HeartMath performance, problems, and strategies.

Clara's HeartMath performance, problems, and strategies. During her first 11 sessions, Clara's coherence levels were very low, with six of those sessions being at 100% red (*Red 76-100%*, 8 excerpts; see "Clara's HeartMath Performance" in Figure 54). After her 11th session, Clara's levels of medium (*Blue 0-25%,* 18 excerpts) and high (*Green 0-25%,* 12 excerpts) coherence did begin to improve, and she scored a high coherence level (green) of 66% on her last day.

One of my early impressions of Clara was that she was lost in daydreaming a lot of the time. On her third session, I wrote in my field notes that I was "still trying to reach her—she's far away. Somehow detached." This made it difficult for Clara to focus long on anything, including her breath, because she was often *Restless, distracted* (4 excerpts; see "Clara's HeartMath Problems" in Figure 54). On her first HeartMath session, she came into my room out of breath from recess and said her "heart feels like I get 12 candies," an original way of saying her heart was beating fast, and it was (*High heart rate,* 1 excerpt). Her average heart rate was 111 that day, the highest for her all that summer and her HRV waveforms looked like a succession of uneven, jagged peaks. Almost four minutes long, this HeartMath session was too long for Clara.

Because she could only maintain focus for a short period of time, I kept the duration of her remaining sessions under a minute. I started to instruct her to *Count breaths* (12 excerpts; see "Clara's HeartMath Strategies" in Figure 54) and set *Breathing goals* (12 excerpts) with her, asking her, "How long can you pay attention to your breath?" She usually chose between 10-20 breaths. This initially helped her to become focused on breathing in through her nose, but she quickly became distracted and started looking around the room. On her third day, I prepared Clara for her HeartMath session by counting 11 breaths with her, then I watched her carefully to see how long she could stay focused. After 48 seconds, I stopped the HRV recording because she started daydreaming. I said, "I don't know where you go." Clara smiled and said she did not know either. So she wasn't conscious, at that point, of what she was thinking about while daydreaming.

On her eighth day, I started having her *Blow through a straw* (10 excerpts) while she lay on the floor. I held my hand directly above the straw so I could feel and count her out-breaths. I wrote in my field notes, "For the first time, I could see her small body relax, as if my counting held her somehow." I used this straw technique with her for the remaining HeartMath sessions, and her coherence levels began to steadily improve.

Two sessions later, she was able to tell me what she had been thinking about while breathing—"a real pink dog" like the stuffed one on her stomach (*Breathing with toy on belly,* 1 excerpt). She got her highest coherence score of the summer (70%) on that day—perhaps the stuffed animal helped her relax.

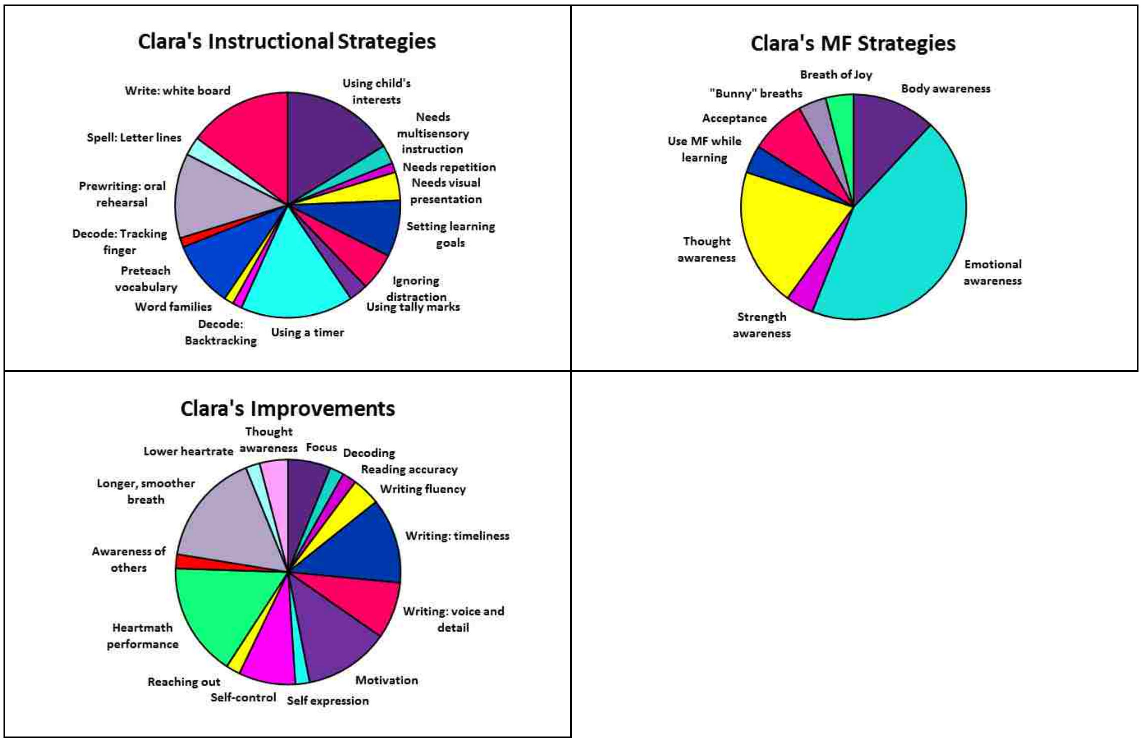


Figure 55. Clara's instructional and MF strategies and her improvements.

Clara's instructional strategies. As noted in her school records, writing was extremely difficult for Clara. It often took her as long as ten minutes to write a sentence with six words, and this was with constant encouragement from me. When writing with a pencil on the first day, she perseverated on the mechanics of writing (e.g., erasing letters—cheap erasers left a smudge behind on the paper that she tried unsuccessfully to remove). She often stared into space, having forgotten what she wanted to write. She got on and off her chair to rearrange the cushions. The next day I gave her a *White* *board* (11 excerpts; see "Clara's Instructional Strategies" in Figure 55) and dry erase markers. She liked writing on this much better (it was easier to erase the letters), but she had to position herself just right. "This thing is bumping [the white board]," she said.

I began experimenting with ways to raise Clara's energy level because she usually appeared to be in an dreamy alpha state, frequently "spacing out" and complaining of being tired. One of the school's recommendations was to incorporate physical activity into Clara's instruction. Because she was dawdling on the way to our class, and displaying avoidant behavior (e.g., disappearing into the bathroom when someone went to pick her up), I asked my RA to "run" with her to our classroom—Clara loved doing that. I also think that it "speeded her up" or raised her energy level.

I also tried other things to "speed her up" when she was writing. I had her set a writing time goal (*Setting learning goals,* 6 excerpts). *Using a timer* (12 excerpts), I set it for the time goal she had chosen that day and then started it, the digital display reminding her of the passing minutes. On the eighth day, I made a game out of *Ignoring distraction* (4 excerpts). Because she had been very distracted by magnet letters on the white board, I challenged her to "see if you can ignore" the magnet letters I was throwing on the board. She enjoyed it and did very well. She even reminded me to do it the next day. She liked it when I tried to distract her while she was writing—in fact, she seemed to be more focused when I was *trying* to distract her. She asked me to make noises—so I sharpened my pencil, played music, shook a box full of candy, banged cabinets, and stomped around the room, often making her laugh. On her 13th session, she went back to using pencil and paper because the faded ink of dry eraser on the white board bothered her. She liked using a mechanical pencil because breaking the lead, and the difficulty of sharpening a pencil with substandard pencil sharpeners, was no longer a problem.

Because one of my goals was to increase Clara's motivation to read and write independently, I ordered a set of Disney princess books for her to read (*Using child's interests,* 12 excerpts). She read these books easily, at an average accuracy level of 98%, but she was very motivated to finish writing her sentence so she could read these books. However, I was not successful in getting her to read these books at home because she kept losing them.

Clara's MF strategies. Another strategy I used with Clara to "speed her up" was showing her how to use energizing breaths (which I called "*Bunny" breaths* [1 excerpt; see "Clara's MF Strategies" in Figure 55] because of the fast in-and-out movements of the stomach) to wake her up and make her more alert. But, as with all the other participants, I worked mostly on *Emotional awareness* (11 excerpts) and *Thought awareness* (5 excerpts) with Clara. During her fifth session, she said when a boy was crying in her class, "I lost my mind." When I asked her what that meant, she said it was "when you can't concentrate."

On another occasion, I showed Clara what she looked like (drooping her head and frowning) because she had been in timeout at recess, and she smiled. During her 16th session, after she had returned from a fieldtrip to the zoo, she was tired and "lazy," in her own words. When writing in her journal, she wanted to lie on the mat in front of the fan. She put her feet on the table and wrote with her book on her knees. I let her do this, making tally marks whenever I observed her off-task or becoming fixated on something, and making comments when she did, always with a very pleasant and teasing tone. "She's distracted by the paper… She's distracted by the letter 'N'" (in "Nana," her grandma). "No, I'm not," she said. "I just need to erase it." I let her lie on the floor to read her new book, but she was very distracted and kept getting up, tossing her hair and standing on her head. I had to count so she would "sit on her bottom" and "look at the words" in the book. "You've lost your mind," I said to her, smiling. Gentle humor worked well with her. After she got her prize that day for reaching her daily goal—to finish her six-word sentence in less than 8 minutes with no more than 6 tally marks for becoming distracted—she gave me a big hug. "Maybe I won't be so lazy tomorrow." Unconditional love and *Acceptance* (2 excerpts) from me helped her become aware of her "laziness" and motivated her to do better the next time.

Clara's improvements. On Clara's second-to-last HeartMath session, she said she was "feeling very tired today" and she was silly, but her coherence level was 50%—her third highest level during the intervention (*HeartMath performance,* 8 excerpts; see "Clara's Improvements" in Figure 55) indicating an improvement in *Self-control* (4 excerpts). On the last day, she chose 30 breaths as her goal, demonstrating an improvement in *Motivation* (6 excerpts) and in *Focus* (3 excerpts). She also appeared more relaxed—I wrote that she had "the face of an angel as she breathed today."

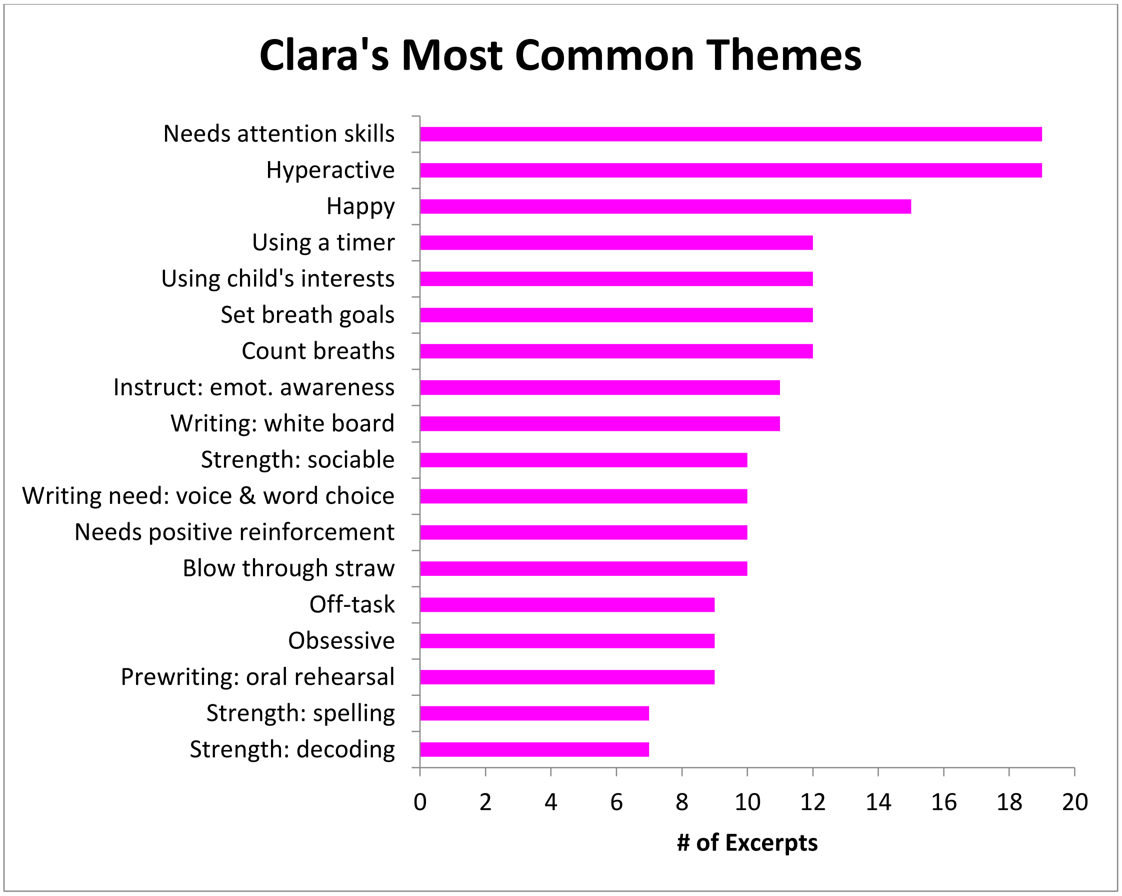


Figure 56. Clara's most common themes (Emot = emotional).

A major theme of Clara's was that she was hyperactive (or restless; see Figure 56) and needed attention skills. I also noticed that she often seemed to be daydreaming, perhaps indicating significantly higher levels of low frequency or *theta* brainwave activity—something that research has found in EEG studies of children with ADHD (Bresnahan, Anderson, & Barry, 1999)—although Clara had not been officially diagnosed as such. In my recommendations to Clara's teachers, I suggested they continue to teach her to overcome distraction by making it into a game and to find other ways to speed up her brainwaves. Also, I observed that using humor to point out when she was distracted seemed to help her "get back on track" and that Clara had a good chance of catching up to an average reading level with more one-on-one instruction.

In my field notes, I speculated that one reason Clara may have been performing so poorly academically is because she missed so much school and because of instability at home. "I think with her grandma's love and attention, and with a supportive teacher, she'll come a long way. She's got a good ear and eye for phonics. She may have been in la-la land because of a home trauma."

Zach: The Boy Who Muttered Around His Father But Found His Voice and His Freedom in a World of Number and Games

Table 14

Zach's General and Cognitive Information and Quantitative Test Scores

Age	Sex	Ethnicity	ELL	Label	Level	IQ	Nonverbal Ability	Proc. Speed	WM
9 yrs., 3 mos.	M	Hispanic	Yes	SLD	B	103 Average	119 Above Average	85 Low Average	100 Average
Mood Average	**Reading Attitude Average**	**Reading Confidence Average**							
3.8	3.4	1.8							
Test	**Pre**	**Post**	**PrePost DIF**	**Fol**	**PreFol DIF**				
Oral Rdg. Average	60.3	59.7	-.7	66.7	6.3				
Retell Average	46	33	-13	32.3	-13.7				
Phonics Test	17	17	0						
Writing Voice	5	3	-2						
Wtg. Word Choice	4	3	-1						
LD Nonword Accuracy	89%	92%	3%						
LD Nonword RT	2030.92	2052.31	45 ms						
LD Word Accuracy	87%	84%	-3%						
LD Word RT	1748.93	2464.38	716 ms						

Zach was one of the two experimental participants with above average Nonverbal ability (119; see Table 14). in visual and spatial processing and nonverbal reasoning. His lowest cognitive area (92, but still within the average range) was on the Knowledge scale of the Kaufmann Assessment Battery—a scale that assessed crystallized intelligence, or answering questions about words and facts in addition to reasoning skills. Knowledge of words/facts could have been impacted by his status as an English Language Learner (ELL). He also had an average IQ (103) and WM (100).

Zach started the intervention by rating himself at the top of each self-report scale, but then he became more aware of his negative emotions than other participants, with the lowest averages on all three self-report scales (Mood: 3.8; Reading Attitude: 3.4; Reading Confidence: 1.8). His score increased on two of the quantitative tests (oral reading fluency: +6.3 words; LD nonword accuracy: +3%), while decreasing on four others (retell fluency: -13.7 words; writing voice: -2 points; writing word choice: -1 point; LD word accuracy: -3%). His RTs increased a little on the LD nonword subtest (+45 ms) and more on the word subtest (+716), indicating a possible increase in reflectiveness during decoding.

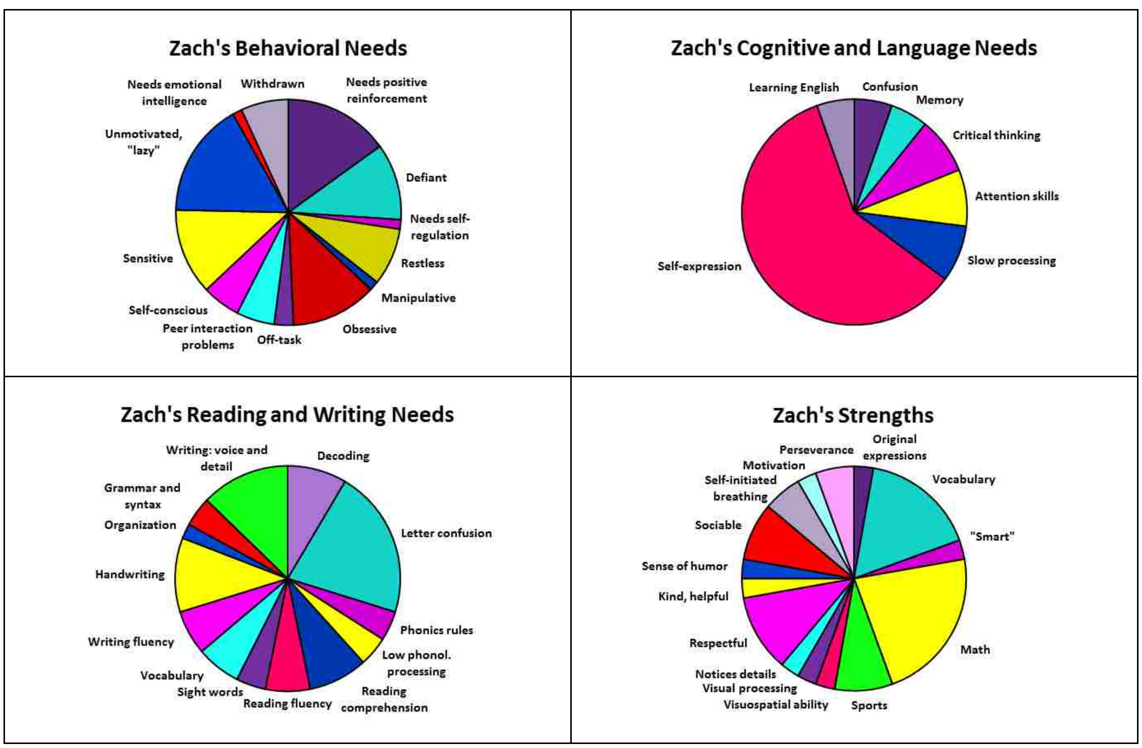


Figure 57. Zach's behavioral, cognitive, language, reading, and writing needs and his strengths.

Zach's behavioral, cognitive, and language needs. Zach's school records documented an observation of him in a bilingual literacy class. In comparison to his peers, Zach was noted to work more slowly (*Slow processing,* 3 excerpts; see "Zach's Cognitive and Language Needs" in Figure 57), have poorer language skills, focus, and attention span (*Attention skills,* 3 excerpts), was less active, had higher frustration and difficulty with content, less emotional maturity, and he appeared to be disinterested. He did not participate in activities (*Off-task,* 2 excerpts; see "Zach's Behavioral Needs" in Figure 57), was not responsive to the teacher or his classmates (*Withdrawn,* 5 excerpts), "does not start tasks on time but does stay on task, does not answer when called on (shyness), does not show independence, and does not seem alert." At the school's assessment meeting, Zach's father said he did not think his son was disabled, just "lazy" or not interested (*Unmotivated, "lazy,"* 12 excerpts). Zach was often *Defiant* (8 excerpts) with me, doing the opposite of what I asked, but responded well to positive reinforcement and humor (*Needs positive reinforcement*, 11 excerpts).

Zach was sometimes hard to understand when he was anxious or upset, whispering or mumbling (*Self-expression*, 22 excerpts; see "Zach's Cognitive and Language Needs" in Figure 57). On the first day of the intervention, I noticed that Zach was whispering to himself. "I hate this," he whispered, when working on making a paper face of himself for my bulletin board. He said that he got distracted easily and "I forget a lot." He also said he did not want to be in summer school. He wanted to start talking about his video games right away. He was much more serious and mature when I interviewed him at his house, but his speech was often disjointed and rambling. When

I asked him what he liked to do for fun, he said this:

> Sometimes like, um, just lay there and sometimes when I, I, um, and then I, sometimes for fun when I'm bored, like I can't play games…but, I don't know, I just don't want to 'cause everything is boring now. I just like, and then go to tell [his brother] to knock the door 'cause I'm very afraid…

When I asked him what he was afraid of, he said he did not know how to say the word in Spanish and then started talking about his bilingual teacher.

Zach's reading and writing needs. Despite his average performance on the Phonological Awareness test, the school assessment team that assessed Zach and collected information about his academic performance said he struggled in phonemic awareness and phonics (*Low phonological processing,* 2 excerpts) and was below average in *Decoding (*4 excerpts) and *Reading comprehension* (4 excerpts). They also said he became frustrated with long reading tasks (*Reading fluency,* 3 excerpts).

Zach had writing goals in his school records, and his teachers said that he had trouble thinking of what to write (*Writing fluency, 3 excerpts)*, made significant spelling errors (e.g., spelling "as" with a "z" instead of an "s"), and had difficulty with *Organization* (1 excerpt) and writing complete sentences (*Grammar and syntax,* 2 excerpts). He consistently wrote "b" for "d" (e.g., "spiber" for "spider"; *Letter confusion,* 10 excerpts). Although Zach was not determined by the school district to have DYS, young children with DYS (7-10 years old) reverse easily confused letters more frequently than children without DYS (Wolff & Melngailis, 1996).

Zach's strengths. Zach loved numbers, and had above average skills in *Math* computation (8 excerpts; see "Zach's Strengths" in Figure 57). Although Zach could sometimes be difficult, he could be *Respectful* (4 excerpts) and *Sociable* (3 excerpts) and sometimes he *Self-initiated* breathing (2 excerpts) to calm himself down. He also had a good *Vocabulary* (6 excerpts). For example, he used the word "accepted" in one of his journal entries to describe how he felt around one of his friends. "I fel [feel] accepted az a frend [friend]."

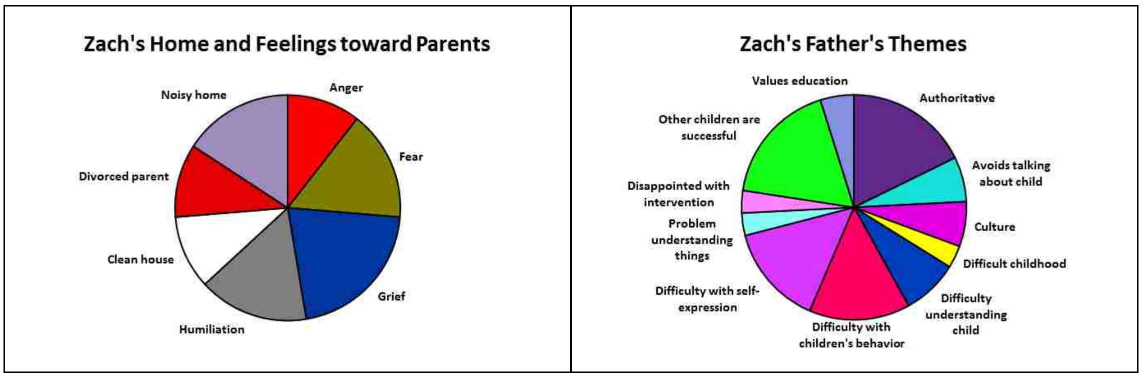


Figure 58. Zach's home and feelings toward parents and his father's themes.

Zach's home and feelings toward parents. Zach lived at home with his father, one brother, and his grandmother. During the first interview, our impression was that the house was *Clean* (2 excerpts; see "Zach's Home and Feelings Toward Parents" in Figure 58) and orderly and that Zach appeared to be very smart and engaged, working hard to get his answers just right.

Zach's father seemed like a supportive parent in his first interview. I thought he would be happy to hear Zach read the books he took home to practice reading. However, on his fifth day, Zach came in angry (*Anger,* 2 excerpts) because his dad made him bring his books back, but refused to sign Zach's homework slip so he could get a prize. When I tried to straighten things out by calling his father and having Zach talk to him, Zach could not hold the phone up to his ear and was barely audible. I could hear his father saying, "Speak up! I can't hear you!" Afterwards Zach wrote, "I Got vere ninvis [very nervous] and I bibnt toc [didn't talk] to mi Dad that wel" (*Fear*, 3 excerpts).

The next day, Zach was again very angry. When I asked him if he had read the books he had taken home to his father, Zach told me that his dad had told him that he was "busy." Then he told Zach to find his books, but he could not find them. The next day he wrote "I am wird [weird] and Dumb in m bran [my brain]!" (*Humiliation,* 3 excerpts). And then he said, "Don't give me another book to take home."

In his first interview, Zach seemed nervous around his father, who often seemed intolerant or unaware of Zach's sensitivity. When I asked Zach if he got in trouble at home, his speech became confused and jumbled, talking about his older brother. "I think I remember from a long time ago, I think five years, or six ago, um, I think he got mad 'cause, um, he had lost something so he got very mad…" Here his father cleared his throat, as if warning his son not to talk about this subject. So Zach quickly finished. "He, I don't know, I think, no, he just got mad, very mad. That's all." During his post-interview, when his father left the room, Zach whispered to himself, "I think he's going to laugh at me."

While Zach was often angry or afraid of his father, he felt *Grief* (4 excerpts) about his mother. One day he said, "I feel sad when I close my eyes and think of someone I love." After playing a guessing game with him about who he was thinking about, he told me it was his mother, who he had not seen his in two years—except on Mother's Day.

Zach's father's themes. Zach's father spoke often of his other three children in the first interview (two of them were now adults), telling us how educated they were (*Other children are successful,* 11 excerpts; *Values education,* 3 excerpts; see "Zach's Father's Themes" in Figure 58). He did not usually refer to his children by name, using "older one" and "the young one" or "the other guy" frequently. He said that Zach was "outgoing and happy" as a baby, and that he had to take full custody of him when he was three years old. It was important to him that his two younger sons learn Spanish, but they "don't want to do it. So I'm just keep, keep pushing it… It's like, you know, I have to threaten 'em with, taking the Xbox… away." He did not think Zach had a learning disability; he thought he was lazy and gave Zach's reluctance to get up in the morning as an example. He said when it came to homework, Zach cried and threw a fit (*Difficulty with children's behavior,* 9 excerpts). "But then he sits down and starts doin' it and then he works and he gets it done, it's like, I'll tell him, 'See, it took you longer for you to throw a fit than getting it done." Later, when trying to help his father understand Zach's low grade in reading on his report card (*Problem understanding things*, 2 excerpts), I said, "Maybe when he reads something, he doesn't always understand it?" His father's reply is very interesting:

> Yah. He, like I said, he's, he gets frustrated right away. His world shuts down quick and he will start with the crying. It's like he's releasing 'em at a point. Right away. Tears. I don't know where they come out of, right away. It's like rivers, you know? [Slight laughter]. I'm like, "What's wrong with you?" You know?

Here his father recognized that his son needed to release his tears, but did not understand why he was crying (*Difficulty understanding child,* 5 excerpts). And he said when he asked Zach what was wrong with him:

> …he'll shut down. So we have to, uh, start it all over again, you know? "Go rinse your face, come back, we'll do something else different," you know, in a different way. And then, then he'll get the momentum and the attitude to tack, tackle the job.

Being *Authoritative* (11 excerpts) is another theme of Zach's father. He implied that he had been strongly disciplined as a child (*Difficult childhood,* 2 excerpts):

> You can't have your children run over you. But, uh, uh, I mean, I, I haven't, I haven't had to exercise that, that belief, you know? When I [emphasis] was growing up, I'm telling you, they think there's child abuse now, that's child abuse [emphasis] when I [emphasis] was growing up. [Laughs] So, I turned out okay, you know. It worked.

But he said he did not spank his children and he thought they misbehaved around him "because they know they can get away with it."

His father was not completely negative about his son. He said his teachers thought Zach was smart, and that he had a good heart and liked helping other people. He also said his sons were much better than he was at "technology," often teaching him how to do things like copying and pasting a video from YouTube into his listings on eBay.

In the second interview, Zach's father told his son to speak up a few times while Zach tried to describe his HeartMath performance to him and how it helped him become calm. After the interview, his father said Zach was already calm and he did not shut down "very much now." He seemed *Disappointed with intervention* (2 excerpts). When I asked him if he had noticed any changes in Zach over the summer, he said, "Yes. I notice he's a little bit, pays attention more. He's still the same old lazy kid."

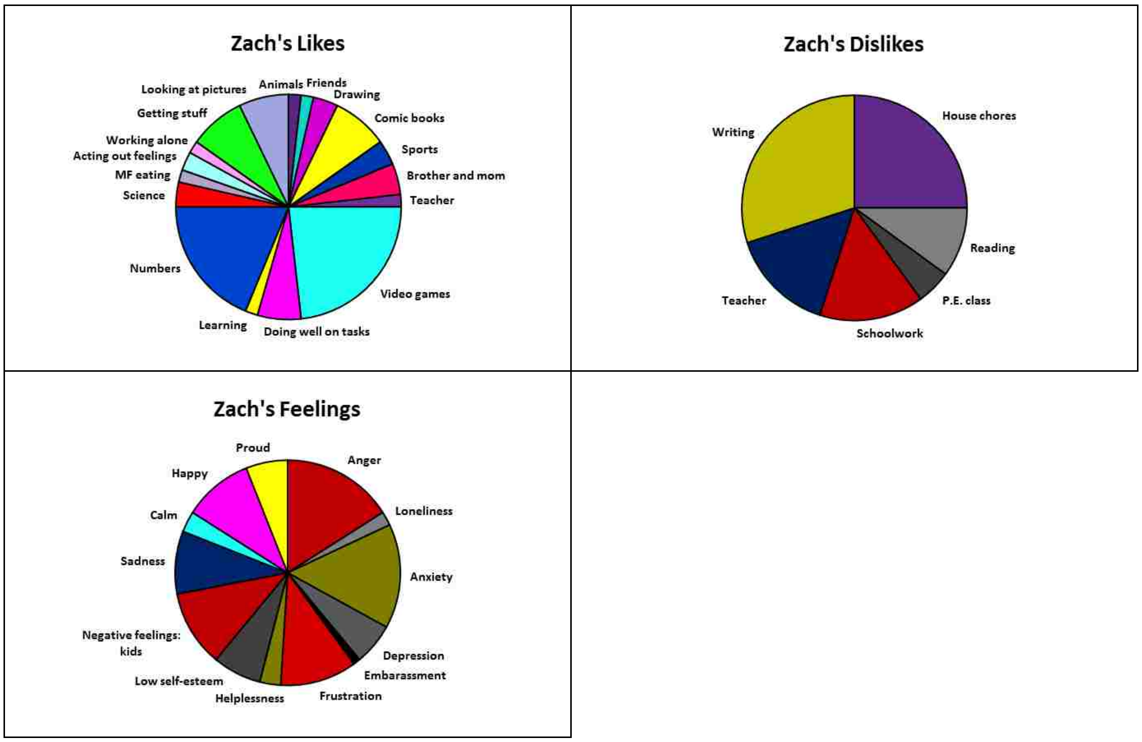


Figure 59. Zach's likes, dislikes, and feelings*.*

Zach's likes and dislikes. During Zach's first interview, he said he liked math because "you don't need to like, like, um, read, you have to just like, um, subtract or plus in your mind" (*Numbers,* 21 excerpts; see "Zach's Likes" in Figure 59). He also said he liked math because "you don't need to like, like, um, read…" (Dislikes *Reading,* 2 excerpts; see "Zach's Dislikes" in Figure 59). He said he liked *Science* (4 excerpts; see "Zach's Likes") because "we do a lot of stuff" but he did not like his *Physical education* (P.E.) *class* (1 excerpt; see "Zach's Dislikes) because he got hit sometimes when he played volleyball. But more than anything else, Zach liked to play video games (26 excerpts; see "Zach's Likes") and wanted to spend a lot of time talking and drawing pictures about them.

Zach's feelings. Sometimes Zach "freaked out" in school, getting very frustrated (*Frustration,* 11 excerpts; see "Zach's Feelings" in Figure 59) when he could not figure out the answer. He often perseverated about numbers in his interview. "We went to Kansas I think three days ago. I think it was three or two days ago or one." He tried to describe what was happening in his mind when he was trying to solve a math problem:

> It's weird because when they, when they figure out something in my mind there's like a background… with number that's changing one, two, three, and I have to figure out like, in the front and I have to do like seven times divided seen divided by eight equals whatever.

He described his embarrassment and frustration when he could not solve the problem. "…It sounds embarrassing, but I cried 'cause I couldn't do it and I knew that I couldn't do it so I used my fingers…"

On the second day of the intervention, I noted that Zach's moods changed very quickly. He came in calmer and quieter than he had the previous day, but he began jogging around the room after I said, "I wonder what your heart rate is today? It was fast yesterday." When I told him I was giving him a notebook, his mood changed from silly to sad (*Sadness*, 9 excerpts), and his mouth and head drooped. "I maybe will lose it," he said. His conversation was disjointed and confusing. One minute he was saying that "dropping things on the floor in class makes me nervous" and the next he was saying "I almost hit my grandma." "How do these two things connect?" I asked him. He said he did not know.

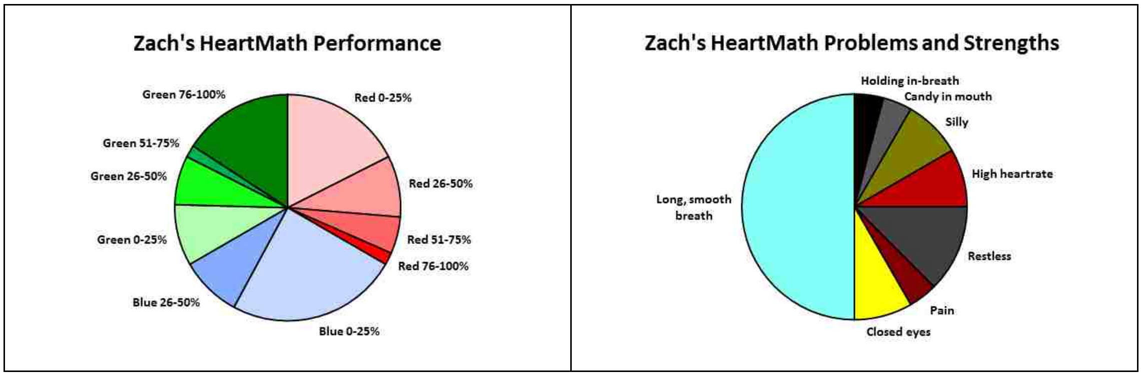


Figure 60. Zach's HeartMath performance, problems, and strengths.

Zach's HeartMath performance, problems, and strengths. Zach was good at HeartMath from his very first session—his HRV waveforms were smooth and regular and his coherence level was 48% (*Green 76-100%,* 9 excerpts; see "Zach's HeartMath Performance" in Figure 60)--although he was often restless and "fidgety" (*Restless,* 3 excerpts; see "Zach's HeartMath Problems and Strengths). The number feedback on the HeartMath screen may have been motivating to him because of his love of numbers and computers. His breathing ability also may have helped him get in touch with his emotions. On his sixth session, his anger level changed from "5" before the session to a "6 ½" afterwards—his level of anger had increased.

On the next day, I did two HeartMath sessions with him because there were a lot of red lines in the first session's data, indicating restlessness. His coherence level improved on the second session, but he began clenching his fist at the end. He said it was because he did not want to write in his journal. After his sixteenth session, he told me, "I'm sad a little bit." When I said, "You miss your mom," he bit his lip and said he did not want to talk about his mom because "I don't want to cry."

I did not teach Zach breathing techniques. He did not need them (*Long, smooth breath;* 12 excerpts). He was motivated to play the HeartMath games, like the Garden Game where color returns to a garden and animals appear as coherence level increased.

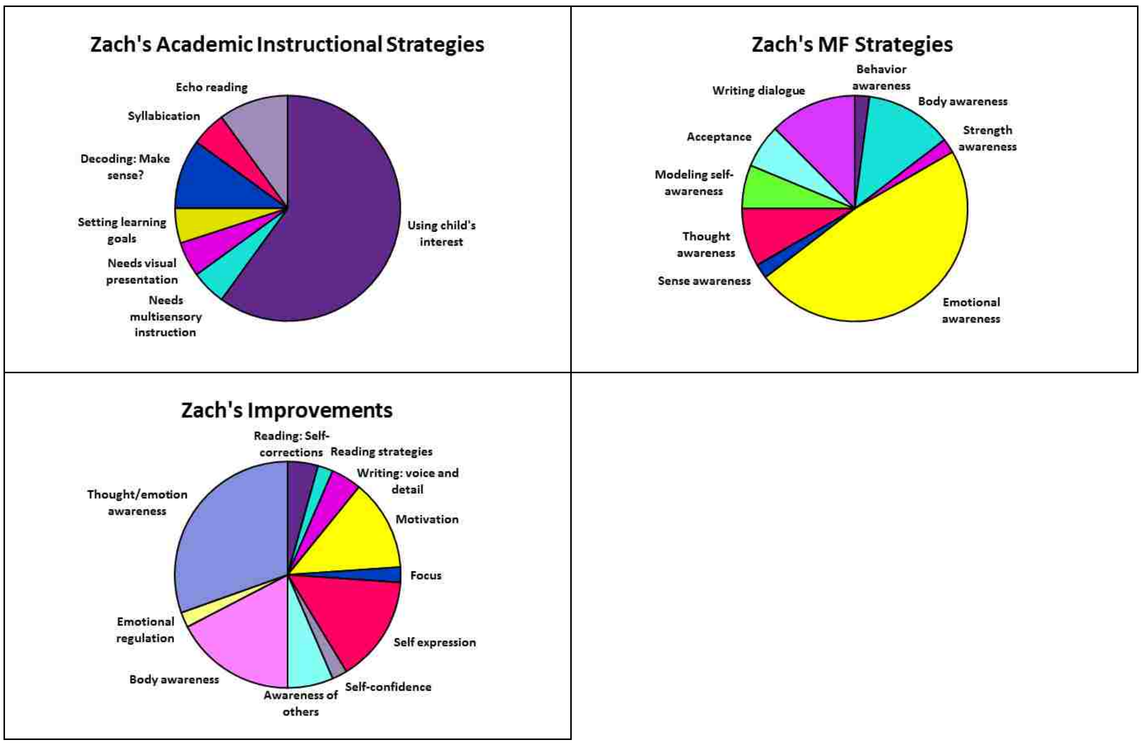


Figure 61. Zach's academic and MF strategies and improvements.

Zach's academic instructional strategies. To motivate Zach to read, I chose books based on the interest inventory Zach had completed before the intervention began (e.g., rocks, robots, etc.; *Using child's interests,* 12 excerpts; see "Zach's Academic Instructional Strategies" in Figure 61). On his fifth session, I showed him a comic book about Lego Superheroes. He loved this book, becoming completing absorbed in its pictures, repeating the funny lines. I was able to ask him, "Does that make sense?" when he miscued and, because of his interest in the book, he would reread the sentence, sometimes correcting himself. This strategy was not successful when he was not interested in the book. He would talk over me, rushing through the text to get to the end.

Zach did not like writing, as he expressed to me several times during the intervention. He wrote one day, "I suk at rding [suck at writing]." During his seventh session, he said he had a lot of things he wanted to write about in his regular class, but his teacher would not let him write them down. He turned his body away from me, speaking in whispers or muttering, and I had to put my ear close to him. As I questioned him, he said the teacher had told him to write whatever he wanted to write, but then told him he could not write about weapons, saying, "No weapons in school." So I encouraged him to write about his favorite subject—the video game called MindKraft—which is what he wrote about in his writing sample and was all he wanted to talk about when he first came to my room. As he drew the MindKraft weapons with considerable detail (see Figure 62), he talked about them, his voice getting louder and happier and more confident. When I pointed that out to him, he said he was not happier, with a peeling-nose-grin. Then I asked, "Why is your voice louder?" "Because I'm teaching about MindKraft, " he answered.

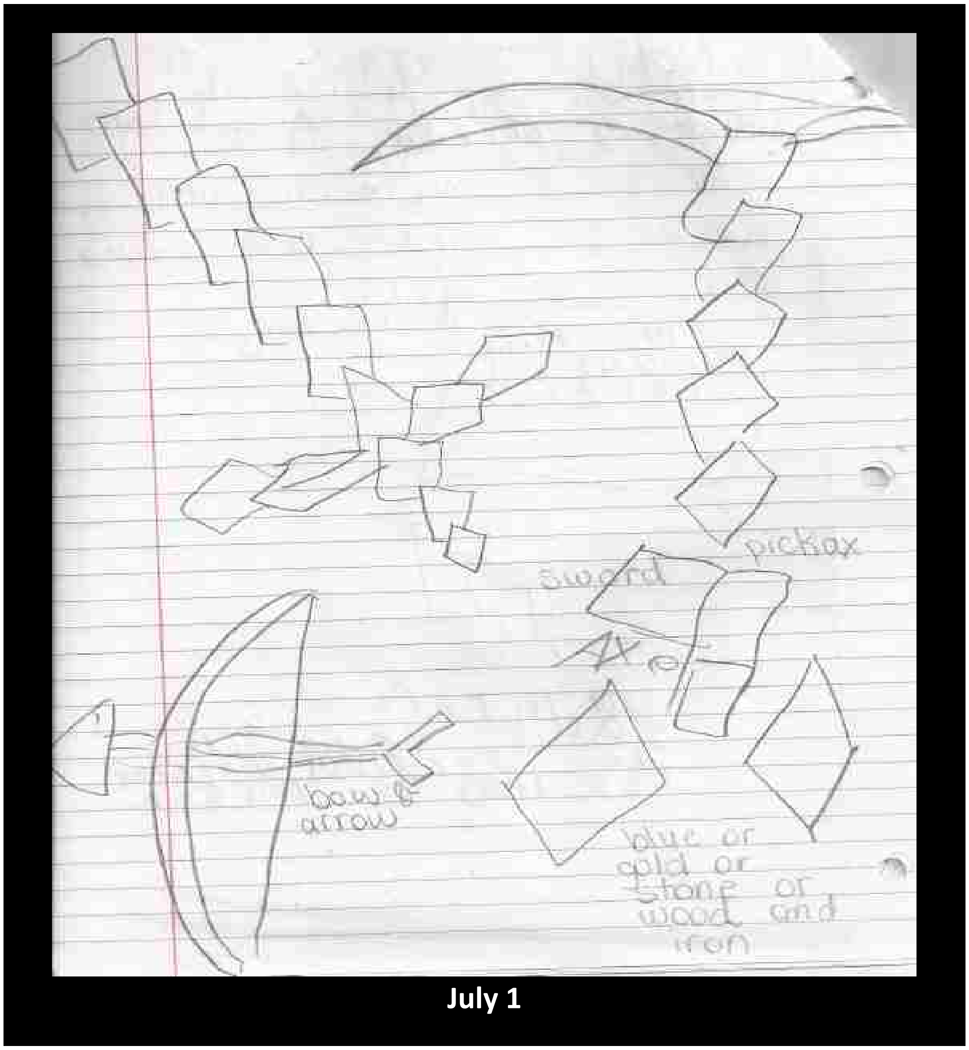


Figure 62. Zach's drawing.

Zach's MF strategies. Zach's behavior was often defiant, as if he were trying to anger me—hiding behind chairs, tossing emotion flashcards all over the floor, loudly opening and closing the door repeatedly when he left. So, instead of reproving him, I started to "join in" with him (*Acceptance,* 3 excerpts; see "Zach's MF Strategies" in Figure 61). For example, when he began to mimic the facial expressions of cartoon figures on my feelings poster, I joined in and made a story out of the emotions. "My dad got *angry* because I forgot my book and I *worried* I'd get in trouble," I said.

On the sixth day, when he would not talk to me at first, sucking in his mouth, I made the same face and he laughed. "Why are you doing the same as me?" "To show you what you look like" (*Body awareness,* 6 excerpts). During the eleventh session, I wrote in my field notes that Zach liked to do the opposite of what I asked and that he was so accustomed to power struggles with his father, grandmother and teachers that "he falls into that pattern easily and is completely unconscious of it." For example, instead of trying to concentrate on his breathing during HeartMath, he stared at a box of Nerds (probably angry because I had not let him eat them) and said he "didn't care about it." When I drew his attention to his defiant behavior (*Behavior awareness,* 1 excerpt), he said sadly, "I follow the rules."

Two sessions later, I had figured out a way to turn candy-eating into a MF eating exercise. When I asked about the taffy's flavor, sweetness, size, and smoothness, Zach gave me decimal ratings (10.2, 9.6), updating his ratings as he noticed that the attributes of the candy (e.g., sweetness, smoothness) changed.

Zach's improvements. Writing helped Zach become more aware of what was happening in his thoughts (*Thought/emotion awareness,* 14 excerpts; see "Zach's Improvements" in Figure 61). On July 7th, he drew a picture of the numbers in his brain, saying the numbers 8 and 9 were coming out of the background. Two days later, he drew a picture of the numbers at the back of his brain, on a dark red background. However, he refused to write a sentence about it, continuing to talk instead. "I'm not listening to you, Zach," I said, "because I'm very angry. Do you know why?" (*Modeling self-awareness,* 3 excerpts; see "Zach's MF Strategies). He knitted his brow. "Because you're not writing." Later I asked him how he felt when I said I was angry. "Sad," he said.

During his fifteenth session, I began doing writing dialogues with him, as I had done with Sam. He really enjoyed these sessions (*Motivation,* 6 excerpts; see "Zach's Improvements"), becoming very precise about colors and number ratings. For example, he told me he was in a bad mood, but would not tell me why. So I wrote, "Where is it?" He wrote, "on my chest." "What color is it?" "Vilit [very light] blue." "Is it warm, hot, cold, or cool?" "hot." "How hot—from 1-10?" "11." After more written questions from me about how loud it was ("laud" he wrote in response), what it would say if it could talk ("No?!"), and if it was mad, sad, bored, shy, or scared (Zach circled sad, bored, and shy), Zach finally revealed why he was in a bad mood. He wrote that there was a bug on his neck and told me there had been a cockroach in the library that he thought was going to bite him (*Self-expression,* 7 excerpts).

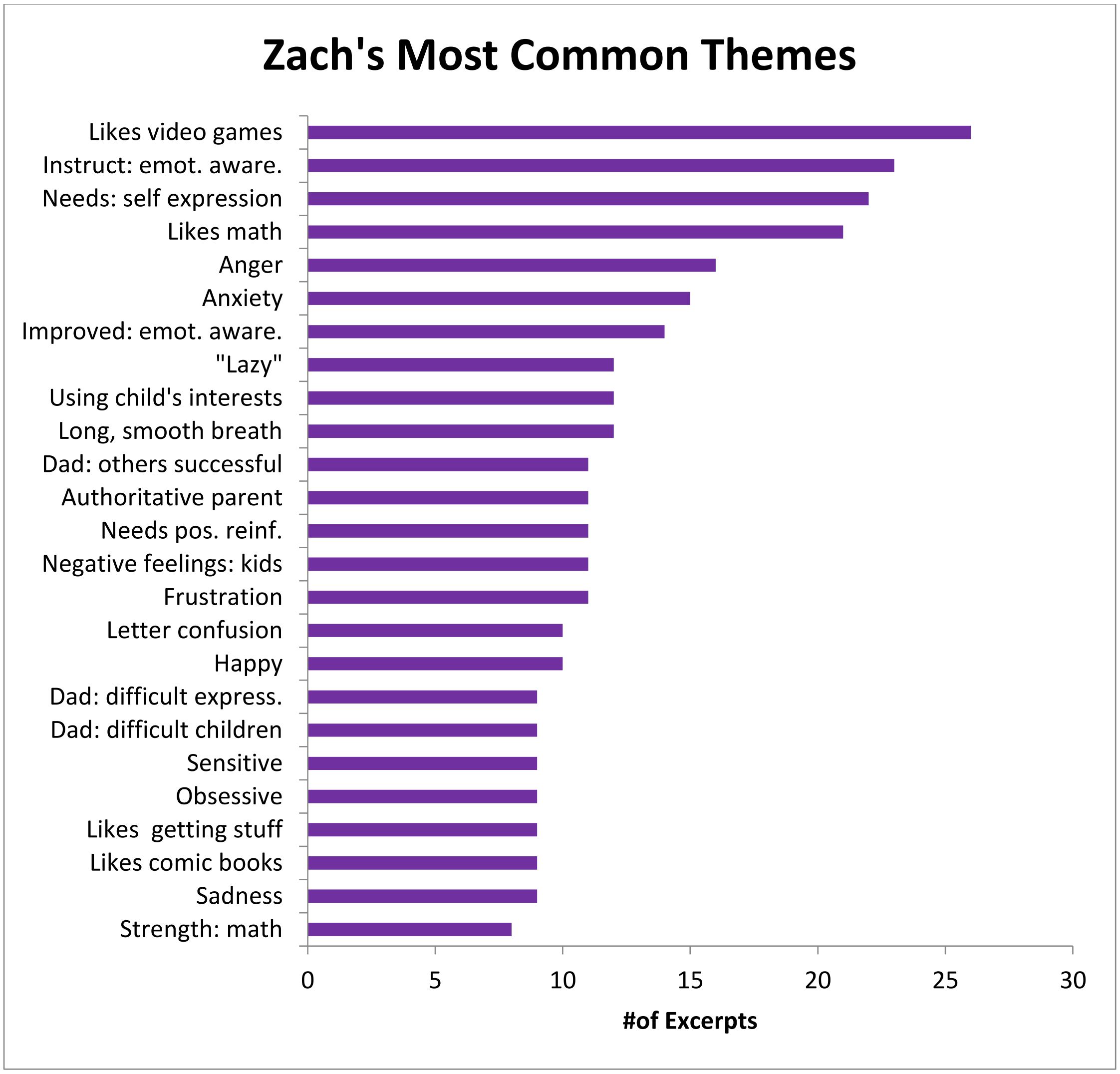


Figure 63. Zach's most common themes (Express: oral expression; Pos. reinf. = positive reinforcement; Emot. aware. = emotional awareness).

Zach seemed anxious around his father, sometimes whispering or muttering (see Figure 63). His authoritative father did not seem to understand or pay a lot of attention to his sensitive son, who he thought was "lazy" and not disabled. Zach loved to talk about numbers and video games, and his confidence level and positive affect increased when he was encouraged to read or write about his interests. He also became more aware of his emotions after breathing and while writing and enjoyed quantifying his sensations and emotions in precise numerical terms.

Fawn: The Girl Who Started to Breathe When She Worried about Failure

Table 15

Fawn's General and Cognitive Information and Quantitative Test Scores

Age	Sex	Ethnicity	ELL	Label	Level	IQ	Nonverbal Ability	Proc. Speed	WM
8 yrs., 10 mos.	F	Hispanic	No	SLD	B	105 Average	100 Average	115 Above Average	91 Average
Mood Average	**Reading Attitude Average**	**Reading Confidence Average**							
4.7	4.6	2.9							
Test	**Pre**	**Post**	**PrePost DIF**	**Fol**	**PreFol DIF**				
Oral Rdg. Average	64.3	49.3	-15	56	-8.3				
Retell Average	29.3	52.7	23	33	3.7				
Phonics Test	14	17	3						
Writing Voice	5	4	-1						
Wtg. Word Choice	4	4	0						
LD Nonword Accuracy	95%	88%	-7%						
LD Nonword RT	1115.13	972.48	-143						
LD Word Accuracy	90%	90%	0%						
LD Word RT	1098.47	1049.33	-49						

Fawn differs from the other experimental participants in several ways. She is one of the two experimental participants who the school district said demonstrated characteristics of DYS, meaning she met the official state criteria for DYS (State of New Mexico House Bill 230, 2010):

> …a condition of neurological origin that is characterized by difficulty with accurate or fluent word recognition and by poor spelling and decoding abilities, which characteristics typically result from a deficit in the phonological

> component of language that is often unexpected in relation to other cognitive abilities…

Fawn had the highest IQ (105; see Table 15) in the experimental group and all of her other cognitive measures were average or above average. She is unique in the group for being above average on Verbal Reasoning Ability (116; word definitions and deciding how words are similar) and in Processing Speed (115). She was reading close to her grade level (end of third grade). She usually rated herself at the top of the self-report scales, but gave herself lower scores on two days. She improved on the retell test (+3.7 words) and on the phonics test (+3 points), but her score decreased on the oral reading test (-8.3 words), writing voice test (-1), and on accuracy in the LD nonword subtest (-7%). This may be because her mother lost her job during the summer, and Fawn had to go stay with relatives, missing the last sessions of the intervention. She only attended 16 days of school that summer, while most participants attended an average of 20 days.

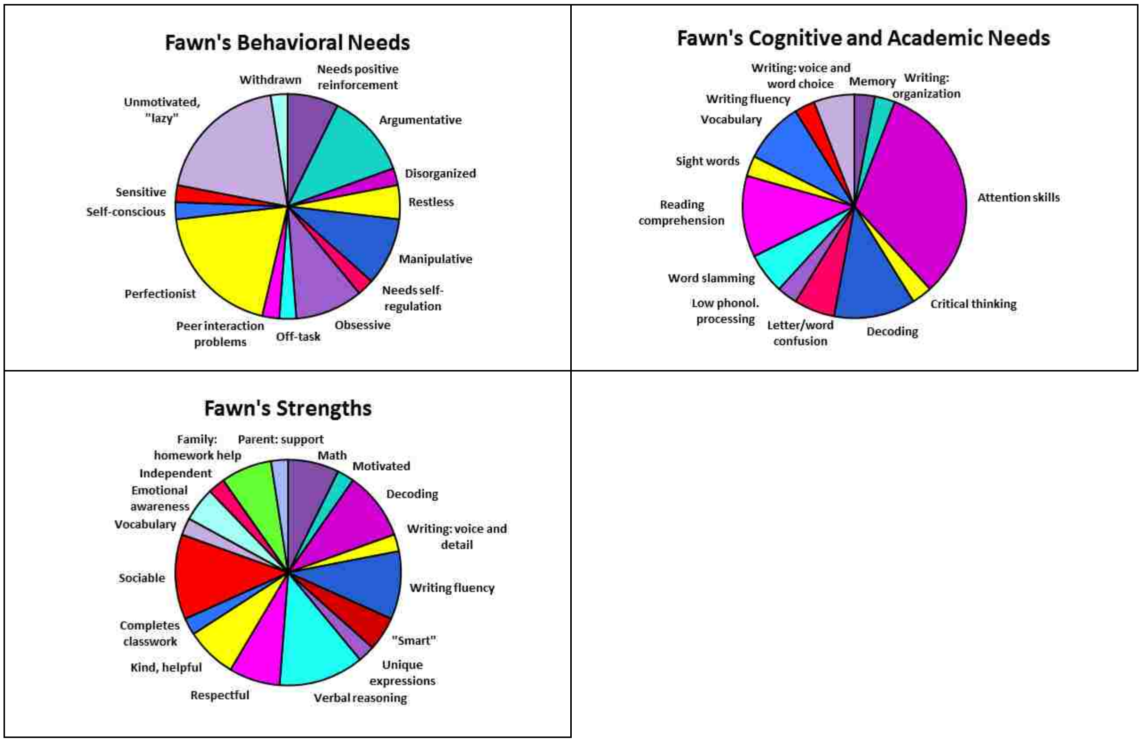


Figure 64. Fawn's behavioral, cognitive, and academic needs and her strengths.

Fawn's behavioral needs. Fawn was often *Argumentative* (5 excerpts; see "Fawn's Behavioral Needs" in Figure 64) and *Manipulative* (4 excerpts) with me, trying to get more "stuff." One day, after seeing Clara's Cinderella stickers, she said, "Aww, how come I can't have stickers?" Then she asked if she could take another book home. "But you haven't brought back the old book at home. If you lose both books, I have to pay for both," I said. "You're plying [implying] that I lost the book," she said, and she shut down.

On another occasion, Fawn begged for candy, a prize for homework completion and returning the school's book. "Not until you bring the book back," I said. "I don't *have* to come here," she said, suggesting that if I did not give her candy, she would not come back. It seemed like she spent most of her energy trying to get something out of me—a book, a piece of candy, a reason why I was not coming to her house for her birthday. On her last session, she asked me if I would give her another book. "No," I said. "What are you getting me for my birthday?" she asked. "Nothing," I said. "That's not nice—you should get me something for my birthday," she wheedled. Trying to joke her out of this *Obsessive* thought-pattern (4 excerpts), I replied, "And what did you get me for *my* birthday?" "I don't even know when your birthday is!" she laughed.

Fawn was also a *Perfectionist* (8 excerpts). She did not like to make mistakes, as we found out during Fawn's first (and only) interview. We asked her grandmother, "On her science projects and in math, is she real [emphasis] particular? Does she have [emphasis] to get things exact [emphasis]?" Her grandmother said, "Yeah. Yeah."

Fawn's cognitive and academic needs. In her school records, Fawn's assessment team said she had a significant weakness in *Reading comprehension* (4 excerpts; see "Fawn's Cognitive and Academic Needs" in Figure 64) and had a low reading *Vocabulary* (3 excerpts). Her records also said Fawn needed glasses to correct her vision. I never saw her wearing glasses, although her mother told me Fawn got headaches because she needed glasses. Fawn's school records noted that her second grade teacher said she took a lot of time during *Decoding* (4 excerpts) and she tended to substitute words with her own words, changing the sentence meaning. She may have been considered as having DYS because she performed below average (84) on a phonological awareness test (*Low phonological processing,* 1 excerpt) and she seemed to lack some basic phonics skills.

Later in the pre-interview, Fawn's mother offered up more insight into some of

Fawn's reading problems. "She hates, 'cause I think after she reads it then she forgets what she's read and then she gets upset 'cause she doesn't know. And then she doesn't want to do it." Fawn's mother also thought that some of Fawn's problems might be due to a "short attention span" (*Attention skills,* 11 excerpts). "You said she was a little copy of you," I said. "Yeah, and see I have a short, short attention span," her mother said.

Fawn's strengths. During my interview at Fawn's home, both her mother and her grandmother told me that Fawn had loved preschool and that her teachers had said how *"Smart"* (2 excerpts; see "Fawn's Strengths" in Figure 64) she was. "She excelled so good, and then, I, we, were shocked that she's not doing very good," said her grandmother. When she was determined to have a learning disability by the school, they were surprised. "It was just weird to us that she was," said her mother who also thought she was *Independent* (1 excerpt) and had common sense:

> She's smarter than the average 8-year-old, 7-year-old. She knows how to live around here [laughs], you know. Like, some kids are like, "Give me something to drink." She'll just go get it. Or, "Let me show you... This is how you do it..." Just common sense, I guess. She learned common sense real fast. She likes to do, take care of herself.

Like Zach's father, Fawn's mother thought her daughter was bright and not disabled, just "lazy" (*Unmotivated, "lazy,"* 8 excerpts; see "Fawn's Behavioral Needs"). When she was working on something she liked (e.g., science projects), her grandmother said Fawn was very *Motivated* (1 excerpt; see "Fawn's Strengths") and eager work on it every day after school.

In the interview, I noticed that Fawn "talked easily" (*Verbal reasoning,* 5 excerpts). After my first session with Fawn, I wrote, "Wow, is she verbal." She was very talkative (*Sociable*, 5 excerpts), telling me at length about the meditation CD that her brother had. When I told her I had given it to him, she said, "That was you?!"

Fawn also liked being *Kind, helpful* (3 excerpts). Fawn told me that she liked to help people in math. When I asked how she helped them, she said, "I try to give them hints to like to the answer of it." Her mother also said that Fawn was always trying to help around the house, e.g., with the cooking. "Let me taste that... Let me see if you got it right."

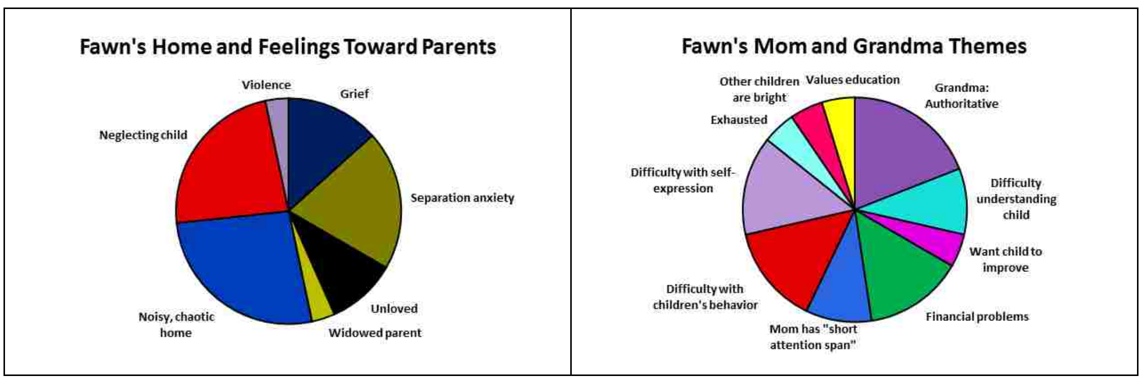


Figure 65. Fawn's home and feelings toward parents and Fawn's mom and grandma themes.

Fawn's home and feelings toward parents. In comparison to some of the other children's homes where we conducted interviews, Fawn's home did not seem quite as chaotic, but there was still a lot of noise—alarm batteries beeping, dogs barking, and the TV was on (*Noisy, chaotic home,* 8 excerpts; see "Fawn's Home and Feelings toward Parents" in Figure 65). Instead of addressing this background noise (e.g., turning off the TV or admonishing the dog), the noise was ignored. Fawn and her brother and sister looked "well-taken care of," I wrote in my notes. Fawn's mother had bright red hair ("you can see me a mile off," she said), bright eyes, a happy face, and tattoos all over her arms.

Separation anxiety (6 excerpts) was a constant theme with Fawn. After her mother left for two weeks that summer, she wrote in her journal: "I am sad because my mom left I didn't wont [want] my mom to leve I will miss my mom so much." She told me that she did not "get to spend that much time" with her mother (*Unloved, 3 excerpts)* and that her father died when she was four years old (*Grief,* 4 excerpts). Both her mother and grandmother told me they did not get to spend a lot of time with Fawn (*Neglecting child,* 7 excerpts)— her grandmother said it was because she was often visiting her other daughter-in-law and her mother said it was because her work schedule was exhausting and "I don't have the attention span, see, sometimes to sit there and with three different kids and do it [homework] three different times." Fawn also said her father had beat up her mother one time, breaking her nose (*Violence*, 1 excerpt). On her tenth session, Fawn told me she would miss the last week of summer school because her mom was leaving and her mother's boyfriend said he did not want to take care of them for two weeks. So they were going to Las Cruces to stay with an aunt instead.

Fawn's mom and grandma themes. After Fawn told me this, her mother called to tell me that her daughter would not be at school that day. "You're the only teacher that cares," she said (about Fawn being absent). She told me she had been fired from her waitress job (*Financial problems,* 3 excerpts; see "Fawn's Mom and Grandma

Themes" in Figure 65) and she was going to Cheyenne to work for a few weeks. She said her boss had fired her because she had moved out of the house where he had been their landlord. "When he lost control over me, he let me go," she said.

In my interview with Fawn's mother, she talked about having some *Difficulty with her daughter's behavior* (3 excerpts). "She is the one that is the least quiet. And when you tell her to be [emphasis] quiet, she's louder [laughs]." She also called Fawn a "talk-backer" and she liked to be the boss. When I asked what Fawn did when she got frustrated, her mother said, "Um, rolls her eyes, talks back." Her grandmother said she cried.

Fawn's grandmother seemed to have a more *Authoritarian* (4 excerpts) style of parenting than Fawn's mother. When telling a story about how Fawn spent ten to fifteen dollars on buying popcorn and pickles for her friends, her mother said they had to "watch her on that." Grandmother interrupted here: "Uh, I don't think we had to watch [emphasis] on that. We had to get upset with her."

I did not have a second interview with Fawn and her mother. Fawn completed all of the post-tests, and I scheduled an interview. Ten minutes before we were to meet at Fawn's house, her mother called and canceled. She never returned any of my calls to schedule another time.

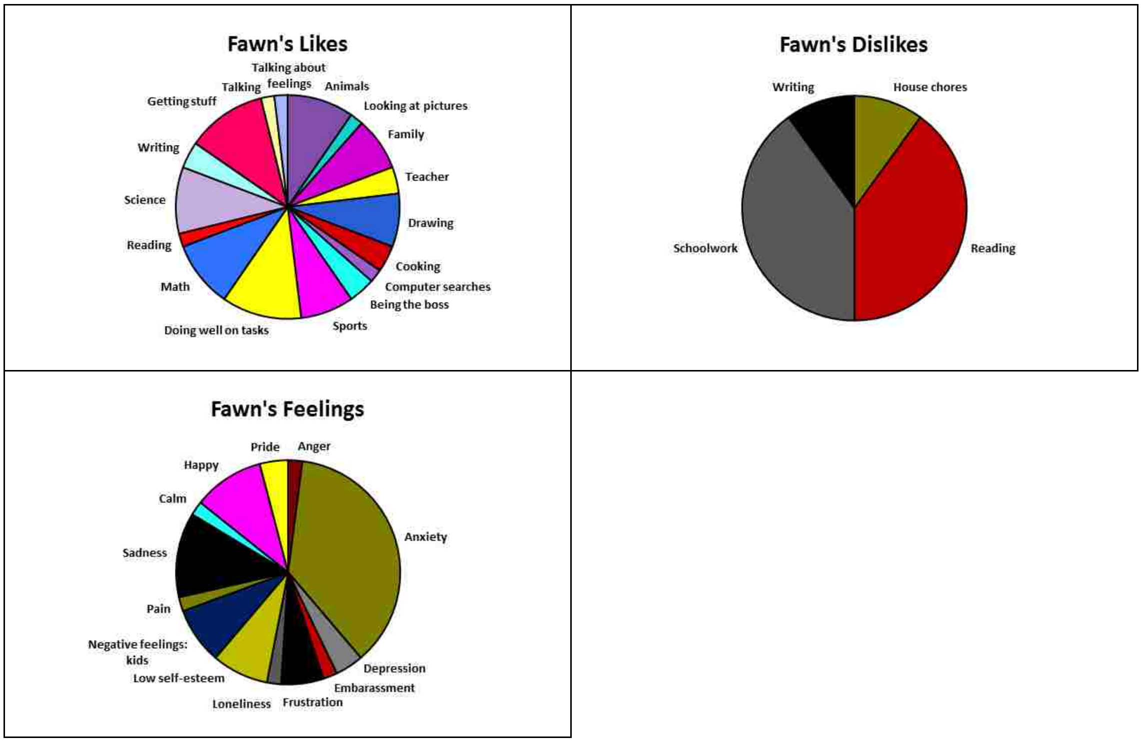


Figure 66. Fawn's likes, dislikes, and feelings.

Fawn's likes and dislikes. During her interview, Fawn often seemed depressed (*Depression,* 2 excerpts; see "Fawn's Feelings" in Figure 66) or indifferent. She was enthusiastic about liking *Math* (5 excerpts; see "Fawn's Likes"), physical education (*Sports,* 4 excerpts), recess, and *Drawing* (4 excerpts) animals, but she began shrugging her shoulders when talking about reading. She said she did not like reading because "it's too much work" (*Reading,* 4 excerpts; see "Fawn's Dislikes" in Figure 66). When I asked her if she wanted to get better at reading, she shrugged. When I asked her if she remembered being in my research project back in the first grade, she said she did not like sitting quietly—it was boring. "What would you rather do instead of sitting quietly?" I asked. "Be at recess," she answered.

Fawn's mother gave me a different story about Fawn's feelings toward reading.

When I asked if Fawn did not like books, her mother said that lately she did. "Now that she's learning how to read more, she's been wanting to read books. Everything, she wants to read everything." She hinted at some irritation with her daughter's behavior, telling me that Fawn would continue reading things even when asked to stop. "Like when we're at the restaurant she'll read you the whole menu. The whole [emphasis] menu." Then I asked why Fawn had told me she did not like to read, her mother said, "She's just lazy."

When I asked what Fawn liked to do, her mother said that she loved to write (*Writing,* 2 excerpts; see "Fawn's Likes"). "She likes to write even though it's just gibberish or whatever, but she'll just write even if it's her name fifty million times." Her grandmother said Fawn liked doing science projects (*Science,* 5 excerpts). "…We get on the computer and she starts it… and every day she's eager, 'Grandma, this, are we gonna' finish it today?'"

Fawn's feelings. After her third session, I wrote this about Fawn:

> She gives me that "I'm being cute" look out of the corner of her eyes and sometime she talks like a child, especially if she feels embarrassed (*Embarrassment,* 1 excerpt; see "Fawn's Feelings" in Figure 66) because she made a mistake. It's like she's saying, "I know I'm not too smart but please like me because I'm cute, take care of me because I'm helpless."

She frequently expressed or wrote about *Anxiety* (18 excerpts) and nervousness about making mistakes when she was reading. She also wrote about *Loneliness* (1 excerpt) and wanting to be loved:

I fill [feel] lonely when no one is playing with me or if I am biy my salf [by myself] thos are the two thing when I fill lonely. I fill cuddly when I am with someone or I am playing with someone or if I am spend time with someone.

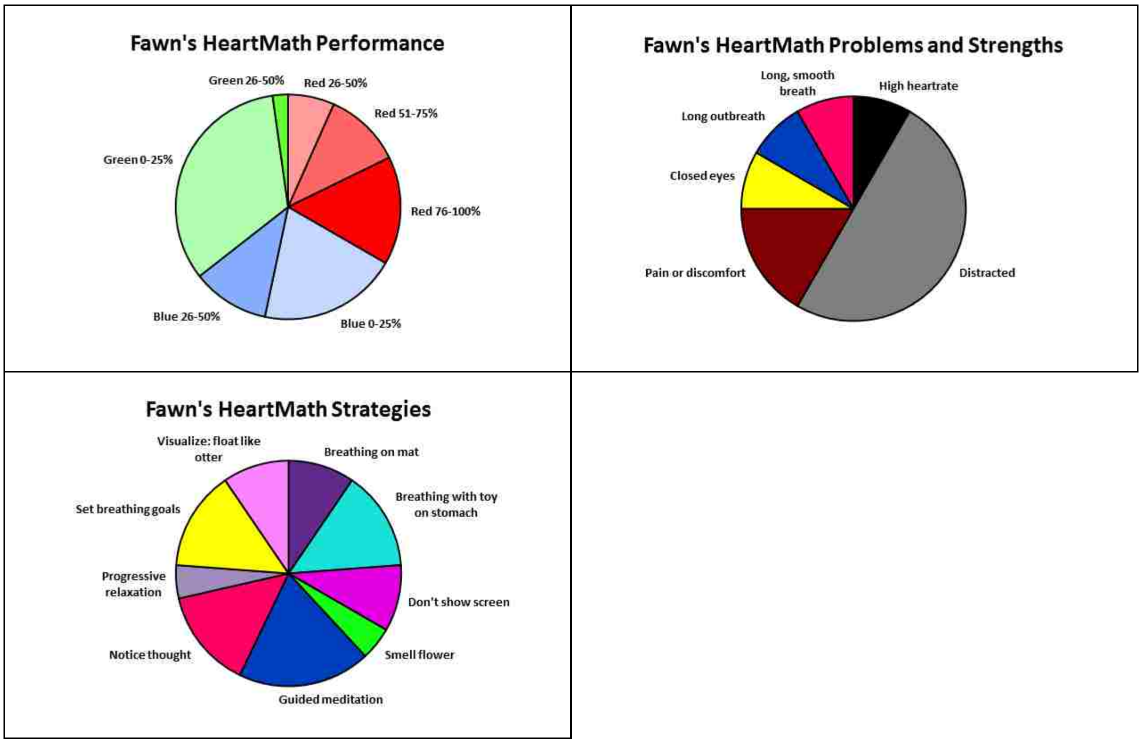


Figure 67. Fawn's HeartMath performance, problems, strengths, and strategies.

Fawn's HeartMath performance, problems, strengths, and strategies. Fawn did not reach high levels of coherence; her average level of coherence was 68% red, or very low coherence (*Red 76-100%,* 7 excerpts; see "Fawn's HeartMath Performance" in Figure 67), possibly due to the distraction of her anxious thoughts (*Distracted,* 6 excerpts; see "Fawn's HeartMath Problems and Strengths" in Figure 67). In the middle of one HeartMath session, while she was lying on the mat, her eyes popped open and she said, referring to a school social event, "Are you coming tonight?" When I said no, her facial expression became sad. "Are you sad that I'm not coming?" I asked. "Yes," she said.

On another occasion, Fawn became restless at the end of the breathing practice, and she said it was because she was getting nervous about reading her book—she wanted a good score with no mistakes. However, her level of medium coherence (blue) improved somewhat over time and her session time also increased from two minutes to three minutes and finally, on her last two sessions, to four minutes. She also seemed to do better with *Guided meditation* (4 excerpts; see "Fawn's HeartMath Strategies" in Figure 67), reaching her highest coherence levels on those days. Like Ana, looking at the HeartMath screen initially increased her performance anxiety so I stopped showing her the screen (*Don't show screen,* 2 excerpts). When she started lying on the floor (*Breathing on mat*, 2 excerpts), often holding a stuffed animal (*Breathing with toy on stomach,* 3 excerpts), her level of medium coherence began to increase. She wrote that she felt good on the floor because she didn't look at the computer, "so I bont kone [don't know] that I am going to do a good job that is what that I am hopeing for."

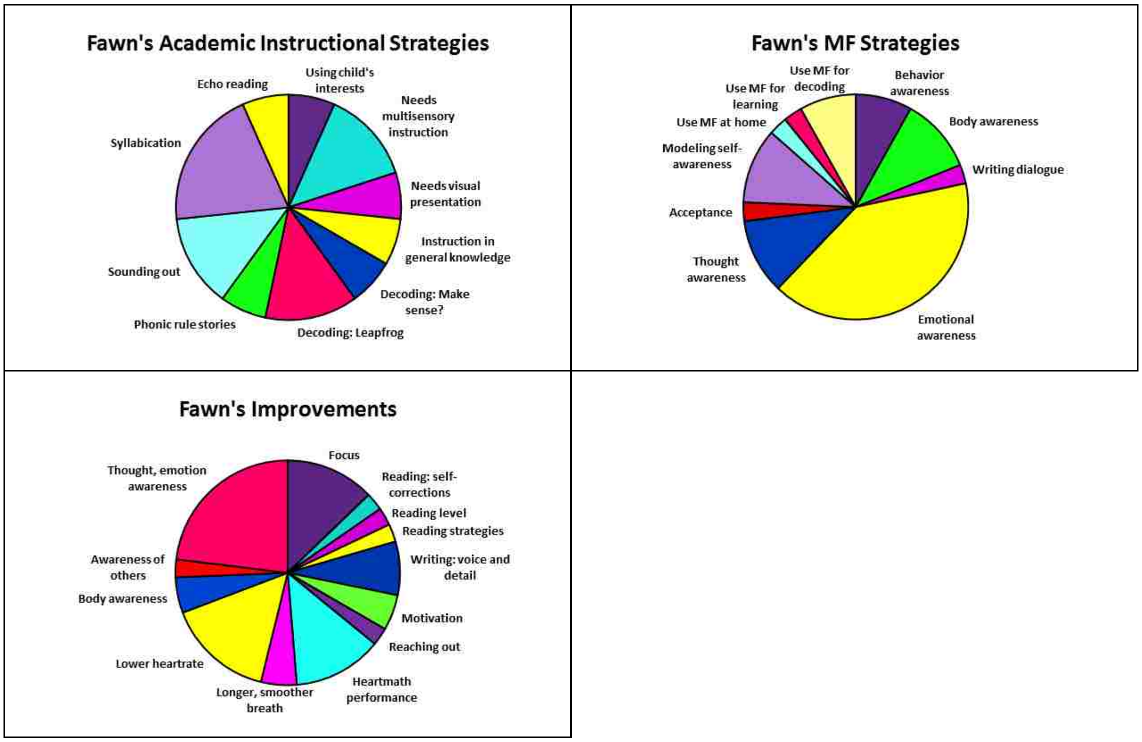


Figure 68. Fawn's academic and MF strategies and improvements.

Fawn's academic instructional strategies. Most of the instructional strategies I used with Fawn were to help her with decoding (*Syllabication,* 3 excerpts; *Sounding out,* 2 excerpts; *Phonic rule stories,* 1 excerpt; *Decoding: Leapfrog,* 2 excerpts; *Decoding: Make sense?,* 1 excerpt; see "Fawn's Academic Instructional Strategies" in Figure 68)—something about which Fawn had a lot of anxiety. She told me the first day, while she was filling out the self-report scales, that she was very good at reading, but she was not calm about it. When I asked her how she felt when she was trying to sound out the word "busy," she said she was nervous because she could not read it. She was very aware of the notes I was making while she read. She knew when she had made a mistake, because I wrote down the word she had missed (see Figure 70 for an example of one of her running records). It was very important for her to do "good." On her fifth session, I asked her why she was using a "robot voice" while reading a passage she had practiced before. "It's 'coz I just want to get through this part because I don't like reading," she said.

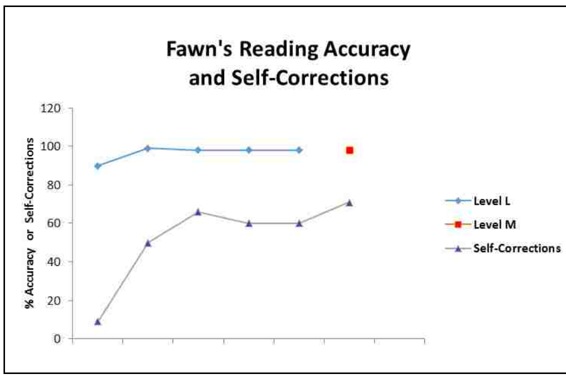
Fawn's MF strategies. I mostly worked on *Emotional awareness* (15 excerpts; see "Fawn's MF Strategies" in Figure 68) with Fawn. She frequently wrote about her mother, especially after she left for Cheyenne. One day she copied a picture of a worried figure on one of my posters (see Figure 69). This figure had a lot of details—5 fingers on the hands, lightning bolt hair, wide eyes, and a zigzag mouth—but no feet, which can indicate feelings of insecurity or inadequacy (Di Leo, 1973). Then she drew a picture of her mother being fired by her boss, both of them in profile, with her mother holding up a hand as if to stop her boss (see Figure 69). She wrote that she was worried because she did not want her mother to get hurt "over there" [in Cheyenne where her mother had a temporary job].

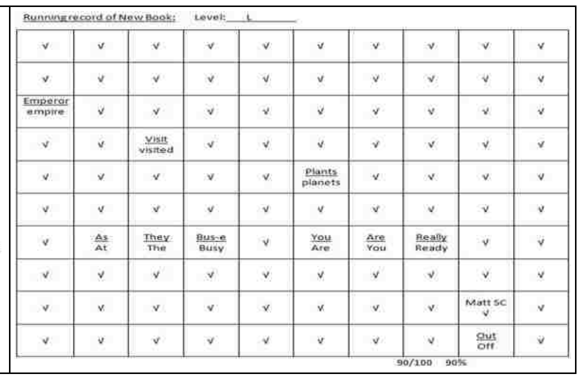
July 18

Figure 69. Fawn's drawing.

Fawn's improvements. Fawn's writing was fluent, but often lacked detail and word choice. "I an [am] happy because I got gum…" After three sessions, her writing became a little more descriptive of her feelings and thoughts (*Writing: voice and detail,* 3 excerpts; see "Fawn's Improvements" in Figure 68). "The thing that is happens in my body is my head starts to tingol [tingle]" (*Body awareness,* 2 excerpts). She went on to explain that she was feeling nervous because she was thinking about getting the words wrong during reading (*Thought, emotion awareness,* 9 excerpts). So I began to work on awareness of her perfectionism. I asked her to write about her thoughts regarding mistakes. "Are you thinking that you're not smart?" "Yes," she said, biting her lip. Then she told me about two boys who had called her dumb. So I told her about a time when I did not feel smart either, and she smiled at me.

The next day, she told me she was nervous while reading, and I said I got nervous too because I wanted her to do a good job. She smiled. I said I would try to breathe loud when I got nervous; I did this and the sound cued her to breathe as well. Perhaps this helped her make more self-corrections when reading (see Figure 70), improving from 50% to 71% (*Reading: self-corrections,* 1 excerpt).




Running record of New Book: Level: L

√	√	√	√	√	√	√	√	√	√
√	√	√	√	√	√	√	√	√	√
Emperor empire	√	√	√	√	√	√	√	√	√
√	√	Visit visited	√	√	√	√	√	√	√
√	√	√	√	√	Plants planets	√	√	√	√
√	√	√	√	√	√	√	√	√	√
√	As At	They The	Bus-e Busy	√	You Are	Are You	Really Ready	√	√
√	√	√	√	√	√	√	√	√	√
√	√	√	√	√	√	√	√	Matt SC √	√
√	√	√	√	√	√	√	√	Out Off	√

90/100 90%

Figure 70. Fawn's reading accuracy, self-corrections, and one of her running records.

Fawn's second-to-last session was difficult. She said she was a "little sad" because her mother was gone and a "little happy." As I had done with Sam and Zach, I used a writing dialogue with her to help her explore her feelings. "What sound does it make?" I asked. She wrote, "a cring [crying] sound." "What does it need?" "my mom." "Does crying make you feel better or worse or the same?" "Beter." "What can you do at school to help the sad?" She wrote that she could imagine her mom's picture in her mind without crying.

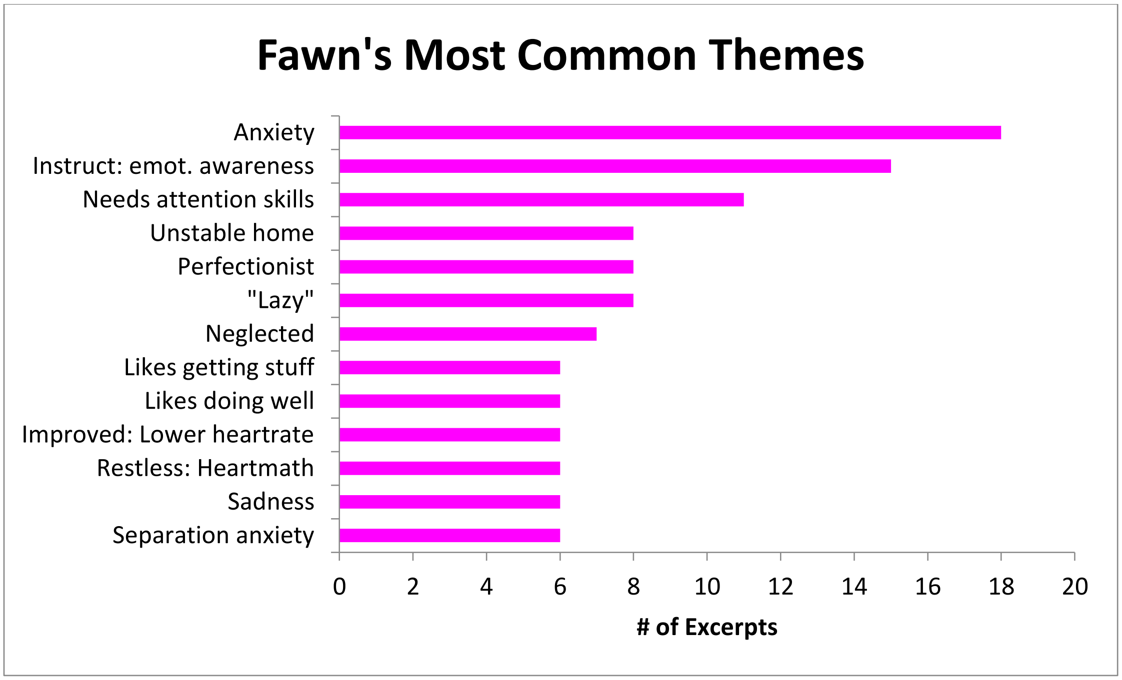


Figure 71. Fawn's most common themes (Emot. = emotional).

Even though Fawn was reading close to her grade level, she was very anxious about reading because she did not like to make mistakes and this anxiety interfered with her ability to concentrate (see Figure 71). She had significant separation anxiety about her mother leaving home and about whether or not she was going to see me after the intervention ended. Instruction in breathing helped lower her heart rate. On the day that Fawn told me her mother had lost her job, she wrote, "Breathing can help me to come bou/ne (calm down) or if I am sad it the help me by breathing."

Ángel: The Boy Who Flew out of Silence on a Paper Plane

Table 16

Ángel's General and Cognitive Information and Quantitative Test Scores

Age	Sex	Ethnicity	ELL	Label	Level	IQ	Nonverbal Ability	WM
9 yrs.	M	Hispanic	No	SLD	D	91 Average	104 Average	Low
Mood Average	**Reading Attitude Average**	**Reading Confidence Average**						
5	5	3						
Test	**Pre**	**Post**	**PrePost DIF**	**Fol**	**PreFol DIF**			
Oral Rdg. Average	18.3	13.7	-4.7	21.7	3.3			
Retell Average	0	0	0	10	10			
Phonics Test	9	9	0					
Writing Voice	2	4	2					
Wtg. Word Choice	2	5	3					
LD Nonword Accuracy	68%	68%	0%					
LD Nonword RT	1555.83	2968.65	1413 ms					
LD Word Accuracy	44%	44%	0%					
LD Word RT	1711.33	2738.59	1027 ms					

Of the three Level D experimental participants, Ángel had the highest IQ (91; Average; see Table 16). In his school records, there were scores for two WM subtests. His Recall of Digits Backward score was 20 (Very Low) and his Recall of Digits Forward score was 33 (Low). He was above average on the Picture Similarities subtest and below average on the Verbal Reasoning Ability scale (87), which included assessments of oral language, oral expression, and listening comprehension. He was average on the Nonverbal Reasoning Ability (104) and Spatial Ability (92) scales, designed to evaluate a student's skills without verbal expression.

Ángel improved on four of the quantitative tests: the oral reading test (+3.3 words at follow-up), the retell test (+10 words at follow-up), the writing voice test (+2 or 33%), and the writing word choice test (+3 or 50%). His RTs on the LD test increased substantially (+1413 ms on the nonword subtest and +1027 ms on the word subtest). An emerging reader (reading at a kindergarten level), I taught Ángel to use metacognitive strategies while reading, so his increased RTs could have been due to increased reflectiveness during decoding.

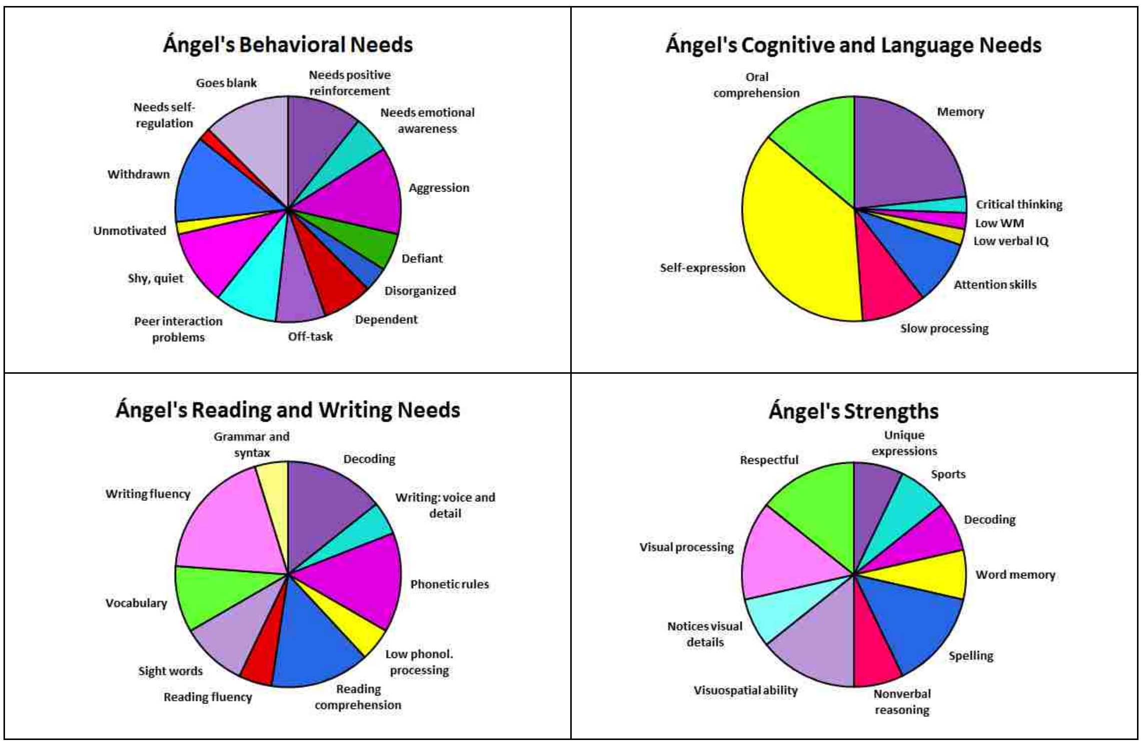


Figure 72. Ángel's behavioral, cognitive, language, reading, and writing needs and his strengths.

Ángel's behavioral needs. In his school records, Ángel's special education teacher reported many problems with his behavior. He did not comply with adult requests (*Defiant,* 3 excerpts; see "Ángel's Behavioral Needs" in Figure 72) and had trouble getting work done in class, often staring out into space or rocking back and forth in his chair or putting his head down on his desk (*Off task,* 4 excerpts; *Withdrawn,* 7 excerpts). He sometimes scribbled on or tore up his assignments. He had trouble paying attention and got easily distracted. He did not seem motivated to work, but his work production and quality increased when he was given one-on-one attention and support (*Needs positive reinforcement,* 6 excerpts). He rarely spoke in class and did not volunteer to answer questions (*Shy, quiet,* 6 excerpts). When asked a question, he did not respond or show any facial expression.

Ángel was placed on a behavior plan because of some violent incidents at recess, hurting younger students by hitting them, pushing them, and kicking them (*Peer interaction problems,* 5 excerpts). He was vulnerable to peer pressure, and his school records said he followed "negative leaders" like Paz's 11-year-old brother. Paz told me that Ángel "hangs out with my brother… and says bad words; they broke a window." According to his school records, his teachers said that Ángel "shows no remorse for his actions and has a difficult time showing compassion towards others." One social worker thought he might have gotten aggressive with his peers because he had difficulty "communicating his feelings" (*Self-expression,* 16 excerpts; see "Ángel's Cognitive and Language Needs in Figure 72).

Ángel's cognitive and language needs. Significant problems with oral expression emerged in an interview with Ángel conducted by a member of the school district's assessment team. When he was asked open-ended questions or to elaborate or imagine an idea, he took a long time to respond (*Slow processing,* 4 excerpts; see

Ángel's Cognitive and Language Needs" in Figure 72) and needed encouragement from the interviewer. Sometimes he could not come up with an answer, even when the question was about television shows or cartoons that he liked (*Goes blank,* 7 excerpts; see "Ángel's Behavioral Needs"). His answer to many questions, after seeming to ponder the question for a long time, was "I don't know" (*Memory,* 10 excerpts; see "Ángel's Cognitive and Language Needs"). The district interviewer wondered "if he is second-guessing himself internally or if he's fearful of saying the wrong thing so he doesn't say anything at all?" He did say he was happy at home and at school but that sometimes he got frustrated because he could not read. He also said he missed his father, who was in jail but he did not know why.

Ángel's reading and writing needs. Reading at a kindergarten level at the end of third grade, Ángel had significant challenges in *Decoding* (3 excerpts; see " Ángel's Reading and Writing Needs" in Figure 72) and *Reading comprehension* (3 excerpts). Ángel's school records also documented his significant deficits in writing. It was hard for him to put his thoughts down on paper (*Writing fluency,* 4 excerpts), his spelling and grammar errors made it difficult to read his sentences (*Grammar and syntax,* 1 excerpt), and he usually wrote sentences with only three or four words (*Writing: voice and detail,* 1 excerpt).

Ángel's strengths. As noted earlier, Ángel had above average skills on Picture Similarities (*Notices visual details,* 1 excerpt; *Visual processing,* 2 excerpts; see "Ángel's Strengths" in Figure 72). During the intervention, I capitalized on his *Visuospatial ability* (2 excerpts) whenever possible. For example, when giving instructions I tried to include a picture; then Ángel was much better at following verbal directions. I never saw any of Ángel's defiant or aggressive behaviors described in his school records. He was always very *Respectful* (2 excerpts) with me.

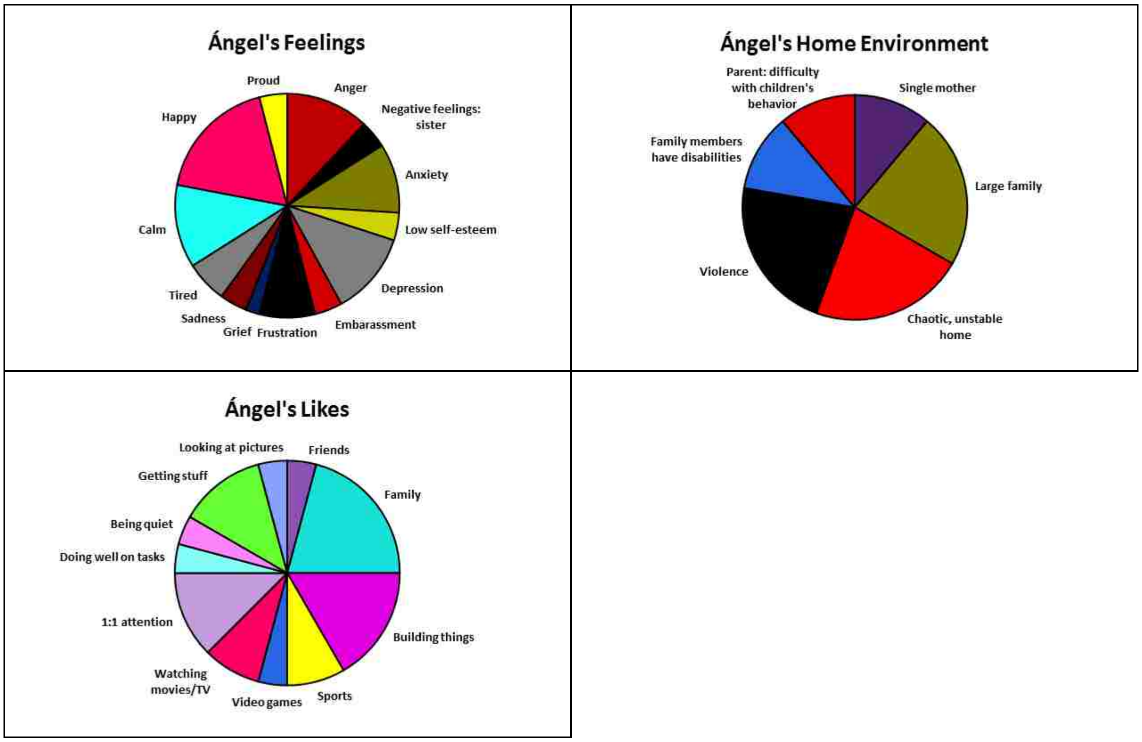


Figure 73. Ángel's feelings, home environment, and likes.

Ángel's feelings. Ángel rated himself at the top of each of the self-report scales every day. Even though he appeared to often be suffering from *Depression* (6 excerpts; see "Ángel's Feelings" in Figure 73), *Anger* (6 excerpts), and *Frustration* (4 excerpts), Ángel was very reluctant to talk about these emotions. One day I asked him to write about a time he got in trouble. It took him a long time to think of something, his eyes looking up at the ceiling. Finally he wrote about being mad because his mother had asked him to clean his room after his baby brother had messed it up. I think he was reluctant to recall negative emotions or unpleasant memories, choosing instead to remember more pleasant ones (*Happy,* 9 excerpts). Ángel chose happy or excited feeling flashcards four times, describing himself as happy when he went for a walk with his cousin by the airport and when he went for pizza with his father. He chose excited to describe how he felt on his birthday and on Christmas. On two other days, he wrote that his heart felt good or warm *(Calm,* 6 excerpts).

Ángel's home environment. Ángel 's school records revealed that many of his family members were or had been in special education, including his mother, his mother's siblings, and his three sisters (*Family members have disabilities,* 1 excerpt; see "Ángel's Home Environment" in Figure 73). His father and mother had "been together on and off for years." Ángel had seen them fighting and there were concerns about trauma and domestic *Violence* (2 excerpts). His father had recently gotten out of jail. Figure 74 (June 24) is a picture he drew of his *Large family* (2 excerpts; the family names he wrote were erased from the picture to protect confidentiality). He had three sisters, two older sisters (16 and 13), and a third sister who was his twin (and in the study's control group) and a baby brother. One of his sisters, according to the school secretary, had schizophrenia. "They're all nice," he said about them, and he drew smiles on all of their faces except on the 13-year-old sister, whose mouth is a flat line. All of the children's heads are tilted toward their mother; their father is on the right side of the picture.

Figure 74. Ángel's drawings*.*

Ángel's likes. Even though his *Family* was not perfect, they were important to Ángel (5 excerpts; see " Ángel's Likes" in Figure 73). He also liked doing nonverbal, physical activities like *Building things* (4 excerpts) and *Sports* (2 excerpts). He was very responsive to *One-on-one* (1:1) *attention* (3 excerpts).

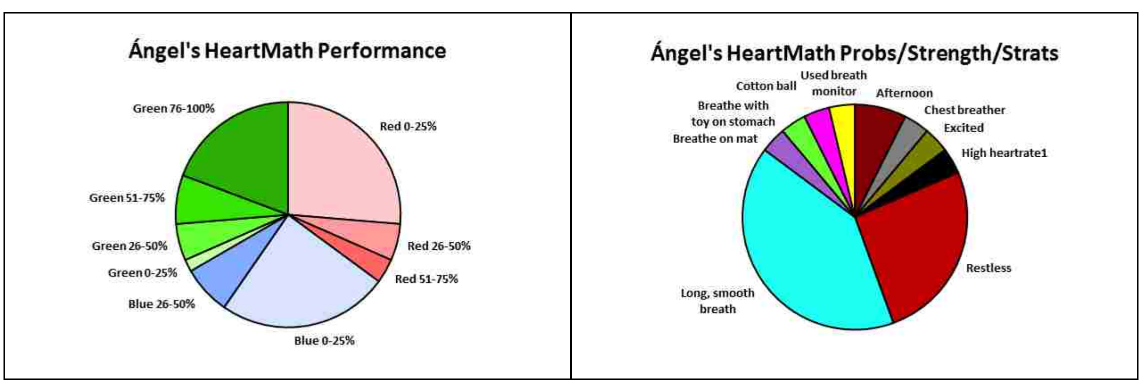


Figure 75. Ángel's HeartMath performance, problems, strengths, and strategies (Probs = Problems; Strats = Strategies).

Ángel's HeartMath performance, problems, strengths, and strategies. Ángel was very good at reaching high levels of coherence (*Green 76-100%,* 11 excerpts; see "Ángel's HeartMath Performance" in Figure 75). During his first HeartMath session, his HRV waveforms were somewhat jagged and his high coherence was only 31%. However, he learned quickly because his waveforms on the next session (the same day) were long and smooth (*Long, smooth breath,* 11 excerpts; see "Ángel's HeartMath Problems, Strengths, and Strategies" in Figure 75) and his high coherence level was 71% that day. He did not want or need further breathing instruction. On his seventh day, when I tried a pinwheel breathing exercise with him, he said he did not like it. He had to think for a while when I asked him why. Then he said, "because I'm not used to it."

Watching his HRV waveforms and the coherence gauges during the session was not stressful for Ángel—it was motivating to him because he could do well on this task (*Used breath monitor,* 1 excerpts). When he got 100% high coherence for the first time, he said, "I got green!" On another day I praised him, "You are really good at this," and he gave me a small smile. I wrote in my field notes that he seemed like he was in a calm state most of the time, "perhaps *too* calm?"

Ángel often appeared a little *Restless* (7 excerpts) during HeartMath, swinging or jittering his legs or moving around in his chair, but it did not affect his performance. However, tiredness and time of day *did* affect his coherence levels. His session was usually in the early morning, but sometimes I took him in the *Afternoon* (2 excerpts) after a fieldtrip. He was excited after going to the movies, eating pizza, and playing games and was not able to reach high coherence. He also seemed tired or depressed after the weekend. One day he told me he was tired because his mother let him stay up until ten o'clock watching movies on Saturday and Sunday nights.

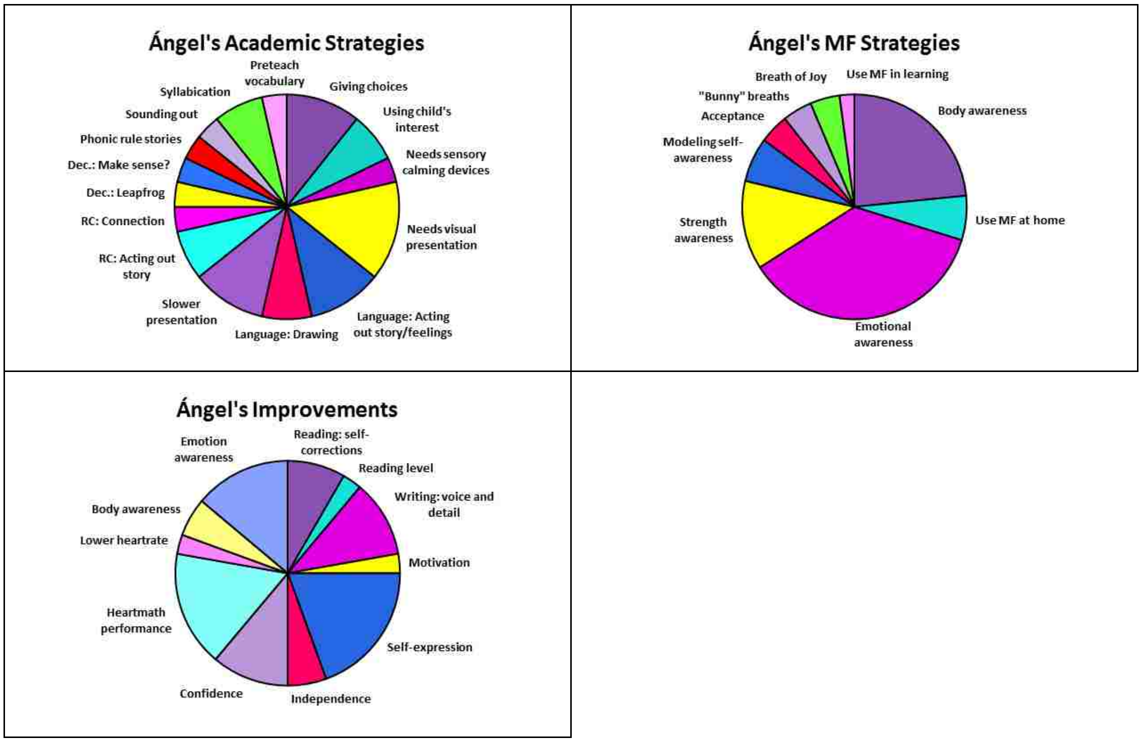


Figure 76. Ángel's academic and MF strategies and improvements (RC = Reading comprehension. Dec. = decoding).

Ángel's academic strategies. Ángel appeared helpless during his first sessions with me, saying he could not take his ear sensor off after the HeartMath session and not knowing how to peel off the stickers he needed to make his bulletin board face. I wrote, "how timid, how hesitant this child is." "Can you help me?" he asked right away. I showed him how he could do it by himself in the future, and he smiled as if to say, "Wow, I can do this." Because of Ángel's passivity and low energy level, I asked him to act out feelings that he had (*Language: Acting out story/feelings,* 3 excerpts; see "Ángel's Academic Strategies" in Figure 76). For example, when he picked the emotion card "excitement," he wrote about being excited when his mother woke him up and said it was Christmas. "What did your body do?" I asked. "Nothing," he said. So I had him act it out—lying on the floor, then getting up quickly to open his presents. He liked doing that; it seemed to make him more alert.

I also spent a lot of time instructing Ángel in metacognitive strategies for decoding (*Dec.: Make sense?,* 1 excerpt; *Dec. Leapfrog,* 1 excerpt; *Syllabication,* 2 excerpts) and reading comprehension (*RC: Connection,* 1 excerpt; *RC: Acting out story)* so that Ángel could begin to rely on himself to figure out words and understand text. Because Ángel was often reluctant or unable to express himself, I encouraged him to draw his thoughts/feelings (*Language: Drawing,* 2 excerpts) and, when he completely shut down, I gave him choices *(Giving choices,* 3 excerpts) to try and bring him out of his depression.

Ángel's MF strategies. I spent a lot of time on *Strength awareness* (6 excerpts; see "Ángel's MF Strategies in Figure 76) with Ángel. Because of his relative strength in nonverbal reasoning and his spatial ability, I bought him a paper airplane kit that contained step-by-step diagrams for assembling a plane. When I showed it to him I said, "I think you're good at making things; you just don't know it yet." Working on paper airplanes seemed to bring him to life. After showing him the book, he figured out the diagrams faster than I did and I told him that. "Your hands are smart," I said. In a loud and clear voice, he asked if we could do this again next time—this was the only time I heard him speak loudly. He wanted to redo his plane, saying he had done it wrong, so I let him take the plane home. The second time we worked on planes together, I told him that sometimes my mind went blank when I looked at the diagrams; I wanted to let him know that teachers are not good at everything (*Modeling self-awareness,* 3 excerpts). I said I was "kinda' stupid about this kind of stuff, and you're smart." He smiled. "I love it when he smiles," I wrote in my field notes that day. "It's not that often, but it is delightful."

I also worked on *Emotional awareness* (17 excerpts) with Ángel. Because his school records mentioned anger issues, I asked him on the fifth day when he felt bad; he said he never did. Then I asked him who he got mad at, and he said he got mad at his 13-year-old sister, writing "she mesis [messes] with stuf. I felt mad. I fill [feel] mad in sid [inside]." I asked him if he liked feeling mad. "Yes," but he did not know why. However, he smiled when I asked, "Maybe it makes you faster?" He said he chased his sister when he got mad. I asked him to breathe when he got mad at her; "see what happens" (*Use MF at home,* 3 excerpts).

It seemed easier for Ángel to express himself in writing. On the third day, I asked him to write about the feelings in his heart and thoughts during a HeartMath session. He wrote, "My heart is worm [warm]. My heart is Big as a penne [penny] theres no thought." In my field notes I wrote, "It's interesting that he wrote there was no thought… He may live more in wordless sensation and emotion."

There were some days when Ángel seemed especially withdrawn. On July 7th, on a Monday after the 4th of July weekend, he seemed very tentative, quiet, and slow, barely speaking. I wrote, "It's like he gets beaten down somehow at home and he becomes afraid to move, to even squeak." I asked him how he felt when he forgot things. It took him a long time, but he finally pointed to the embarrassed face on my poster, even though he had pointed to the same face five days earlier when I asked him how he felt when he could not remember.

Two days later, Ángel completely shut down when I asked him why he had come to school late yesterday. I tried some energizing breath exercises and movements with him to see if that would help his memory (*"Bunny" breaths,* 2 excerpts; *Breath of Joy,* 2 excerpts), but it seemed to make things worse. He did not even want to choose an emotion card. "I'm going to count to 5," I said, "and you'll pick a crayon. Just let your hand move." He slowly picked blue and green, but was reluctant to draw until I covered up his eyes. Then he moved very slowly, covering the page with smooth, horizontal strokes (see July 9, Figure 74 above). His face was sad; he kept moving his jaw, a behavior he was not aware of until I pointed it out to him. "I think when you move your jaw you're not feeling too good or happy," I said.

I noted that Ángel often went blank when he was asked a question, especially when asked about unpleasant events or negative emotions. Perhaps his mind did not want to remember, and then he became afraid he would be in trouble because he could not answer. When asked to remember pleasant events, however, he had no trouble recalling them, remembering what he did on his birthday (a month ago) easily. "wen I was happy my dad took me to Chucke Chees."

Ángel's improvements. Ángel's *Reading level* (1 excerpt) improved from Level C to Level D (see Figure 77). His *Self-corrections* (3 excerpts) improved from 0 at Level C to 40 at Level D. The number of words he read/day improved over the summer from 5 at

Level C to 50 at Level D.

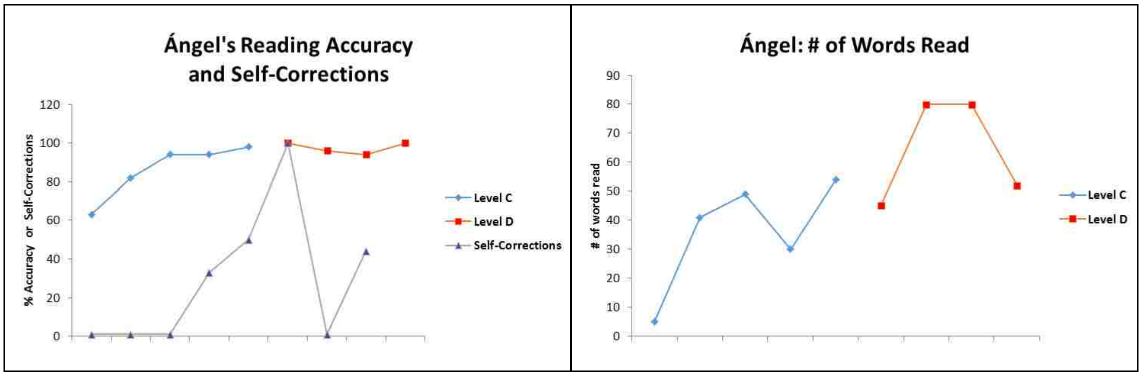


Figure 77. Ángel's reading accuracy, self-corrections, and number of words read.

Over the course of the intervention, I discovered that when I spoke slowly, calmly, and kindly to Ángel, he began to talk more and become more expressive around me (*Self-expression,* 7 excerpts; see "Ángel's Improvement" in Figure 76). On his last session, he said "Yay!" when I told him he could take his airplane kit home with him.

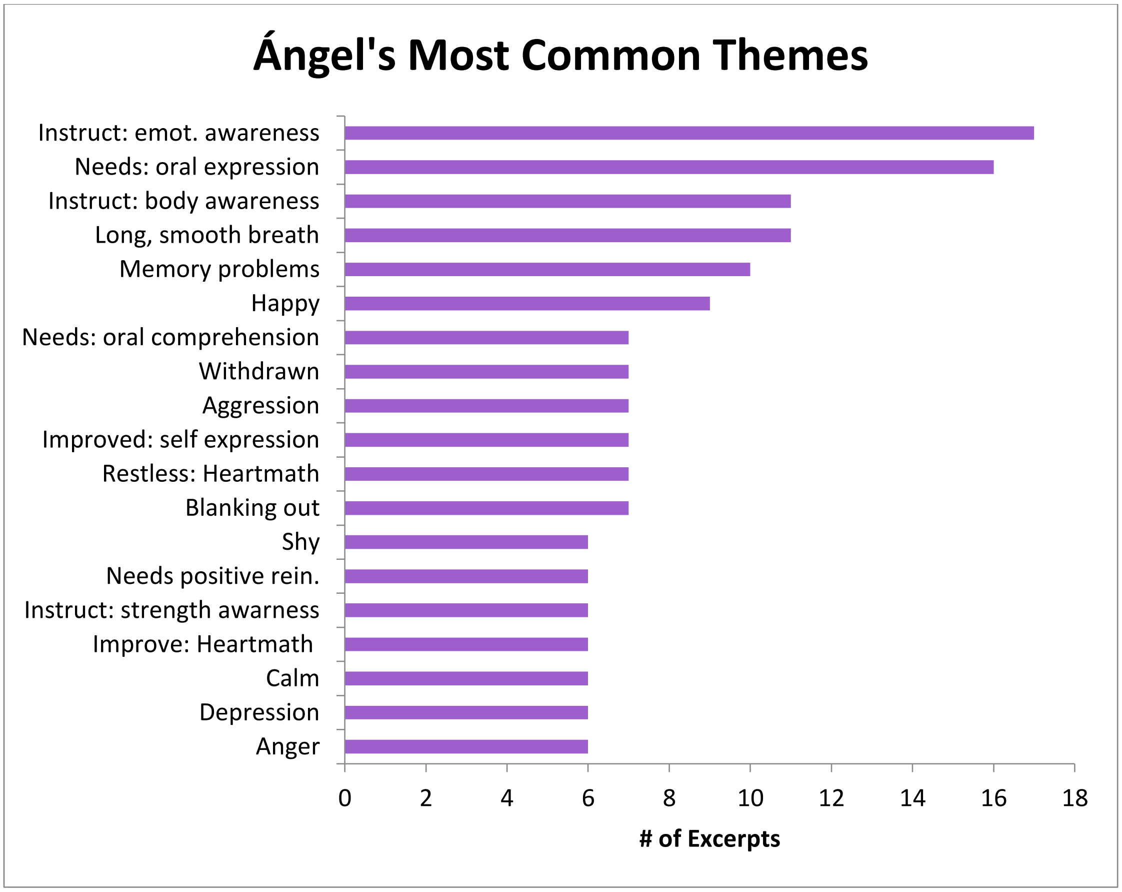


Figure 78. Ángel's most common themes (*P*ositive rein. = positive reinforcement; Emot. = emotional).

Ángel was a quiet, shy boy who came from a troubled home environment. Although his behavior demonstrated that he was suffering from anger and depression (see Figure 78), he did not know how to express himself except through aggression towards other people. His difficulties with self-expression were compounded by memory problems; when trying to remember an answer or recall an unpleasant event, he often blanked out and was unable to answer. The MF intervention helped him discover tools for increasing positive affect (e.g., breathing practice—which he was very good at). It also increased his self-confidence because I focused on developing his strength awareness. For example, knowing he was good at sports, I chose about a book about baseball called "Paul the Pitcher" and had him pretend he was the pitcher. He enjoyed doing this and followed the instructions in the book very well—"throw it fast" or "throw it high." At the end of the summer, when I asked him to write about what he had learned that summer he wrote, " I lrnd haw [learned how] to red [read]. I lrnd haw to mack [make] papkre (paper) planEs."

Juan: The Boy Who Loved To Talk and Hated to Read and Found Peace While Modeling Clay and Imagining His Mother's Face

Table 17

Juan's General and Cognitive Information and Quantitative Test Scores

Age	**Sex**	**Ethnicity**	**ELL**	**Label**	**Level**	**IQ**	**Nonverbal Ability**	**Proc. Speed**	**WM**
9 yrs., 10 mos.	M	Hispanic	Yes	1. OHI 2. SLD	B	96 Average	123 Above Average	96 Average	80 Below Average

Mood Average	**Reading Attitude Average**	**Reading Confidence Average**
5	5	2.9

Test	**Pre**	**Post**	**PrePost DIF**	**Fol**	**PreFol DIF**
Oral Rdg. Average	65	35.3	-29.7	53	-12
Retell Average	16	25.7	10	31.3	15.3
Phonics Test	8	13	5		
Writing Voice	3	4	1		
Wtg. Word Choice	3	3	0		
LD Nonword Accuracy	74%	89%	15%		
LD Nonword RT	1217.32	1261.16	44 ms		
LD Word Accuracy	77%	67%	-10%		
LD Word RT	1340.3	1403.34	63 ms		

Juan was the only participant whose primary disability was OHI or Other Health Impairment, meaning he had been diagnosed with ADHD. He had an average IQ (96; see Table 17), his nonverbal ability (123) was above average and the highest of the experimental group, but he was reading at a first-grade level at the end of fourth grade. His WM (80) was below average. He improved on four of the quantitative tests: the retell fluency (+15.3 words), the phonics test (+5), the writing voice test (+1 or 17%), and on LD nonword accuracy (+15%). His score decreased on two of the tests: the oral reading test (-12 words) and on LD word accuracy (-10%). His RTs increased on both the LD nonword subtest (+44 ms) and the word subtest (+63 ms). Because he was an emerging reader, I taught him to use metacognitive strategies while reading, so his increased RTs (and his decreased score on the oral reading test—a timed test) could have been due to increased reflectiveness while decoding.

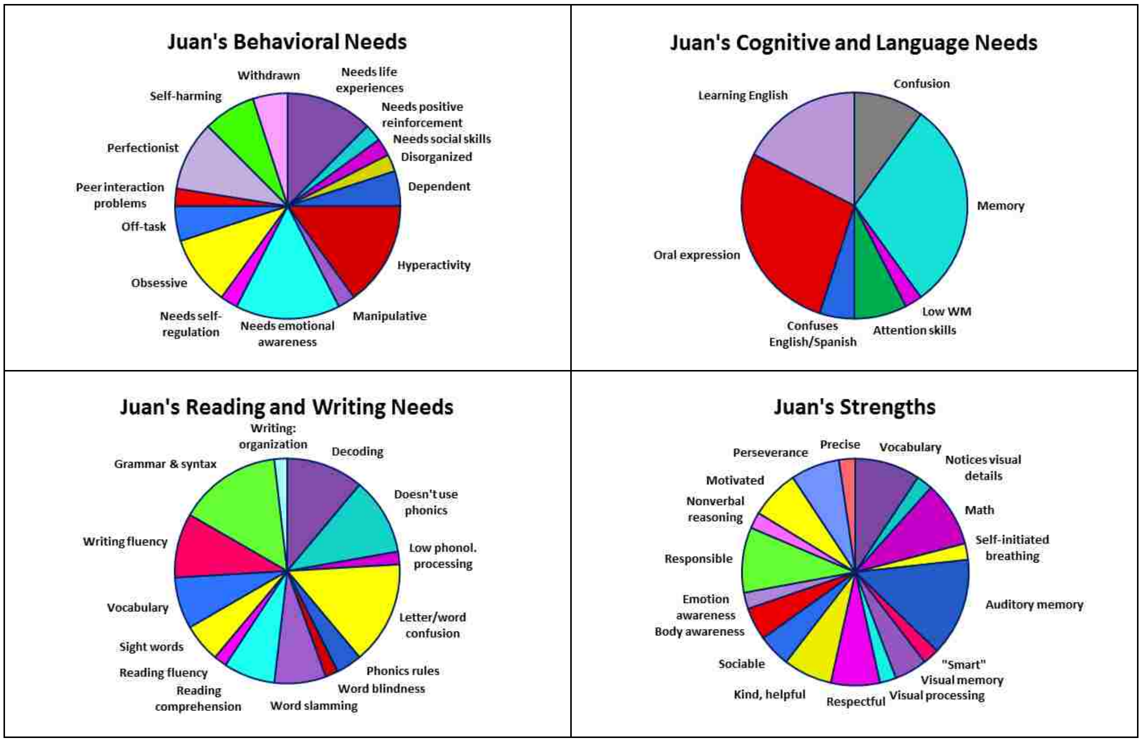


Figure 79. Juan's behavioral, cognitive, language, reading, and writing needs and his strengths.

Juan's behavioral needs. In a functional behavior assessment in his school records, Juan is described as having a high mobility rate—often getting out of his seat, losing things he needed to complete tasks, blurting out frequently, and shutting down and withdrawing from tasks (*Hyperactivity,* 6 excerpts; *Withdrawn,* 2 excerpts; *Off-task*, 2 excerpts; see "Juan's Behavioral Needs" in Figure 79). The function of his behavior was determined to be "escape from academic tasks." ADHD medication helped him somewhat, but he was still easily distracted and highly mobile. He was compulsive at organizing markers or pens and sharpening his pencils (*Obsessive,* 4 excerpts). He used seat cushions and weighted backpacks, sensory devices that are supposed to be provide calming sensory pressure for children with ADHD. In his school records, there were reports of choking himself in class and his mother told the school evaluators that Juan sometimes made comments that he would hurt himself (*Self-harming,* 3 excerpts).

During our first interview, Juan's mother (who spoke in Spanish while a teacher from the school acted as a translator) asked me if she thought he should take his ADHD medication (methylphimadate) that summer. She said he only took his medication on school days, but not on the weekends. She thought his medication helped him a little bit. The translator at the interview said, "When he does not take it, she feels he goes down" and that his grades "went up two or three steps." Because Juan had been taking his medication during the study's pre-tests, I told his mother to keep giving it to him during summer school.

Juan's cognitive and language needs. Juan was an ELL student, so many of his difficulties with *Oral expression* (11 excerpts; see "Juan's Cognitive and Language Needs" in Figure 79) could have been because he was *Learning English* (7 excerpts). When I interviewed Juan, his answers to my questions about himself were very brief and non-descriptive. "Tell us what you don't like about school," I asked. "Not much," he said after a pause. "What don't you like to read?" "I don't know," he said, again after a pause. Perhaps his *Memory* (12 excerpts) problems made it difficult for him to recall things or perhaps it was due to a lack of awareness about himself (*Needs emotional awareness*, 6 excerpts; see "Juan's behavioral needs"). At other times, his answers were confused and jumbled (*Confusion,* 4 excerpts; see "Juan's cognitive and language needs"). "Do you get in trouble at school?" I asked him. "Yeah," he said. "How come?" I asked. "Just because last time we were on with another class and a friend of mine, he went to another kid. And I was not even doing it and I got in trouble for it," he said.

Juan's reading and writing needs. To a greater or lesser degree, spelling was a weakness for all of the participants. For Juan, a Level B student who was almost ten years old, spelling and letter reversals were a significant problem (*Letter/word confusion,* 8 excerpts; see "Juan's Reading and Writing Needs" in Figure 79). In his writing sample, he reversed letters, misspelled the word "me," and sometimes added letters that did not make sense phonetically (e.g., "rbuder" for "brother"): "My rbuder [brother] gous end [goes and] he beracks [breaks] my minicouraft [MindKraft] hous..." And while it is clear that he is attempting to spell sounds in the words as he had been taught (e.g., stretching out the sounds in a word like "ber-acks"), there is little to no evidence that he has a visual memory of high-frequency words like "and" or "goes."

In Juan's school records, his special education teacher said he did not "use or integrate knowledge of phonics, meaning, cues, and language structure when decoding" (*Doesn't use phonics,* 6 excerpts). In other words, he was *Word slamming* (4 excerpts)—he guessed at words without looking at the letters or thinking of the context of the word. However, unlike what his special education teacher had observed, I found that Juan *did* use semantic and/or phonetic cues when decoding. When I analyzed the errors that Juan made during reading, he mostly made semantic errors (e.g., enjoy for joke, spread for stretch, pizza for pie in a book about making pizza). He also looked at the beginning and end of the word when decoding (will/wait, at/it, cook/cooks, here/her). Once Juan told me that one of his reading strategies was to guess a word and then ask the teacher if it was right. In other words, when reading books in class, he was not using metacognitive strategies to decode words, but instead just randomly guessing words because he knew the teacher would eventually give him the right answer. Perhaps this was why he was not using semantic/phonetic cues in class.

Juan's strengths. While he struggled to remember sight words, Juan seemed to have a good *Auditory memory* (6 excerpts; see "Juan's Strengths" in Figure 79). During his first interview, his mother said he was very "*Smart*" (1 excerpt) and always remembered what happened when he was little. I wrote in my field notes that the strategy he often used when decoding was to try and remember if he had heard the word before. Instead of looking at the word or at the pictures in the book, he would look up, an eye movement that is associated with recalling information (Dilts, 1998). It would be interesting to study this behavior in DYS students as the direction of the eye movement can indicate what type of processing they are trying to access—whether visual, auditory, or kinesthetic (Dilts).

Juan's teachers described him as "sweet and respectful, friendly, caring, with strengths in math, a good attitude and a good work ethic who tried hard to please" (*Respectful,* 3 excerpts; *Kind, helpful,* 3 excerpts; *Math,* 4 excerpts; *Motivated,* 3 excerpts; *Responsible, 4 excerpts*). There is evidence of another one of his strengths in his writing sample before the intervention began—a level of *Body awareness* (2 excerpts) in his last sentence. "After I get mada [mad] my boude [body] gets tauerd [tired]."

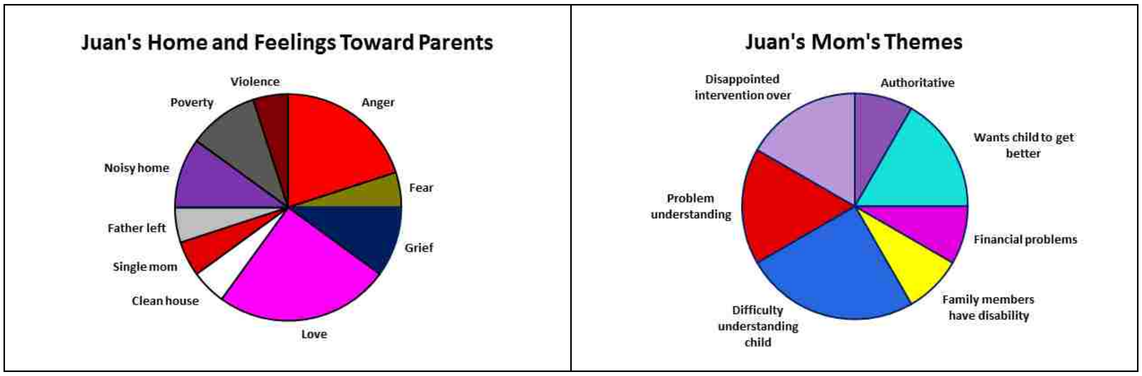


Figure 80. Juan's home and feelings toward parents and Juan's mom's themes.

Juan's home and feelings toward parents and Juan's mom's themes. Juan's school records reported him as saying that he was sad and worried, that he missed his grandfather who had died (*Grief,* 2 excerpts; see "Juan's Home and Feelings toward Parents" in Figure 80), and that he wished he could help his mother more, who worked hard and worried a lot about money (*Financial problems,* 1 excerpt; see "Juan's Mom's Themes" in Figure 80). He also said he was having problems in the apartment complex where he lived because some of the children and adults there behaved badly.

Juan's house was clean and had air conditioning (*Clean house*, 1 excerpt; see "Juan's Home and Feelings Toward Parents"). We sat on a leather couch for the interview; his baby brother often screamed, trying to get attention (*Noisy home,* 2 excerpts). During the interview, Juan's mother said she had a difficult life when he was a baby, referring to some domestic *Violence* (1 excerpt). She said Juan was upset with his dad; "he hates his dad" who he had not seen for seven years and was in another country (*Anger,* 4 excerpts). His mother told us that sometimes Juan said he was going to kill his dad when he saw him again. She also said he was sad about his grandfather who had died, "because he always saw his grandpa as his dad." Two of Juan's uncles also had learning disabilities (*Family members have disability,* 1 excerpt; see "Juan's Mom's Themes"). When the school told her Juan had a learning disability, his mother thought he was just young and not mature enough (*Difficulty understanding child,* 3 excerpts).

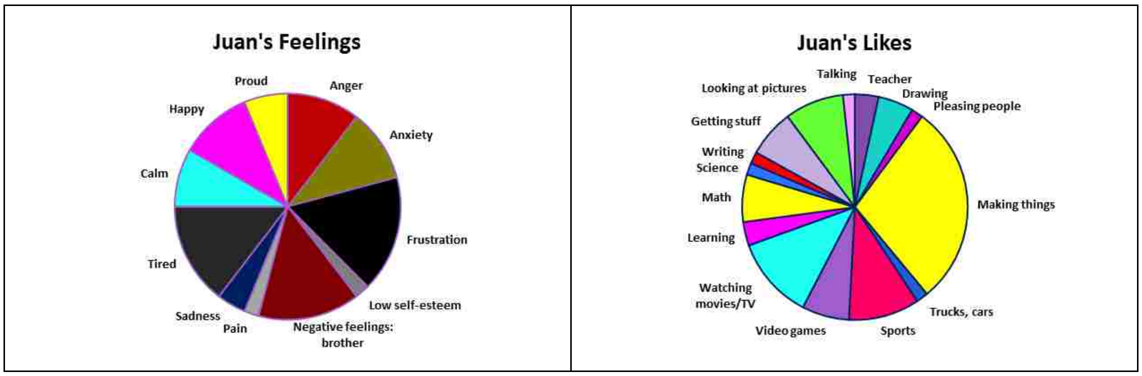


Figure 81. Juan's feelings and likes.

Juan's feelings. Many of the feelings I observed in Juan seemed to be caused by *Frustration* (8 excerpts; see "Juan's Feelings" in Figure 81) and *Anxiety* (5 excerpts) when he was trying to read a new book. For example, when he repeatedly missed a word, he would throw his head back in frustration or begin to read the words faster and faster. The enormous amount of effort he expended while decoding often made him *Tired* (7 excerpts). During his first interview, Juan's feelings about reading were not too clear to him. He said he "kind of" liked reading, but he did not know what he liked or disliked about it. He said he liked writing because he liked making stories, but he had trouble thinking of what to write about. "I'm excited about a lot of stuff, and then I don't know what to pick."

Juan's likes. Juan's mother said her son was always thinking about his future, what he was going to be when he grows up, "that he's going to have a lot of money…

and a big house" (*Getting stuff,* 4 excerpts; see "Juan's Likes" in Figure 81). Because I knew Juan loved *Making things* (17 excerpts) and because he had talked about Legos during his first interview, I purchased a book with large illustrations of Lego creations for him. This was a big success with Juan—he loved *Looking at the pictures* (5 excerpts) and talking about what he wanted to make. One time he told me about building a Halo Ship and his mom had said, "How do you have the patience with all those little pieces?"

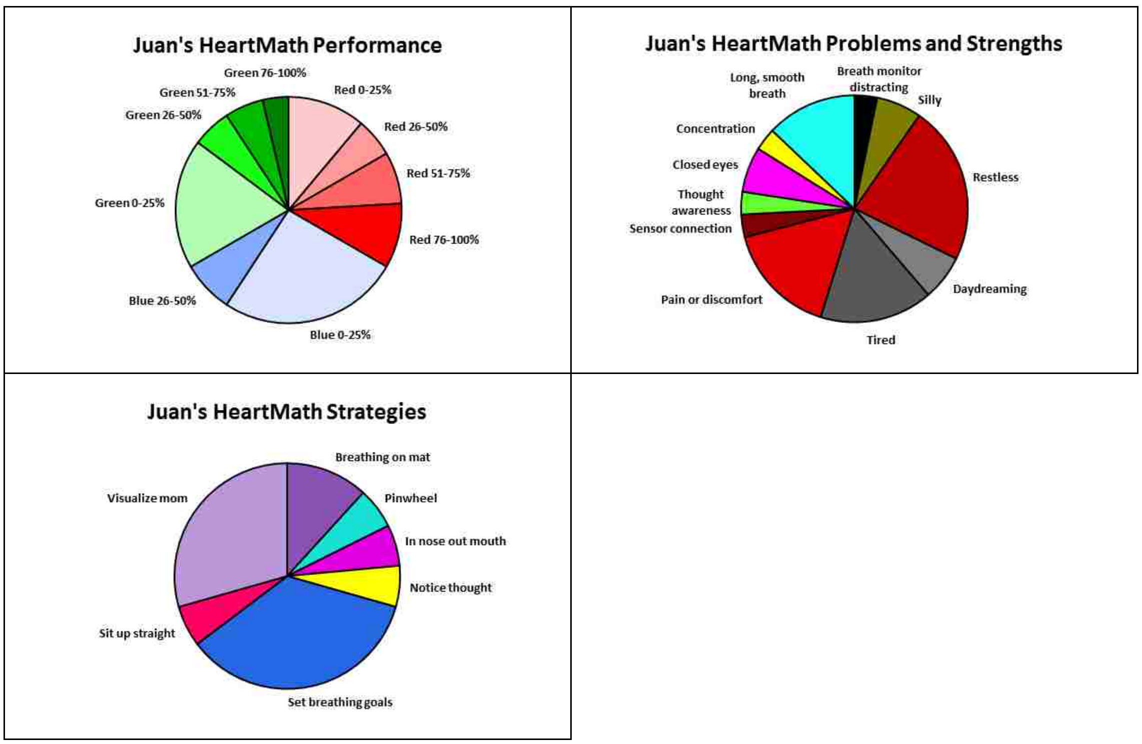


Figure 82. Juan's HeartMath performance, problems, strengths, and strategies.

Juan's HeartMath performance, problems, strengths, and strategies. Juan had difficulty achieving high levels of coherence (*Blue 0-25%,* 14 excerpts; *Green 0-25%,* 10 excerpts; see "Juan's HeartMath Performance" in Figure 82). Like Ernesto, he had also participated in my research study two years ago, learning how to breathe and concentrate from the same teacher but, unlike Ernesto, he had not continued to practice breathing on his own after the first study concluded.

On his first HeartMath session, Juan's HRV waveforms were smooth and regular for the first minute and a half, and then he got *Restless* and started to itch (7 excerpts; see "Juan's HeartMath Problems and Strengths" in Figure 82). "I was thinking," he said after the session. On the third day, he was able to close his eyes and concentrate the whole time, "thinking nothing" he said, and this was the only time his high coherence level was 100% (*Closed eyes,* 2 excerpts; *Concentration,* 1 excerpt; *Long, smooth breath,* 4 excerpts). But the next day, his heart rate was higher, he was yawning, and he said his head started to hurt (*Pain or discomfort,* 5 excerpts).

On July 9, after he had written about how his mother made him feel safe, I asked him to see if he could keep an image of her in his head during the HeartMath session (*Visualize mom,* 5 excerpts; see "Juan's HeartMath Strategies" in Figure 82). He was sleepy that day, so I had him *Sit up straight* (1 excerpt). He said he was able to keep the image of his mother for a while before it disappeared—"she was smiling," he said. On the next day, lying on the mat with his eyes closed (*Breathing on mat,* 2 excerpts), he visualized his mother again. His HRV waveforms were slow and regular at first; then his eyes popped open and he looked at me. "I lost my vision of my mom," he told me later. His level of coherence was high that day (68%).

Being *Tired* (5 excerpts; see "Juan's HeartMath Problems and Strengths) was often a problem for Juan during HeartMath. On his lowest coherence day (98% red), July 18, he said he was going to fall asleep and he rated his sleepiness as "5." He said he was singing a song in his head. His HRV waveforms were very short that day; there were no long waves.

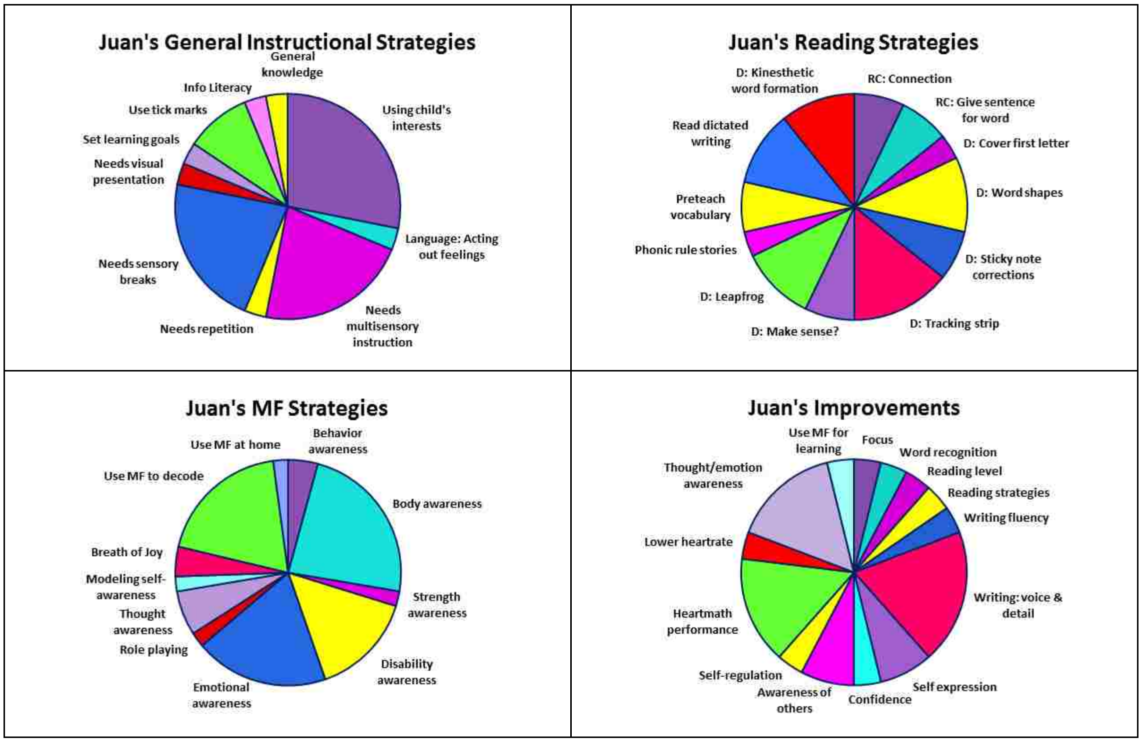


Figure 83. Juan's general instructional, reading, and MF strategies and his improvements (Info Literacy = Information Literacy; RC = Reading Comprehension; D = Decoding).

Juan's general instructional and reading strategies. Juan became fatigued while reading because it took a great deal of cognitive energy for him to concentrate and figure out new words. So I tried many things to help make reading easier and to give him sensory breaks (*Needs sensory breaks,* 7 excerpts; see "Juan's General Instructional Strategies" in Figure 83). I gave him clay when he was reading; he said it was a "little distracting" but he liked the feel of it in his hands. I had him do jumping jacks because he kept saying how sleepy he was. I asked him to breathe when he became frustrated.

Finding a level where Juan could begin reading proved to be difficult because, if he was not familiar with the vocabulary and experiences in the book, he found it very difficult to read the text. In a book about building a house, he did not know the words "tarpaper" or "shingles." So it was important to discuss vocabulary and background concepts when introducing a book to him (*Preteach vocabulary,* 2 excerpts; see "Juan's Reading Strategies" in Figure 83). For example, in bringing out a book about space, I asked Juan what he knew about astronauts. He was not interested in answering; he wanted to talk about a science fiction video game (Halo) instead. So I connected Halo to space (*Using child's interests,* 9 excerpts; see "Juan's General Instructional Strategies"): "In this game, do the good guys go on voyages on rocket ships?" He answered me enthusiastically, always eager to talk about video games.

In a book about building a house, when Juan read "boards" as "wood," I asked him if he had ever seen anybody building something (*RC: Connection,* 2 excerpts; see "Juan's Reading Strategies"). He remembered when his uncle had built some steps, so I asked him to draw the boards in his uncle's steps. He drew a very precise, three-dimensional picture of the boards, and read the word "boards" as "board" the next day.

Once Juan had miscued on a word, it was very difficult to get him to read it correctly. In a book called "Pizza Party" that Juan read on his first day, Juan missed 21 out of 77 words, self-correcting only four of those miscues. When he had difficulty with a word, he would guess what it is and look at me to see if it was correct. When I did not help him, he became frustrated and began to read faster and faster. On the second to last page, he stumbled over the words "what fun," reading it as "with fun."

Juan continued to make this mistake whenever he read this book, so I gave him some clay so he could roll out the letters in the word (*D: word shapes,* 3 excerpts). He said this activity helped him learn how to spell "what," but then he became confused and wrote "*what* my mom" instead of "*with* my mom." I showed him why he may have been confusing the words; because the letters w-h-t were in both words. I asked him to make clay letters for "with." He spent a long time rolling the ball in his hands; I asked him if it was calming for him. "Sometimes," he said. While he wanted to rush through reading as quickly as possible, Juan became a perfectionist when he was rolling clay or making letter shapes, becoming "annoyingly slow," I wrote on day. However, the next time he read "Pizza Party," he read "what fun" correctly and with a lot of expression.

Juan's MF strategies. Legos were a major theme in Juan's writing. On his second day, I asked Juan how he felt when he was working with Legos (*Emotional awareness,* 9 excerpts; see "Juan's MF Strategies" in Figure 83). He said he was concentrated and his heart felt nice. It was hard for him to think of what made him feel bad, until he thought about his baby brother messing up his stuff, another common theme with participants in this sample. He did not know how his body felt when he was mad until I showed him that he was clenching his fists (*Body awareness,* 11 excerpts). One day he drew a picture of himself playing with his Halo truck (see June 30, 1, Figure 84) and said it made him feel happy. "Where?" I said. "In my brain." "What color?" He frowned, concentrating. "Green." "What shape?" "A circle." "Is is green or dark green in the middle?" "Dark green with light green around it" (see June 30, 2, Figure 84).

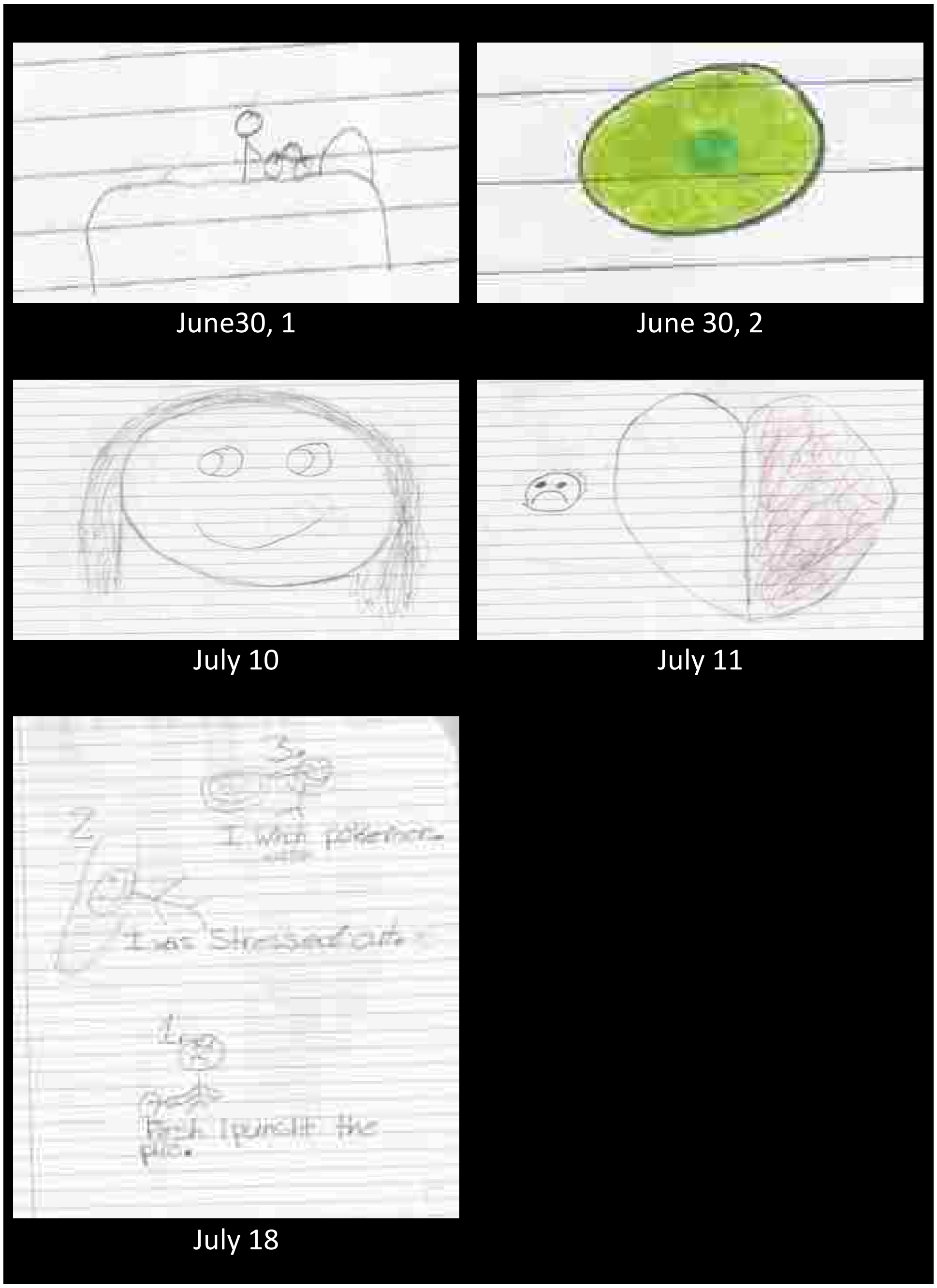


Figure 84. Juan's drawings.

Juan often felt sleepy, so I taught him some energizing breath exercises (*Breath of Joy,* 2 excerpts) and he wrote that breathing faster made him "unsleepy." I also worked with him on his awareness of the "bored" feeling he had during reading ("This is so boring!" he said one day, putting his head down in frustration), giving him a new book in order to generate the feeling of boredom (*Disability awareness*, 7 excerpts). He wrote, "Wen I read a Book it meask [makes] me sleepy and Boredo." Then I asked him to draw his brain when he had this feeling, and he did, looking at a brain poster on my wall (see July 11, Figure 84). Interestingly, he drew red lines representing the boredom only on one side (or hemisphere) of the brain.

Juan's improvements. On his last day, Juan demonstrated that he had developed some *Focus* (1 excerpts; see "Juan's Improvements" in Figure 83) and *Self-regulation* (1 excerpt). His HRV waveforms were short and jagged at first, but quickly became smooth and regular; his high coherence level that day was 59% (Improvement in *HeartMath performance,* 4 excerpts). After the session he told me that at first a song was stuck in his head, but then he talked to himself and started to breathe and think about his mother.

On July 7, Juan started writing about his mother. "My mom mecks [makes] me feel cuddly and save [safe]." Three days later, he drew a picture of how he visualized her during breathing (see July 10, Figure 84). His picture contained a lot more detail than the June 30, 1, picture—it had hair and even pupils. On his fourteenth session, he talked about being angry with his mother for the first time because his brother had gotten into his room and broken some of his Legos by throwing them down the stairs. He said he told his mother, "I asked you to take care of my Legos. How can I trust you?" He wrote and drew about what he did afterwards, first punching a pillow, then lying down "stressed out," and then watching TV (Improvement in *Thought/emotion awareness*, 4 excerpts; see July 18, Figure 84).

I finally discovered a reading strategy for Juan that capitalized on his strength in auditory memory. I asked Juan what he wanted to talk about that day, and, of course, he wanted to tell me his video game, Clash of Clans. While he talked, I typed up his words exactly as he said them. Then I used Microsoft Word's Readability option and found that the reading level of his dictated writing was on the fourth grade level (Level R). While he struggled to read books at a first-grade level, the next day he read his own writing with 92% accuracy, although he stumbled over some of his phrasing. "Huh?" he said. "That doesn't make sense." He also improved from a Level E to a Level F (*Reading level,* 1 excerpt, see Figure 85), increased his self-correction rate (*Reading strategies,* 1 excerpt), and increased the number of words he read in a day from 60 at Level F to 100 at Level F.

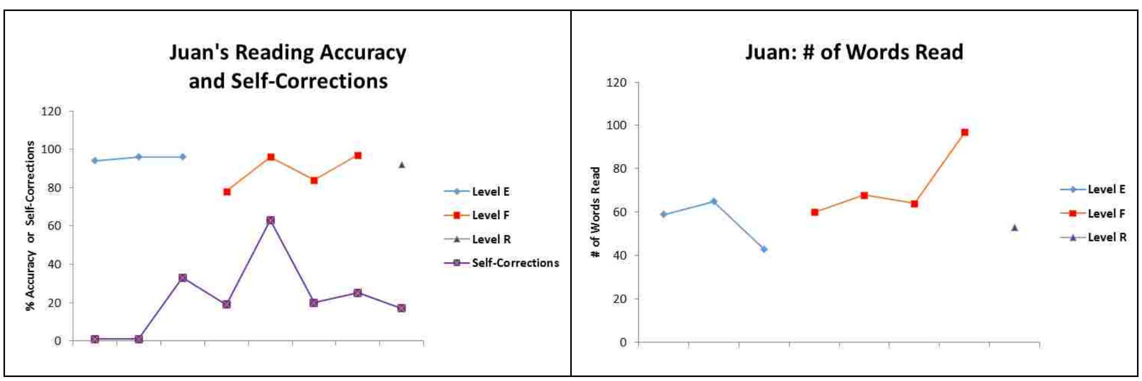


Figure 85. Juan's reading accuracy, self-corrections, and number of words read.

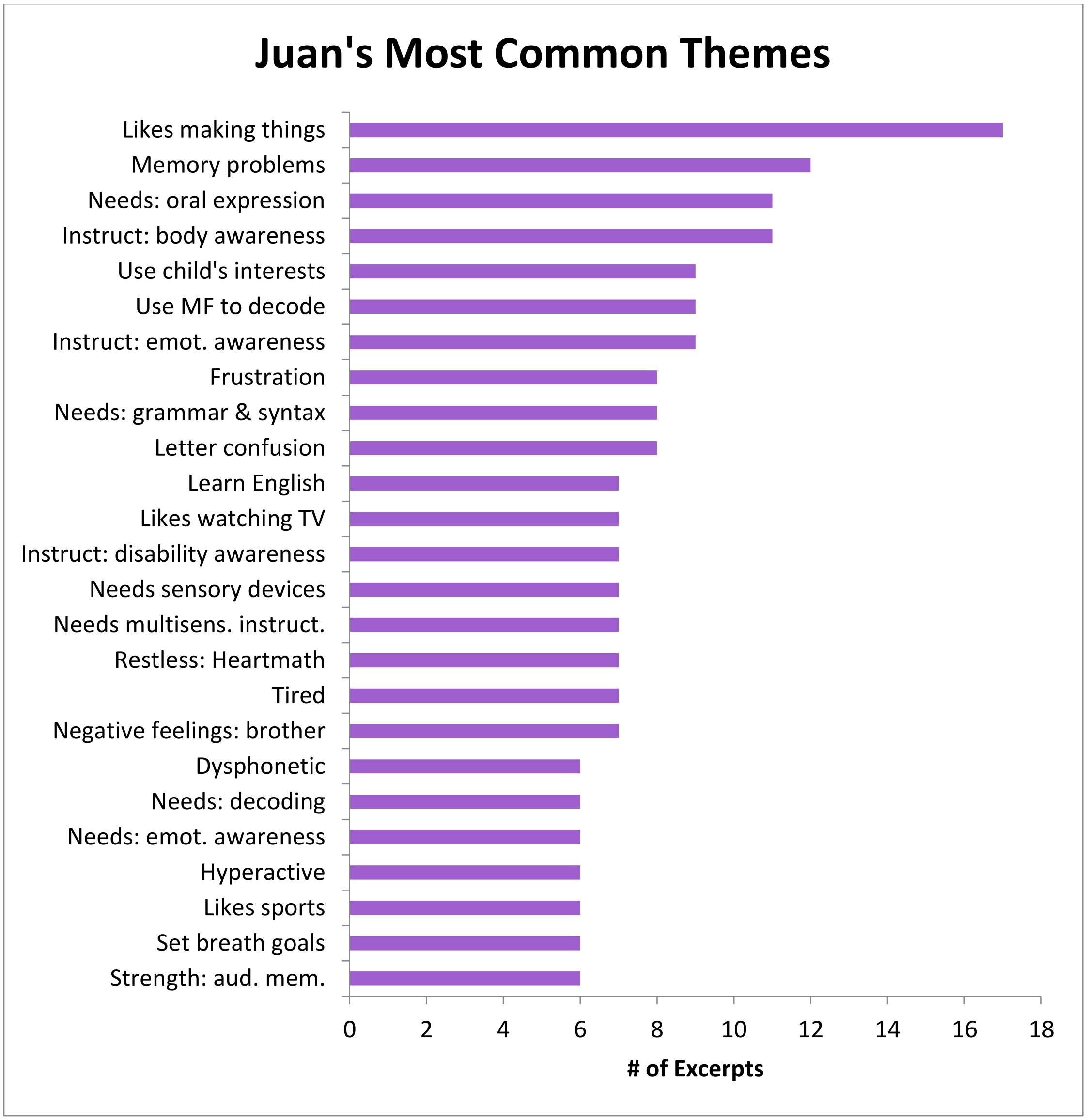


Figure 86. Juan's most common themes (Aud. mem. =auditory memory; Multisens. instruct = multisensory instruction).

Juan was a boy whose ADHD, ELL status, and memory problems compounded his difficulties expressing himself and made it very challenging for him to read (see Figure 86). I instructed him in awareness of his physical responses to frustration (e.g., banging his hand on the desk, getting a headache) so that he could then respond to this frustration with mindful breathing or visualization or by using sensory calming devices. I used his interest in making things to motivate him to read and to encourage him to focus during breathing practice.

Like Pax, Juan was dysphonetic, meaning he had great difficulty integrating letters and sounds and difficulty sounding or spelling words phonetically. So I instructed him in metacognitive reading strategies to help him decode words. In his post-interview, Juan said that what he remembered from the summer. "Those steps… like it doesn't sound right…" "Can you remember what they are?" I asked. "It doesn't sound right or I skipped a word and, and thinking," he replied. He told his mother that clay helped him read and focus and that when he thinks about her and concentrates, he got better at reading. In his first interview, when I asked him what was hard about reading, he said, "that somewhere I can't read." In his second interview, when I asked him the same question, he said, "that sometimes I get really nervous." His mother wanted to know if I was going to keep working with him. When I said, "No," her face fell.

Because of his reliance on his auditory memory, I recommended that teachers have Juan dictate writing about what he cares about. I suggested they write down his exact words without correcting his grammar and syntax, then ask him to illustrate and read these stories. In this way, teachers could use Juan's natural language and interests to motivate him to perform a very difficult task for him—decoding new text.

Noah: The Boy Who Pounced on Fear with a Tiger Cat and Made His Teacher Do Jumping Jacks

Table 18

Noah's General and Cognitive Information and Quantitative Test Scores

Age	Sex	Ethnicity	ELL	Label	Level	IQ	Nonverbal Ability	Proc. Speed	WM
8 yrs., 5 mos.	M	Hispanic	No	SLD	C	90 Average	99 Average	89 Below Average	88 Below Average
Mood Average	**Reading Attitude Average**	**Reading Confidence Average**							
4.7	3.9	2.5							
Test	**Pre**	**Post**	**PrePost DIF**	**Fol**	**PreFol DIF**				
Oral Rdg. Average	4.7	8.7	4	5.3	.7				
Retell Average	0	0	0	11.3	11.3				
Phonics Test	7	12	5						
Writing Voice	2	4	2						
Wtg. Word Choice	3	3	0						
LD Nonword Accuracy	74%	70%	-4%						
LD Nonword RT	1213.27	1957.38	744 ms						
LD Word Accuracy	34%	14%	-20%						
LD Word RT	1435.89	1671.58	235 ms						

While Noah had an average IQ (90; see Table 18) and Nonverbal Ability (99), he had significant behavioral, language, physical, and academic needs. His processing speed (89) and his WM (88) were both below average. Noah's school records said the school district considered him to have DYS. He was identified as also having a speech and language impairment for articulation. His fine motor skills (small muscle movements involved in many academic tasks like handwriting) were significantly below average. From the beginning of the intervention, he rated himself as lower on all three self-report scales, especially on the Reading Confidence scale. However, he did rate himself at the top of each scale on ten days—7 of those days were the last days of the intervention.

Noah improved on four of the quantitative tests: the oral reading test (+4 words at the end of the intervention and +.7 at the follow-up), the retell test (11.3 words at follow-up), the phonics test (+5), and the writing voice test (+2 points or 33%). His accuracy score decreased on the LD nonword subtest (-4%) and the word subtest (-20%), while his RTS increased on the nonword subtest (+744 ms) and the word subtest (+235 ms). An emerging reader (reading at a kindergarten level at the end of second grade), I taught Noah to use metacognitive strategies, so his increased RTs could have been due to increased reflectiveness during decoding.

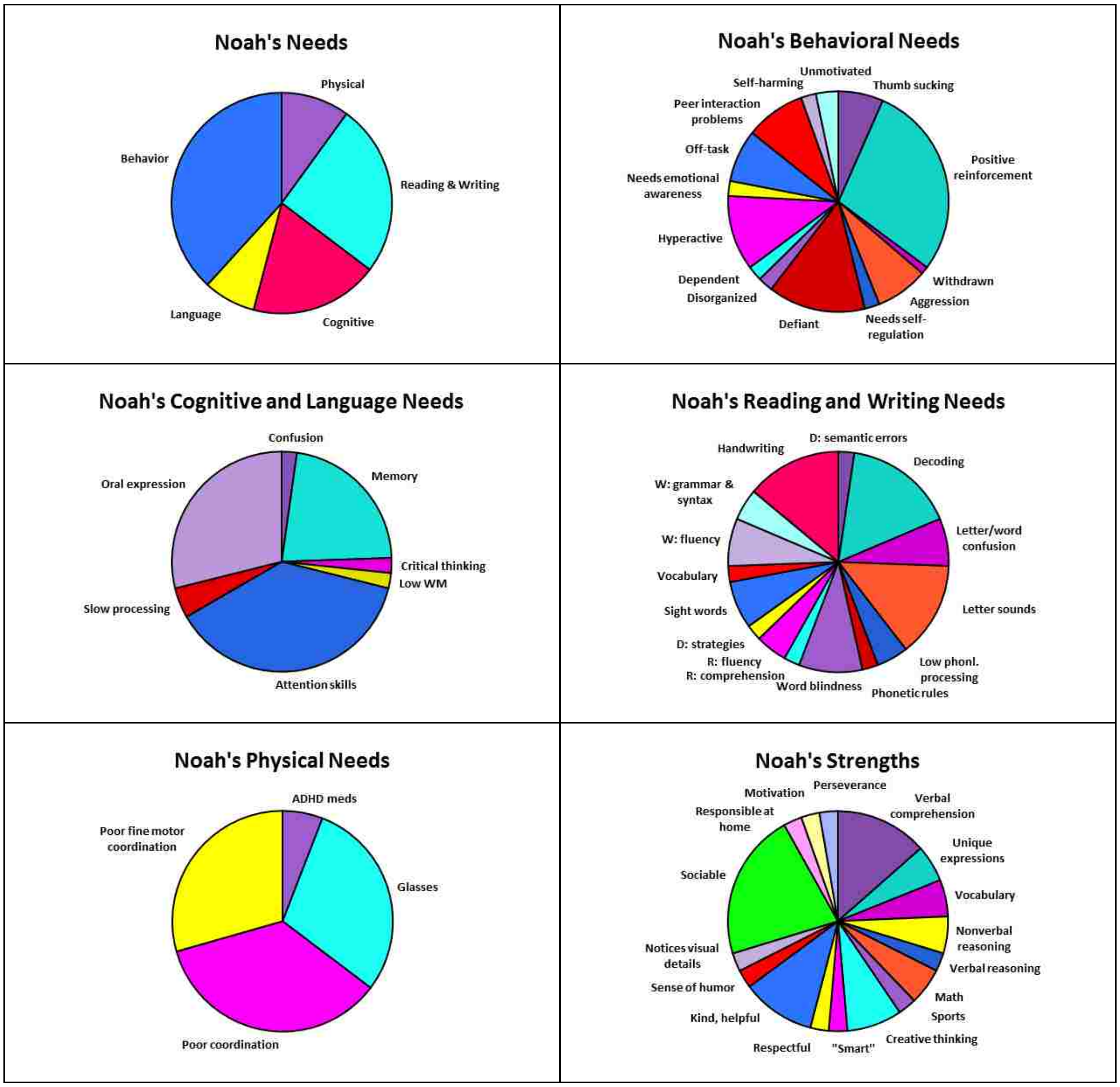


Figure 87. Noah's overall, behavioral, cognitive, language, reading, writing, and physical needs and his strengths (W = writing; D = decoding; R = reading).

Noah's overall needs. In this study, Noah's *Behavior* needs (65 excerpts; see "Noah's Needs" in Figure 87**)** were the most frequent *Needs* theme for Noah; *Reading and Writing needs* (43 excerpts) were his next most frequent *Needs* theme, with *Cognitive* (32 excerpts), *Physical* (17 excerpts), and *Language* need themes following afterwards.

Noah's behavioral needs. Noah's special education teacher reported that Noah had difficulty getting along with his peers (*Peer interaction problems*, 8 excerpts; see "Noah's Behavioral Needs" in Figure 87) and seemed unaware of personal boundaries, getting too close to other students. He often argued with teachers when they tried to help him correct his work (*Defiant,* 13 excerpts). He was "constantly sucking his thumb" which affected his ability to complete work and participate (*Thumb sucking,* 6 excerpts; *Off-task*, 7 excerpts).

The regular education teacher seemed to see Noah in a different light, stating that he got along with all of his peers, completed 50% of the daily tasks, and followed directions, but she did want to see him be more motivated and participate more (*Unmotivated,* 3 excerpts). The different reports of his behavior from his regular and special education classes may have been due to his need for *Positive Reinforcement* (26 excerpts). His school assessment team reported that Noah needed a lot of encouragement from the examiner in order to even attempt tasks, finding it difficult to sit in his chair and often wandering around the room. His behavior had also been different in preschool, when, according to his school records, Noah was a much happier student. The preschool staff said he "was friendly and outgoing and enthusiastic about all that he saw and was asked to do. He showed a happy nature and an excellent ability to focus and maintain his attention."

Noah's cognitive and language needs. Noah's school records rated his *Attention skills* (17 excerpts; see "Noah's Cognitive and Language Needs" in Figure 87) as significantly below average. In an observation during a reading activity two years earlier, his activity level was higher than his peers—he moved around constantly—and his language skills were poor, his emotional maturity was less than his classmates, and his frustration level was high. He did not answer questions, but had good recall of the story. "It appeared that he had little self-confidence." One reason that he did not answer questions was "because he has to repeat what he says due to poor intelligibility" (*Oral expression,* 13 excerpts). It may also have been because, according to his kindergarten teacher, he had difficulty recalling numbers and letters he had previously learned (*Memory*, 10 excerpts).

Noah's reading and writing needs. Noah had writing skills that were significantly below what was expected for his age and grade level. In a recent re-evaluation, the school's assessment team stated that Noah wrote "random letters which appear as if his hand is 'shaky'" (*Handwriting,* 6 excerpts; see "Noah's Reading and Writing Needs" in Figure 87), an emergent state of writing that usually appears when children are much younger (Read Tennessee, n.d.). He did not use spaces between his words and he was not writing independently (*Writing fluency:* 3 excerpts). He struggled to write simple three to four word sentences and rarely attempted to start or complete writing assignments in class.

Noah's reading skills were also very low. By the end of second grade, he still did not know all of his *Letter sounds* (6 excerpts) and he was *Decoding* (7 excerpts) at a kindergarten level. He still had letter reversals (*Letter/word confusion,* 3 excerpts), confusing "b" for "d", and vice versa.

Noah's physical needs. During the first interview, Noah's mother went into great detail about his physical problems as a baby—he had asthma, eczema, and toileting problems. She said one of his special education teachers thought he had ADHD, so they put him on medication (*ADHD meds,* 1 excerpts; see "Noah's Physical Needs" in Figure 87). The first two medications did nothing for him; the school and his parents saw no changes. Then they tried another medication, and his parents started getting reports from the school that he seemed sad all the time. When they put him on an antidepressant, he started to hear voices and hallucinate; so his parents discontinued all medications and decided, "We're just gonna' have to take this the natural route." Noah's mother said that he sucked his thumb "because he …calls it his calming tool." They had not been successful in getting him to stop, even though it was messing up his teeth. They had even tried putting "ghost chili"—one of the world's hottest peppers—on his thumb and "he sucked it right off."

Noah also had *Poor coordination* (6 excerpts). In a report from an occupational therapist (OT), his visual motor integration was his most challenging area, affecting eye-hand coordination, copying, visual closure (recognizing a figure when it is incomplete), and visual motor speed. The OT concluded by stating that two of Noah's greatest challenges were low energy and weakness—weak muscles and poor endurance, and he was under-responsive and sensation-seeking—moving and touching people and objects frequently.

Noah's strengths. While his school records mostly described Noah's challenges, they also referred to some of his strengths. His school assessment team said he was average (and thus a relative strength for him) in *Creative thinking* (3 excerpts; see

"Noah's Strengths" in Figure 87), gross motor skills (*Sports*, 1 excerpts), and social functioning (*Sociable,* 8 excerpts). His special education teacher said he liked to be a helper in class "where he picks up the class breakfast bin, walks younger students back to class and completes his class jobs" (*Kind, helpful*, 4 excerpts).

Noah and his parents considered *Math* (2 excerpts) to be one of his strengths; however, his school records stated that his math skills were not consistent. He was more accurate with addition but less so with subtraction and he struggled writing numbers past 20. While he had difficulty expressing himself due to articulation problems, his *Vocabulary* 2 excerpts) was average for his age and I observed that he had loved verbal interaction with me, understanding dialogical nuances (*Verbal comprehension,* 5 excerpts).

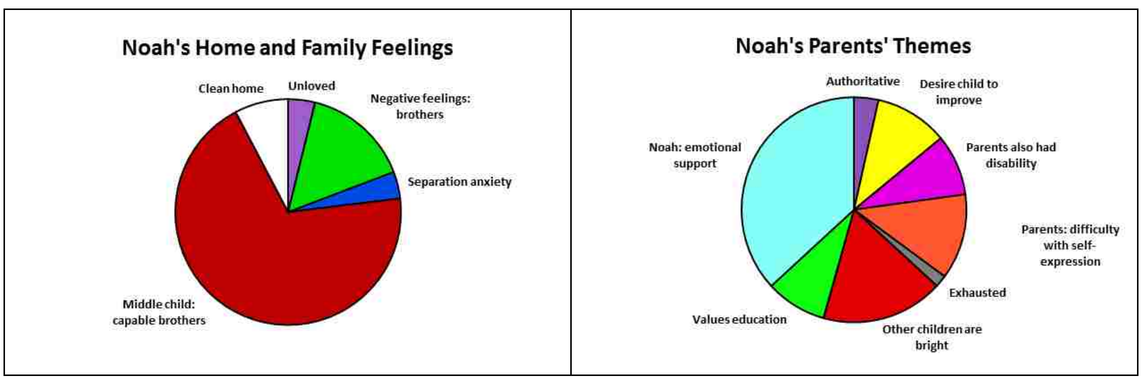


Figure 88. Noah's home and family feelings and his parents' themes.

Noah's home and family feelings. This was the only interview we conducted with both parents present. Noah's home was *Clean* (2 excerpts; see "Noah's Home and Family Feelings" in Figure 88) and orderly; the TV was turned down and the background noise was minimal. Noah was the middle child between two capable brothers, a significant theme in both the pre- and post-interviews (*Middle child: capable brothers,* 18 excerpts). Noah's parents talked about the intelligence of Noah's older and younger brothers. Of the younger son, his mother said "he's a really, really mathematical kid" and said he could count by twenties "and he's only six." Of the older son, she said, "Anything that he puts his mind to, he can do it." His father called the older son "that prototypical kid, he's naturally talented." Any time Noah's older brother tried something—skateboarding, bike riding, basketball—he learned how to do it easily.

In contrast, Noah experienced mostly failure at home and especially at school. His mother told us that Noah's special education teacher said mostly negative things about Noah, and that she frequently said to Noah that he had "middle child syndrome." Noah had interpreted this to mean that his mother did not love him and had come home crying (*Unloved,* 1 excerpt). His mother had reassured him that she loved him "just the same as I love the other two."

Noah's parents' themes. The most frequent of Noah's parents' themes was the emotional support and acceptance they gave him (*Noah: emotional support,* 21 excerpts; see "Noah's parents' themes" in Figure 88). Noah's mother said it was important to know how to talk to Noah. "Like, I call him my little helper. Now, if I do not [emphasis] call him my little helper, he will not help me." She gave an example of how she had gotten Noah to clean some of his little brother's room, telling him that he was better at cleaning under the bed and she needed someone good to do it. He excitedly said, "Okay! I'll go do it!" He might not want to read or write, but he would try "if you ask him the right way." She wanted Noah to become more confident and not to be so hard on himself. She did not understand why he called himself stupid, because that was not a word they used with him.

Noah's father had a hard time answering my question about Noah's strengths, saying that it was hard to find his strength "because he backs off of it." He gave an example of a time that people started congratulating Noah for improving at writing, and then "he started messing up again." He said what he loved about Noah was that "he won't take crap." He was not going to let people step on him or take advantage of him. He thought one way to motivate him in school was to "rephrase '*harder'* to him as more fun, maybe." He said they were both willing to try every program out there and to use every tool possible to help their son succeed (*Desire child to improve,* 6 excerpts).

Noah's mother thought that one of his biggest strengths was "just his ability to love; he's really loveable. He's a good kid and he can show the love, too." She said that Noah's behavior was different at school, but she did not feel welcome there. "The teacher says at school that he postures them, um, that he yells at them, and is mean to the teachers… I've offered to come in, but the teacher's kinda' iffy about it. So I don't go." She said she did not see the same behavior at home. "It's not all the time where he's upset and it's not all the time where he's yelling. She's saying it's all the time."

Both Noah's father and mother were not impressed with his teacher, partly because of their own childhood experiences in special education (*Parents also had disability,* 5 excerpts). His mother thought his teacher might not want her to come to Noah's class "because I don't think they're doing schoolwork." She said all she had done as a child in special education was to watch movies and sell candy.

Noah's father thought that Noah had a learning disability like he had. "Reading and spelling is not really the strong point," he said about himself. He thought that Noah needed someone to inspire him, "someone to make him interested in everything." He had not seen very much improvement in his son with his current teacher. He thought "she's just really burnt out, she just needs something to refresh her courses in life, go back to school I think." He said that they were researching other schools because he did not want his son to fall behind and he wanted his sons to go to college (*Values education,* 5 excerpts). "I want my kids to focus on school and—and then whatever life brings them… but education's more important." He said that Noah doubted himself a lot and he needed something to "boost himself." They had tried karate. Noah was confident while he there, but as soon as he left, the confidence was gone. "We don't know where that fire is. We're still searching."

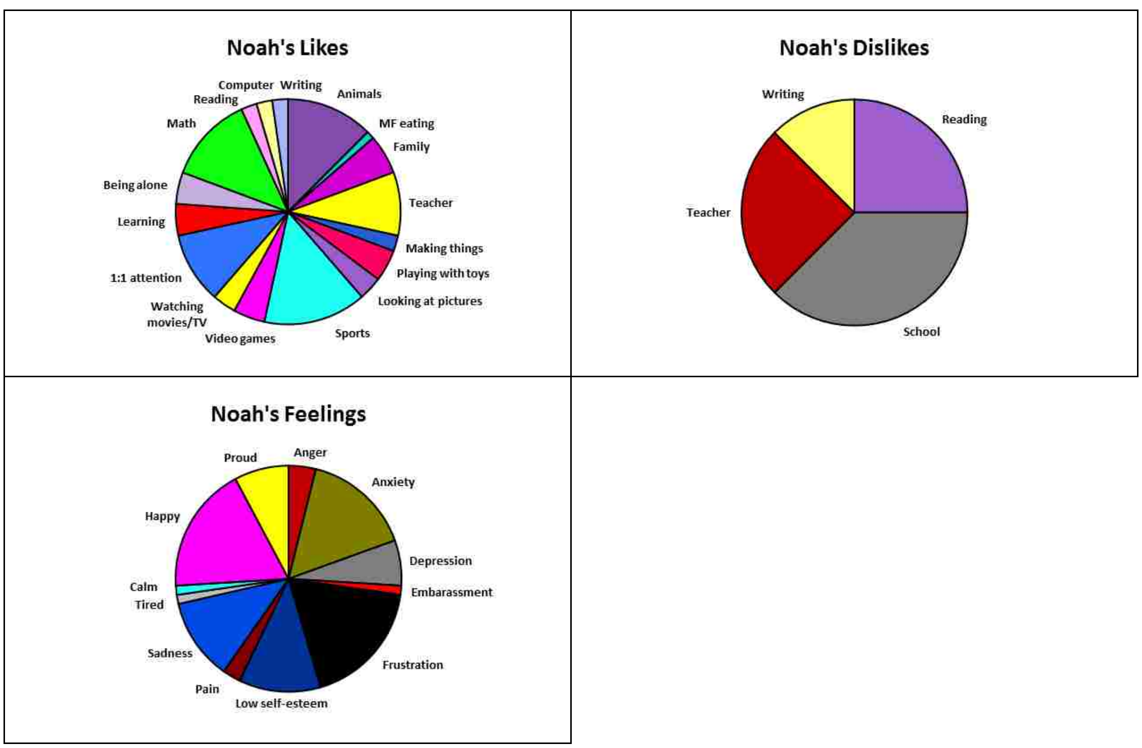


Figure 89. Noah's likes, dislikes, and feelings.

Noah's likes and dislikes. In his first interview, Noah said he liked *Math* (11 excerpts; see "Noah's Likes" in Figure 89) because "it's my bestest thing that I know," but he said he he did not like reading (2 excerpts; see "Noah's Dislikes" in Figure 89) and he hated writing (1 excerpt). When I asked him why he did not like reading, he said, "'Cause I gotta' read the words." And writing? "'Cause I don't really know, um, how to write first. And then I, I just make up words." When I asked him if people said he was good at something, he said, "Not really. No one say anything like that" [emphasis]. He had no favorite teachers, but he did not like his classroom teachers (Dislikes *Teacher,* 2 excerpts). "I usually yell at them."

When I asked Noah if he ever got in trouble at school, he said "yes" very quietly and did not want to talk about it. He thought he was good at math, doing his chores, and feeding his three cats (Likes *Animals*, 11 excerpts; see "Noah's Likes"). I also interviewed his older brother, who was in the control group. In contrast to Noah, his brother said he liked school, he liked to read and write, but he did not like math because he got frustrated. Perhaps he said this to make his brother feel better, because later in the interview he said he was good at math. "Did you say math?" I asked. "Wait, no, not math [laughs]!" He also went on to add that he was good at tetherball, kickball, and it seemed like he was good at just about everything.

Noah's feelings. Noah's mother told me that he had a huge fear of failure, even with "fun" activities like Xbox. "He feels like if I'm not going to do it, I don't have to fail at it, so I don't have to feel bad about it" (*Low self-esteem,* 9 excerpts; *Anxiety,* 12 excerpts; see "Noah's Feelings" in Figure 89). She thought playing Xbox would be something he could learn how to do, but for the first week he was "punching the controller, smacking himself, telling himself how stupid he was… And now, what, you're almost a pro at it now?" she said to him (*Frustration,* 14 excerpts). Her approach to him was always positive and supportive, telling him the things he had gotten better at, like reading, riding his scooter, and Xbox. "Practice makes perfect," she said.

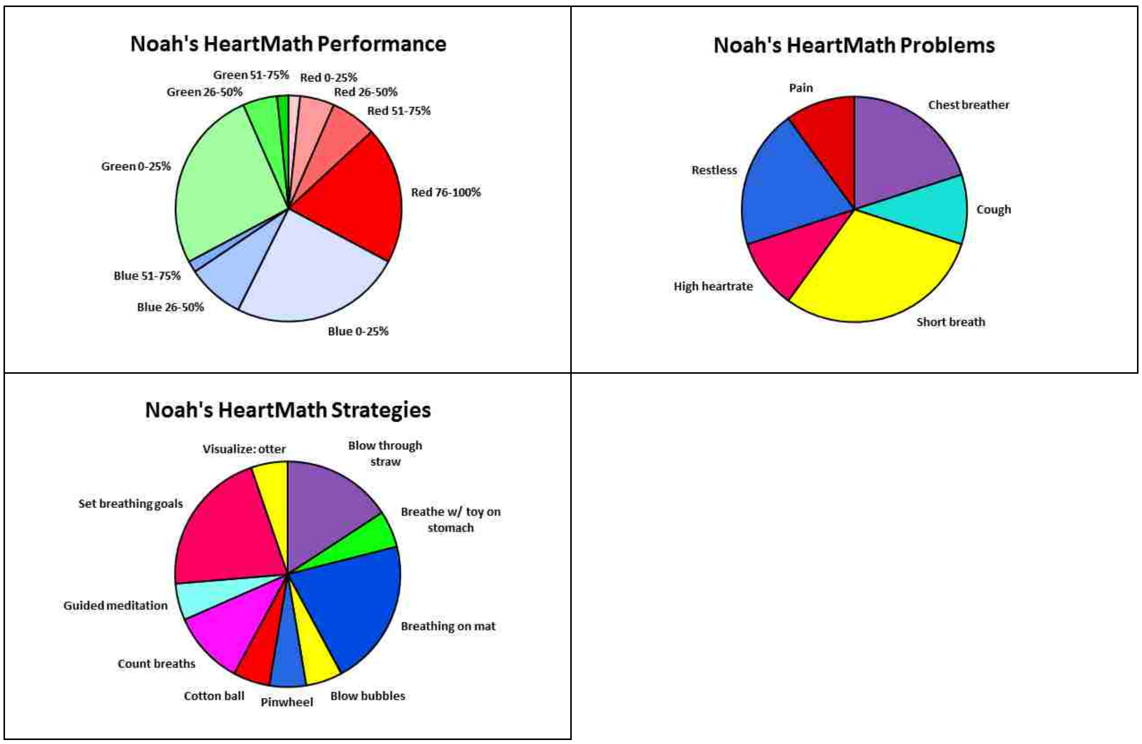


Figure 90. Noah's HeartMath performance, problems, and strategies.

Noah's HeartMath performance and problems. On his first day, I wrote that Noah "already knows how to breathe pretty well," fascinated by what he was seeing on the computer monitor, but his HRV waveforms were jagged and erratic and his coherence was usually low (*Red 76-100%,* 12 excerpts; see "Noah's HeartMath Performance" in Figure 90). Noah's fifth session was the only one without any red (low coherence). He was in a good mood that day, even feeling confident about reading (his reading confidence average was lower than the other participants—a 2.5). On his third session, I began to have him lie down on the mat; this seemed to calm him. He stopped talking and fidgeting (*Restless,* 2 excerpts; see "Noah's HeartMath Problems" in Figure 90). He also liked it when I gave him a stuffed cat to hold on his stomach, watching it go up and down with his breath.

The next day Noah said he got a headache while he was breathing (*Pain,* 1 excerpt). "If you chose a number from 1-10, 10 meaning I'd have to take you to the hospital, what number would it be?" I asked. He said "9," but then kept adjusting it downward when he started working with clay. He seemed to enjoy body awareness activities and counting.

Noah's HeartMath strategies. On July 2, I started having him lie on the mat (*Breathing on mat,* 4 excerpts; see "Noah's HeartMath Strategies" in Figure 90), asking him to *Count* his *breaths* (2 excerpts) as he would *Blow through a straw* (3 excerpts). I let him *Set breathing goals* (4 excerpts). "How many breaths do you want to do today?" I asked him each day. In the beginning, he chose a very small amount of breaths to focus on—five breaths the first day.

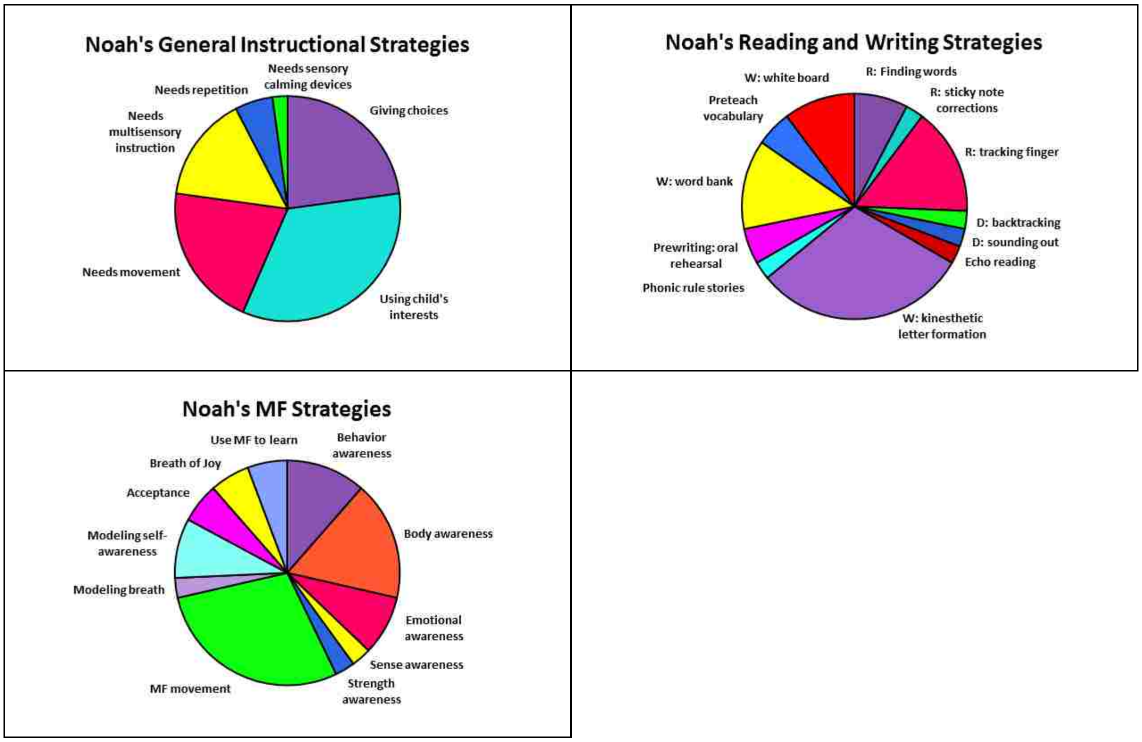


Figure 91. Noah's general, reading, writing, and MF strategies (R: reading; D: decoding; W: writing).

Noah's general instructional strategies. I tried to incorporate his ideas into reading and writing as much as possible (*Giving choices,* 21 excerpts; *Using child's interests,* 31 excerpts; see "Noah's General Instructional Strategies" in Figure 91). For example, one day I had planned to use clay with him to spell some words (*Needs multisensory instruction,* 14 excerpts), but Noah wanted to use bubbles. I asked him to show me what he meant. He got my magnet letters and tried to get bubble soap on them. When one of the letters dropped into the container, he said I should get it out by pouring out the liquid onto a napkin. "I don't want to do that," I said. So he suggested I pour it out into a little cup on my desk and then he showed me how to make letters by waving the bubble wand around to make letter shapes in the air.

Noah's reading and writing strategies. Most children learn how to become comfortable with holding a pencil by extensive scribbling before they come to kindergarten, where their writing freedom is curtailed. Pressured by the state and district to have each child learn to write the alphabet as quickly as possible, teachers instruct students on "correct" letter formation. Because Noah seemed to be in an early stage of writing, I wanted to give him a lot of experience with scribbling and *Kinesthetic letter formation* (12 excerpts; see "Noah's Reading and Writing Strategies" in Figure 91)—using large movements and various sensory mediums to "write" letters so that he could internalize the letter shapes.

It took me a while to discover that Noah needed to do this. On his second day, I asked Noah to write a sentence with pencil and paper, and his avoidance behavior showed up; he wanted to talk about the Hulk instead. I asked him to breathe, and then he tried to write. His hands shook as he concentrated on holding the thin pencil tightly, slowly writing his own name and Tiger (his name for my small stuffed cat). When his pencil broke for the second time, he said he was "frustrated." I asked him if he would like to write on my *White board* (4 excerpts) instead; he wrote "Hi t i luv" [Hi Tiger, I love you] much faster with the dry erase markers.

I wrote in my field notes that day that Noah needed time to play with and explore letters, to write them large, to create letters with his body. I ordered a rug with alphabet letters around the edges so we could hop around it, spelling words that were important to him like "love" and the names of his three cats. Learning to read and spell the cats' names was a slow process for Noah. Even after much practice (visualizing the letters in his head, spelling in shaving cream or sand or by making clay letters), he still confused the cats' names, especially if they were visually similar (e.g., "Techy" and "Tiger").

On July 8, I heard that Noah had been crying at lunch because his special education teacher had told him to copy three words and he had not been able to do it. Eight days later, my RA told me that his special education teacher wanted to know if I wrote with Noah because she could not get him to write. The next day I gave Noah a mechanical pencil. "See, when you break it, it's magic—just push it again." He used his pencil to write something meaningful—a card for his parents that said "mom dad I love you Noah;" his letter-formation was much better. Then I wrote his Sped teacher a note: "If Noah writes with this [mechanical] pencil today, he can keep it"—trying to help her motivate him to write in class.

Noah's MF strategies. From Noah's very first session, I incorporated frequent *MF movement* (10 excerpts; see "Noah's MF Strategies" in Figure 91) breaks into his routine—showing him yoga positions or mindful movements in books, letting him choose what position and how long he wanted to do it, and then doing a little bit of reading or writing. I wrote in my field notes, "I'm moving from the moment he comes in until he leaves."

At first Noah was happy and loving, showing none of the troublesome behaviors discussed in his school records, but on his fourth session, he became a little more resistant. "No, I don't want to do that." "Will you do it for me?" When I asked him if he had brought back his book, he said he was "frustrated" but would not tell me why until I guessed that he could not find his book. I used gentle teasing and humor with him when he became defiant (*Acceptance,* 2 excerpts). For example, when he refused to put the right color caps on the markers I said in a kind voice, "Are you arguing with me?" (*Behavior awareness,* 4 excerpts) Then I said, "Well, okay then. If you get all mixed up when you get a color…" He said, "No, the color line," meaning that he could look at the color line on the marker to find the color he wanted.

Noah loved verbal interchanges with me. One day he wanted me to get more shaving cream (for a writing activity). "I don't have enough," I said. "You can buy more," he said. "I might," I said. "You might!" he said loudly. After the first few sessions, I never asked him to repeat himself, because this seemed to cause him to shut down and withdraw. Instead I did my best to understand his abbreviated language, thereby encouraging him to talk freely with me without fear of criticism (*Strength awareness,* 1 excerpt).

Noah became very anxious when asked to read, and often rushed through a book, reciting the text instead of reading it. I attempted to desensitize this performance anxiety in a multiplicity of ways, just as I had worked on his writing anxiety. First I told him Tiger, the stuffed cat, was going to be his reading buddy. "Prove to me you can read the words by having Tiger point to them," I said. He enjoyed doing this. On his third session, when he tried to avoid reading by talking quickly and moving around the room, I said, "Are you afraid of this book?" "No!" "Is Tiger scared of this book?" (*Emotional awareness*, 3 excerpts) "No," he said and came back to the book.

Sometimes we would do a yoga position when Noah became anxious, letting him choose which one he wanted to do. Instead of correcting his mistakes, I put sticky notes on the page to show him that what he was saying was different from the word on the page. Anticipating that the page at the end of the book (which contained a different word pattern than the previous pages) would be difficult for him, I would say, "Here's the scary page." This cued him to look at the words instead of just guessing. I used Nerds (tiny little sour candies) to motivate him to find words in a book before he read it: "I'll give you a Nerd each time you find the word 'what.'" Sometimes we talked about how the Nerd tasted in his mouth (*Sense awareness,* 1 excerpt).

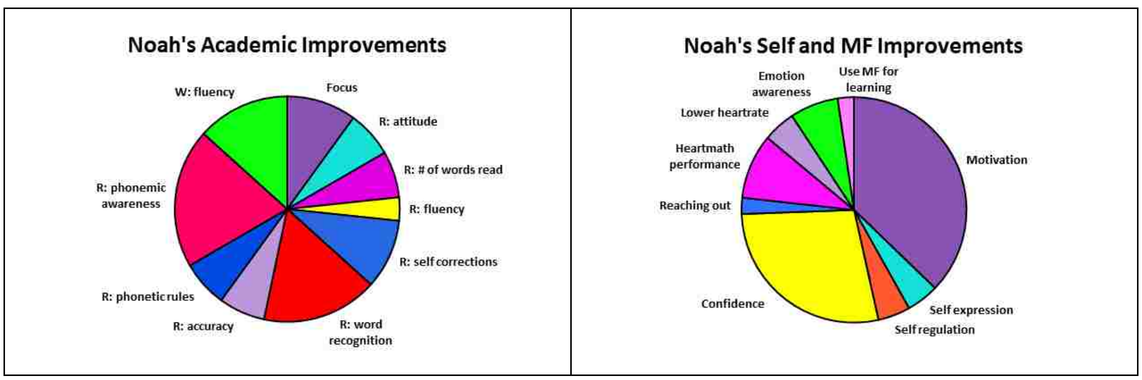


Figure 92. Noah's academic, self, and MF improvements (R = Reading; W = Writing).

Noah's academic improvements. Giving Noah Nerds for finding specific words motivated him to look carefully at the words and increased his reading confidence level (*Focus,* 3 excerpts; see "Noah's academic improvements" in Figure 92). On July 14, he chose "8" on the Reading Confidence scale (the highest rating in the scale was "3;" see Appendix D), read four books, and sounded out the word "can" without prompting (*Reading: word recognition,* 5 excerpts). He did not want to leave that day. "I'll make you read books all day," I teased him. "I could read books all day!" he said. Noah's

Reading Accuracy (2 excerpts) improved from 40% to 100% (see Figure 93), his *Self-corrections* (3 excerpts) improved from 0% to 100%, and the *Number of words* he *read* (2 excerpts) improved from 10 to sometimes as many as 60 words/book.

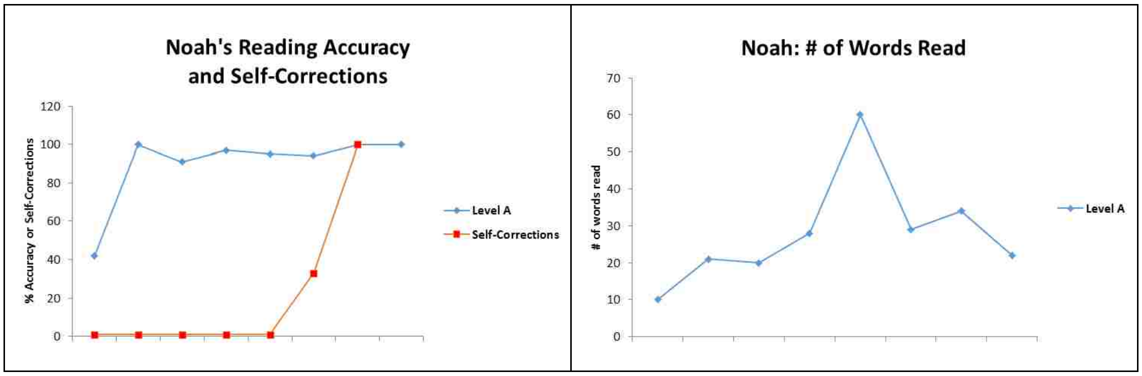


Figure 93. Noah's reading accuracy, self-corrections, and number of words read.

Noah's *Writing fluency* (4 excerpts) also increased. On July 18, I asked him to write in his notebook with a pencil. "Tell me what you want me to do," I instructed. Asking me how to spell jump, he wrote "Jumpp. tee" [jump 3 times]. He also wrote "a cartw" [cartwheel], so I jumped three times and then did cartwheels in a very narrow classroom. The following day he was ecstatic because he had written five words with my RA for his post-writing sample (he had not written any words in his pre-writing sample—he had dictated words instead). With me that day, he wrote 9 words, telling me to bounce the ball 31 times. At first he wanted me to do it 100 times. "No," I said. "I'll do 20 or 30 times but not 100 times. I'll be tired. We won't have time for Nerds" (reading activity). Then he wanted to add "hit ball." I sounded out "hit" for him; he wrote the "h" and "t" in hit and then he asked me how to spell "kick." I worked up a sweat on that hot summer day!

Noah's self and MF improvements. On the last day, I asked him what "activities" (his word) he had liked this summer. "I like writing with you, reading with you, helping you." He said that he wanted to do more activities that would help him learn (*Motivation,* 16 excerpts; see "Noah's Self and MF Improvements" in Figure 92). "Sand writing, shaving cream writing—more of everything… I liked how we breathed." He also said he wanted his new teacher to "play a lot—like a reading game."

Noah's *HeartMath performance* (4 excerpts) also improved that summer. He started out choosing to concentrate on only 5 breaths in his HeartMath session. On his last 3 days, he chose 30, 40, and finally 45 breaths, an improvement in his motivation, focus, and self-confidence (*Confidence,* 12 excerpts). His level of high coherence on his last session was 33%, his second highest for that summer.

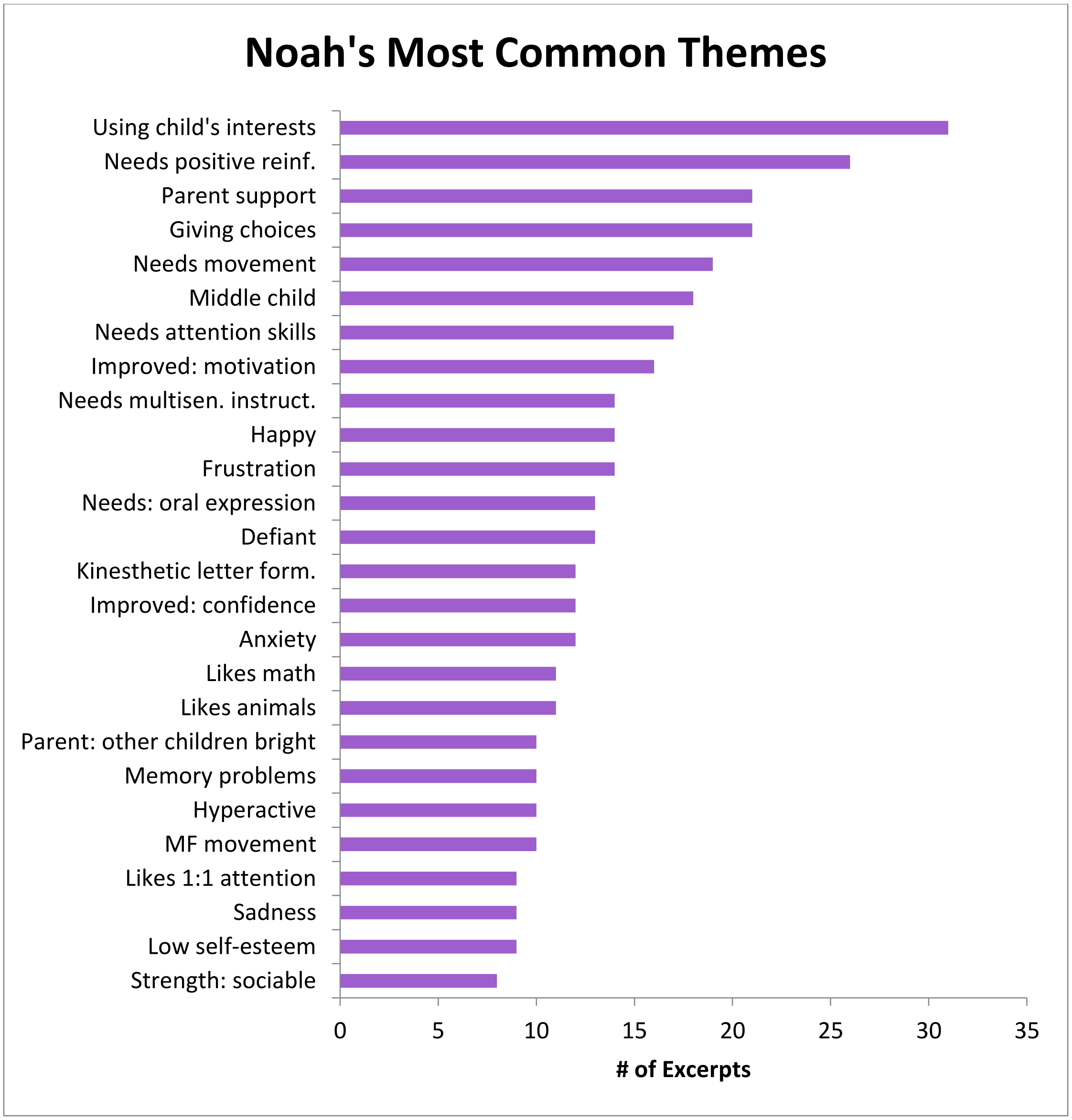


Figure 94. Noah's most common themes (Letter form = letter formation; Multisens. instruct. = multisensory instruction).

Noah was a boy with significant learning challenges who had developed a strong performance anxiety regarding academic tasks or learning any new skill (see Figure 28). At home, his parents were very supportive of Noah, but he had two very capable brothers who outshone him in almost every arena. Using his interests, allowing him frequent movement breaks, and giving him choices and positive reinforcement increased his motivation and confidence and improved his reading and writing skills.

During his second interview, I asked Noah what he liked about the summer. "I like how you helped me," he said. He told me the toy cat Tiger had helped him read by "fishing the words." When I asked him what he was good at, he said, "I don't have no idea now. I'm not good at writing or drawing or reading, yet." He was going to a new school this year, and he liked it and his new teachers. "Do you think you're getting better at reading and writing now?" I asked. "Yes," he said.

Noah's mother told me that he had talked about summer school constantly, saying that he loved it and everybody there who was teaching him. She said he was happy "because he was starting to learn more… He said that there was actually learning going on… He said, 'I'm reading. I'm actually reading.' And when he comes home, he actually does read." She said that he was much happier at his new school because his teachers were better. "He has made progress from when you guys got with us to now. He had made a—to me it's huge progress."

I recommended that Noah's teachers use a playful approach with him, giving him tactile experiences with letter formation, letting him scribble, and to be active with him, using plenty of movement breaks. He would be motivated to read and write if it was meaningful to him, like Rousseau's *Emile* (1762):

> Present interest, that is the motive power, the only motive power that takes us far and safely. Sometimes Emile receives notes of invitation from his father or mother, his relations or friends; he is invited to a dinner, a walk, a boating

> expedition, to see some public entertainment. These notes are short, clear, plain, and well written. Someone must read them to him, and he cannot always find anybody when wanted… Time passes, the chance is lost. The note is read to him at last, but it is too late. Oh! if only he had known how to read! (pp. 178-179)

Merging of Quantitative and Qualitative Results

Merging the quantitative and qualitative results will help to assess whether or not training in metacognitive strategies (including mindfulness), relative to control training, resulted in the amelioration of symptoms of dyslexia in children. As the Research Design diagram in the Methods section of this dissertation indicates, after analyzing the quantitative and qualitative data, I will both summarize the quantitative and qualitative data and I will produce a matrix—or summary table as recommended by Cresswell and Plano Clark (2011)—relating the qualitative themes to the quantitative findings. First I will present the matrix of merged findings, and then I will summarize the quantitative and qualitative results.

In the left column of Table 19 are the predictions for behavioral benefits, in the middle column are the quantitative findings (with evidence that supports or opposes the predictions), and in the right column are the qualitative themes that relate to those findings.

Table 19

Merging of Quantitative and Qualitative Results

Predictions	Quantitative Results	Qualitative Themes
Improvement in reading accuracy	**Supporting evidence from Running Records:** Running records data showed that Ana, Ernesto, Fawn, Ángel, Juan, and Noah's reading accuracy improved during the intervention. **Opposing evidence from the lexical decision Nonword subscale:** Although non-significant, the control group's mean accuracy was higher than the experimental group's accuracy (Exp. M = .046; Control M = .063; $t_{diff}(16) = .35$; $p > .05$; $d = 0.10$).	*Reading Improvements: Improvement in accuracy* (5 excerpts) *Reading Improvements: Improvement in word recognition* (10 excerpts) *Reading Improvements: Improvement in phonemic awareness* (7 excerpts)
Improvement in reading level	**Supporting evidence from Running Records:** Running records data showed that Paz, Ernesto, Fawn, Ángel, and Juan improved by one reading level during the intervention.	*Reading Improvements: Improvement in reading level* (8 excerpts)
Improvement in reading fluency	**Supporting evidence from Running Records:** Running records data showed that Paz, Ángel, Juan, and Noah improved in the number of words they read/day during the intervention. **Opposing evidence from DIBELS Oral Reading Fluency:** Although non-significant, the control group difference	*Reading Improvements: Improvement in fluency* (2 excerpts)

	mean was higher than the experimental mean (Exp. M = 1.4; Control M = 6.0; t_{diff} (16) = 1.46; p > .05; d = 0.03).	
Improvement in use of metacognitive strategies during decoding	**Supporting evidence from the lexical decision Nonword subscale:** *T*-test difference scores showed that mean response times (RTs) were longer in the experimental group (Exp. Nonword RT M = 213; Control M = -362; t_{diff} (16) = 2.07; p = .056; d = 1.32), indicating a possible increase in reflectiveness as a result of using metacognitive strategies during decoding. **Supporting evidence from the lexical decision Word subscale:** *T*-test difference scores showed that mean response times (RTs) were significantly longer in the experimental group (Exp. Word RT M = 310; Control M = -300; t_{diff} (16) = 2.71; p < .016; d = 1.32) indicating a possible increase in reflectiveness as a result of using metacognitive strategies during decoding.	*Reading Improvement: Improvement in use of metacognitive strategies* (12 excerpts)
Improvement in self-correction rate during reading	**Supporting evidence from Running Records data:** Running records data showed that the self-correction rate of Ana, Ernesto, Fawn, Ángel, Juan, and Noah improved over the summer.	*Reading Improvements: Improvement in self-corrections* (12 excerpts)
Improvement in writing skills: voice	**Supporting evidence from the Six Traits Writing Rubric:** Although non-significant, on average, the experimental	*Writing Improvement: Improvement in voice and detail* (38 excerpts)

	group improved by 1.60 points while the control group did not—on average—change at all (Ex*p. M* = 1.60; Control *M* = .00; $t_{diff}(16) = -1.11$; $p > .05$; $d = 0.52$).	*Improvement in self-expression* (43 excerpts)
Improvement in writing skills: word choice	**Supporting evidence from the Six Traits Writing Rubric:** Although non-significant, on average, the experimental group improved by .50 points, while the control group improved by .25 points (Ex*p. M* = .50; Control *M* = .25; $t_{diff}(16) = -.49$; $p > .05$; $d = 0.23$).	*Writing Improvement: Improvement in voice and detail* (38 excerpts)
Improvement in academic engagement during instruction		*Academic and Cognitive Improvements: Improvement in focus* (13 excerpts) *Academic and Cognitive Improvements: Improvement in memory* (3 excerpts) *Self and Social Improvements: Motivation* (32 excerpts)
Improvement in positive affect during instruction	**Supporting evidence from the Mood self-report scale:** Although non-significant, on average, the experimental group rated themselves as slightly higher than the control group (Ex*p. M* = 4.68; Control *M* = 4.63; $t(16) = -.20$; $p > .05$; $d = 0.12$). **Opposing evidence from the Reading Attitude and Reading Confidence self-report scales:** Although non-significant, on average, the control group rated	*MF Improvements: Increase in positive affect* (58 excerpts)

	themselves slightly higher than the experimental group on daily reading attitude and reading confidence (Reading Attitude Exp. *M* = 4.54; Control *M* = 4.61; *t*(16) = -.08; *p* > .05; *d* = 0.08; Reading Confidence Exp. *M* = 2.74; Control *M* = 2.75; *t*(16) = -.17; *p* > .05); *d* = 0.02.	
Decrease in anxiety during instruction	**Supporting evidence from heart rate measures on HeartMath:** A contrast test showed that heart rate in experimental participants decreased significantly over the course of the intervention, indicating a decrease in anxiety. (*M* = -534.8; *t*(9) = -3.48, *p* = .007; 95% CI [-186.84, -882.76])	
Improvement in self-awareness		*MF Improvements: Increase in thought, emotion awareness* (59 excerpts) *MF Improvements: Increase in body awareness* (21 excerpts)
Improvement in self-acceptance		*Self and Social Improvements: Improvement in self-expression* (43 excerpts) *Self and Social Improvements: Improvement in self-esteem/confidence* (25 excerpts)

Summary of the Quantitative and Qualitative Results

Disregarding the quantitative results with very low effect sizes (d < 0.05), the merged data suggest that training in metacognitive strategies (including mindfulness) had some behavioral benefits for children diagnosed with learning difficulties, including a decrease in anxiety and improvement in reading accuracy, reading level, reading fluency, self-correction rate, use of metacognitive strategies, use of voice and word choice during writing tasks, academic engagement, positive affect, self-awareness and self-acceptance.

Qualitative themes from this study are presented in Figure 95 as the code application word cloud provided by the software package I used to analyze the qualitative data (Dedoose Version 6.1.9, 2015). In the word cloud, themes or codes that were the most frequent appear in the largest size font (e.g., the most frequent code was *Instruction in emotional awareness* with 134 excerpts so it is in the largest font). Themes appear in random order, clustered around the largest themes.

The qualitative themes with the largest number of excerpts give a "big picture" of the intervention and its participants. The major components of the MF intervention were *Instruction in emotional awareness* (134 excerpts)and *Instruction in body awareness* (74 excerpts). Many of the participants had *Difficulty with oral or self-expression* (116 excerpts), needed *Concentration or attention skills* (64 excerpts), had *Difficulty remembering or retaining information* (70 excerpts), and experienced *Anxiety* (80 excerpts) and *Frustration* (69 excerpts) during academic tasks like reading and writing. However, during the intervention, students were usually *Happy* and *excited* (82 excerpts), perhaps because a key instructional strategy I employed was *Using a child's interests* (75 excerpts) in order to motivate him or her to learn and using *Affectionate, humorous, playful rapport* (70 excerpts) as a form of positive reinforcement with them. By the end of the intervention, participants showed *Improvement in thought, emotion awareness* (59 excerpts) and *Improvement in self-expression* (43 excerpts).

Figure 95. Dedoose word cloud.

Implications and Future Research Directions

This section outlines some implications of the major findings for interventionists, educators, and researchers looking to ameliorate some of the symptoms of dyslexia and/or learning disabilities.

Metacognitive Strategies

Our findings suggested that experimental participants' response times (RTs) in the lexical decision task increased significantly more than the control groups RTs, indicating a possible increase in reflectiveness and/or metacognition. There are many types of metacognitive strategies used in research with learning disabled children, as the following section will demonstrate.

Using multiple cues to decode words. The intervention in our study was based loosely on Reading Recovery (RR), as discussed in the literature review of this dissertation. Within RR, children are instructed to use multiple metacognitive strategies in order to decode and comprehend text. This is called the multiple cues word reading theory, and it has come under criticism in recent years, especially in New Zealand, the "birthplace" of RR (Greaney, 2011). Critics state that the multiple cues model of reading has been rejected by the scientific community (Pressley, 2006) because it emphasizes the importance of using text-based cues (e.g., picture and context cues) "without recognizing that skills and strategies involving phonological information are of primary importance in beginning literacy development" (Tunmer, Chapman, Greaney, Prochnow, & Arrow, 2013, p. 16). Critics of RR assert that phonetic information is usually used only when confirming word guesses or for self-correction.

Chapman, Prochnow, and Arrow (2015) write that in New Zealand, where RR has been used for over 25 years, there is an assumption that children learn to read "naturally" if they are immersed in a "print-rich" environment; children are encouraged to construct meaning from text and discouraged from word-level analysis. Tunmer et al. (2013) argues that explicit, systematic teaching in phonemic awareness and phonics is essential for reading success. Pressley (2006) states that letter sound cues are much more important in word identification than semantic or syntactic cues—that, in fact, a heavy focus on text-based cues is a "disastrous strategy" for emerging readers (p. 32).

Spear-Swerling (2006) asserts that the emerging reader moves away from reliance on multiple cueing systems to decode words as they develop increasingly more accurate and automatic word identification skills. It is the unskilled reader who relies on context to compensate for poor decoding skills and has a tendency to guess at words rather than look at them carefully. Spear-Swerling continues:

> Almost every teacher of struggling readers has seen the common pattern in which a child who is trying to read a word (say, the word brown) gives the word only a cursory glance and then offers a series of wild guesses based on the first letter: "Black? Book? Box?" (The guesses are often accompanied by more attention to the expression on the face of the teacher than to the print, as the child waits for this expression to change to indicate a correct guess.) (para. 3)

I called this behavior "word slamming" in this study. When I observed students doing this, the child was *not* using context cues or self-regulatory cues or any other metacognitive strategies to decode the word. Instead they were—as Spear-Swerling states—trying to read the expression on my face. Reliance on context—according to Spear-Swerling—to compensate for poor decoding skills places a drain on comprehension and becomes increasingly problematic for readers as they endeavor to read more challenging text with little to no pictures and increasingly complex grammar and syntax.

There is evidence for and against the effectiveness of Reading Recovery. In a three-year longitudinal study, Chapman, Tunmer, and Prochnow (2001) compared 26 six-year-old children (independently selected by their schools for RR) who completed a RR program with 20 poor readers who did not receive RR and with 80 average to above average readers. All of these children were assessed on a battery of phonological-processing skills and reading achievement tests. The authors comment that the children selected by their schools for RR had more severe reading difficulties than the poor readers' group (who were not selected for RR by their schools).

With two exceptions, two years after completion of RR, the RR participants continued to receive significantly lower scores than the normal readers on phonological-processing skills, and were not significantly different from poor readers who had not received RR (e.g., Pseudoword Decoding Normal M = 83.77; RR M = 56.81; Poor Readers M = 64.06; $p < .001$; effect sizes not provided). The exceptions were in Phoneme Segmentation where there was *not* a statistically significant difference between the normal and RR groups (Normal M = 19.41; RR M = 17.05; Poor Readers M = 14.94; $p > .05$) and Analogical Transfer where poor readers performed significantly better than the RR group (Normal M = 66.47; RR M = 46.29; Poor Readers M 49.76; $p < .05$).

Furthermore, RR did not accelerate the progress of children to average levels of reading performance as evidenced by several tests (e.g., Word Identification two years after RR completion: Normal $M = 45.93$; RR $M = 24.24$; Poor Readers $M = 30.82$; $p < .001$).

Children who derived modest benefit from RR significantly outperformed children who only benefitted minimally from RR on all phonological variables, and on word recognition and comprehension (e.g., immediately after completing RR, Pseudo Word Decoding: Partial Benefit Group $M = 51.14$; Minimal Benefit Group $M = 26.18$; $p < .01$). The authors assert that these findings suggest that immediate and long-term reading achievement depends on developing phonological-processing skills. What the authors do *not* state, however, is that it appears that some children *do* learn phonological-processing skills during RR and benefit from the program while others appear to need a more intense intervention.

Evidence supporting RR comes from Moore and Wade (1998) who decided to conduct a follow-up study of children (ages 10 to 12) who had received the RR intervention when they were six years old. Moore and Wade wanted to determine if gains were maintained for these children and compared them to a group of their classmates whose scores had not been low enough to qualify for RR. They tested 242 children (121 in each group) on a variety of literacy assessments, including writing, reading strategies, attitudes to reading, and reading and comprehension "ages" (the level of reading ability an average child has at a given age). Overall, the ex-Reading Recovery group performed significantly better than the comparison group, who originally had more ability than the RR group in first grade (RR reading age in months, *M*

= 122, Comparison *M* = 110; RR comprehension age, *M* = 117; Comparison *M* = 104). Also, when reading connected text, the ex-RR group sounded out words or broke them into syllables almost twice as much as the comparison group (RR *M* = 63.18%; Comparison *M* = 34.66%; *p* < .000). On average, the ex-RR group wrote longer, more precise and interesting prose, they had more positive reading attitudes, they read more, their reading and comprehension levels were significantly higher, and they used more metacognitive strategies when reading.

As a final response to this criticism of using meaning-based cues to help decode unknown words, here is a quote from Hudson, Pullen, Lane, and Torgesen (2009):

> Many unknown words in text cannot be decoded completely by using phonemic decoding processes alone. Children must first identify and blend individual sounds to obtain an approximate pronunciation for an unknown word in text, and then use their sense of the meaning of the passage to select a word that most ‘‘sounds like’’ the unknown word and makes sense in the context of the passage… Integration of these graphophonic and morphosyntactic cues is critical when determining the exact pronunciation of the word being decoded. The speed with which students can combine information from these multiple cues should contribute to the overall fluency of reading connected text. (p. 14)

When I was trained in Reading Recovery, I learned to develop short lessons that directly targeted a child's needs during each session. The majority of those lessons were explicit phonics lessons based on a miscue analysis of Running Records. After completing the daily Running Record, I showed the child the words they missed in the book. I directed them to look at the word and try again. If they missed the word a second time, I asked them to look at the letters in the word and modeled how to sound it out.

Given the criticism of Reading Recovery, the following things are important for interventionists who want to use a multiple cues model for instructing children with dyslexia/learning disabilities.

1) It is important to teach children to use *both* graphophonic and morphosyntactic cues and to emphasize that one type of cue is not more important than the other.
2) When a child looks at your face to see if they guessed correctly, ask them "Does that make sense?" and "Does your guess match the letters in the word?" Ask them these questions every time, regardless of whether or not they guessed correctly, and they will eventually begin to ask these questions of themselves.
3) In this study, I used many strategies to get children to *look* at the letters in a word (e.g., using a tracking strip, rolling out letter shapes in clay, finding words in a book, and sticky note corrections). It is important to find creative and multisensory ways to help dyslexic and/or learning disabled children focus on letters and letter patterns in words.

Phonological and strategy-based remedial reading instruction. Interventionists, researchers, and educators should also be aware that there are metacognitive approaches to teaching phonemic awareness and decoding skills. Lovett, Lacerenza, and Borden (2000) designed a reading program that begins with direct instruction of basic phonological awareness and gradually shifts to dialogue-based training in the use of metacognitive word identification methods. Some of the metacognitive strategies in this program included comparing an unfamiliar word to a word they already knew, trying different vowel pronunciations, looking for little words inside the big word (also a Reading Recovery strategy), and looking for prefixes and suffixes.

Gaskins et al. (1988) created a program that also used a metacognitive approach to phonics instruction that included using context cues. Here is an example of how they modeled their compare/contrast strategy to a class of students:

> Please blank me about the cat. Let's see, *what would make sense in that sentence* [emphasis mine] in place of blank that begins with r? Please run me about the cat, please rain me about the cat. None of those makes sense—guess I'll try compare/contrast strategy. I need to look for the first vowel and what comes after it. Oh, oh—the first spelling pattern could be e or it could be e-m, I'll have to be flexible. I'll try e first because he is on the wall. The second vowel is i and the spelling pattern is i-n-d. I know the key word is find. If h-e is he, then r-e is re. If f-i-n-d is find, then m-i-n-d is mind. The word is remind. *Let's see if it makes sense in the sentence* [emphasis mine]. Please remind me about the cat. Yes, that makes sense. Remind means to help me remember. (p. 4)

Lack of transfer. Many intervention studies have reported improvements in children's word attack and decoding skills, but these gains failed to generalize to other types of reading tasks. "In fact, generalization of remedial gains has proved a formidable hurdle for many intervention methods reported in the literature…" (Lovett et al., 2000, p. 459). Numerous researchers have documented that children with learning disabilities are passive learners who seldom transfer newly acquired strategies to new learning tasks (Borkowski, Estrada, Milstead, & Hale, 1989). According to Borkowski et al., in order for strategy generalization to occur, it may be necessary to explicitly train LD children on the personal value and merit of using strategies and the executive processes involved in implementing said strategies.

Metacognition and strategic processing. Borkowski et al. (1989) wrote about a model of metacognition and understanding problem-solving skills in children with general learning disabilities who have I.Q.s between 80-95 (six out of ten of the experimental participants in this study fell into this category). These children are slow learners who have repeatedly failed in academic situations, are easily distracted, have low self-confidence and low self-esteem, and "exhibit a chaotic approach to problem solving. This latter characteristic is hypothesized as mirroring deficiencies in higher order executive processes and associated self-deprecating motivational states" (p. 58). Borkowski et al.'s metacognitive model is especially applicable for these types of children, but also may be relevant to children with specific learning disabilities, who have more well-defined deficits in areas like math or decoding and metacognitive failures that inhibit their use of reflective processes during novel tasks.

Borkowski et al.'s (1989) model of metacognition includes these major parts: Specific Strategy Knowledge, Relational Strategy Knowledge, General Strategy Knowledge (including self-efficacy beliefs) and Metacognitive Acquisition Procedures (e.g., executive or self-regulatory processes).

Executive processes and attributional beliefs. Even when children with learning disabilities are taught specific learning strategies and how to apply them, they have difficulty monitoring the efficiency of their efforts when they use these strategies (Lovett et al., 2000). Self-instruction training (or guided self-talk) may help to train executive processes. In Bornstein and Quevillon's (1976) study, researchers investigated the efficacy of self-instructions on improving on-task behavior with three overactive preschool boys with generalized learning problems. At the beginning of each two-hour session, the child watched the experimenter modeling overt self-verbalizations after which the child completed the task with covert self-instructions. Mean rates of on-task behavior increased from baseline (10.4%, 14.6%, and 10% for each child) to post-treatment (82.3%, 70.8%, and 77.8% for each child), suggesting transfer of on-task behavior from the experimental tasks to the classroom and was maintained at a follow-up assessment 22.5 weeks after training.

Because of a long record of academic failure, children with learning disabilities do not believe that their efforts will improve their performance. Borkowski et al. (1989) asserted that a child's beliefs about self-efficacy, stemming from prior use of strategies and the consequences of those strategic attempts, fuel the executive processes for solving problems (e.g., problem seeking, strategy selection, and self-monitoring). Therefore, intervention should include a lot more than training in specific strategies. Intervention should also include training in executive processes needed to implement strategies and training of attributional beliefs, or beliefs about self-efficacy.

Training children to become aware of their self-talk during academic tasks could perhaps kill two birds (training in executive processes and attributional beliefs) with one stone. Children are constantly talking to themselves and others while completing (or not completing) classwork. For learning disabled children, this self-talk is mostly negative. Awareness of self-talk during academic tasks (e.g., when Zach wrote in his journal, "I suk at rding" [suck at writing]) in the presence of a nonjudgmental, accepting observer enables the child to examine the truth of their self-talk and deconstruct it. For example, in his first interview, Noah said he hated writing and he did not like reading words. When I asked him, "Do they [his teachers] say you're very good at…" Noah answered, "Not really. No one say anything like that [emphasis]." After the intervention, during his post-interview, Noah's self-talk had changed a little. When I asked him what he was good at, he said, "I don't have no idea now. I'm not good at writing or drawing or reading, *yet*" [emphasis mine]. Future research could record children's self-talk during academic tasks in their regular or special education classrooms before and after a MF intervention to investigate if self-talk messages changed and if this impacted academic performance.

Motivational processes. Training in executive processes and attributional beliefs is still not enough to create generalization of newly acquired strategies to novel situations. Now the student needs to recognize the usefulness of being strategic and believe that, with enough effort, they can be successful when deploying said strategies (Borkowski et al., 1989). In other words, it is essential to include motivational processes in strategy training.

Oka and Paris (1987) proposed four dimensions of motivation that might affect

whether or not underachieving children will use a strategy in a classroom setting: (a) a sense of control; (b) significant goals and values; (c) self-management skills; and (d) interpretations of success and failure. Beliefs about control is the first dimension.
If children think they have no control over their performance outcomes, they will give up easily when faced with difficult tasks because they expect failure. Over time, their self-esteem will be affected and repeated failures convince the child that outcomes have no relation to one's efforts. This is Seligman's (1975) theory of learned helplessness.

In our study, the signs of learned helplessness and its resulting depression could be clearly seen in Ángel. In our very first session, Ángel did not know how to take the HeartMath ear sensor off or how to peel off stickers. "Can you help me?" he asked me right away, instead of trying to figure it out for himself. I showed him how he could do it by himself in the future, and he smiled as if to say, "Wow, I can do this."

Significant goals and values is Oka and Paris's (1987) second dimension of motivation. The child's perception of the importance of a task is affected by how difficult they think it is (based on their past failure or success with the task) and whether the task helps them fulfill their own needs, goals, and values. If a child has failed repeatedly at a task, and it has nothing to do with their own interests, they are likely to avoid the task because it makes them feel badly about themselves (e.g., Juan who thought reading was "boring" because it was so hard to do and he preferred playing or talking about video games).

This second motivational dimension of Oka and Paris (1987) was a key component of this study. Whether it was books about fashion for Ana, a drawing pad for Paz, princess books for Clara, joke books for Sam, comic books for Zach, books on making paper airplanes for Ángel, reading and writing about video games for Juan, or spelling words while throwing a ball back and forth with Noah, I incorporated children's interests to motivate them to attempt tasks they had failed at before.

Oka and Paris's (1987) third dimension of motivation is self-management skills, or the ability to use skills to successfully attain certain goals. Goal-setting was an important instructional strategy used in this study that taught students self-management skills. For example, I asked Clara to set a writing time goal. Then I set a timer for the time goal she had chosen that day and started it. In the beginning, she chose very short time periods. After she discovered she was not successful in attaining those goals, she learned to choose more appropriate ones. During her writing time, I made a game out of ignoring distraction while writing. Because she had been very distracted by magnet letters on the white board, I challenged her to "see if you can ignore" the magnet letters I was throwing on the board. So she learned strategies for ignoring distraction and began self-monitoring progress towards her goal by looking at the timer and adjusting her writing speed accordingly.

Oka and Paris's (1987) last dimension of motivation—a child's interpretations of success and failure—is probably going to influence whether or not that child chooses and/or perseveres on difficult tasks and is able to resist distraction. In two studies with 130 fifth-graders, Diener and Dweck (1978) discovered striking differences in attributions between mastery-oriented and helplessness-oriented children during failure conditions. Students were requested to verbalize their thoughts while they completed problems intended to induce success or failure. The attributions of mastery-oriented and helpless children were very similar when they were involved in success problems, but were markedly different during failure problems. Mastery-oriented children made few comments about their own performance, engaged in self-monitoring while searching for more successful problem-solving strategies, displayed positive affect, and expressed optimism about the outcome of their efforts. Twenty-one children in the mastery-oriented group improved their problem-solving strategy after failure, 37 kept their strategies the same, and 11 of them deteriorated.

In comparison, helpless children exhibited negative affect and avoidance behaviors, ascribed their performance to factors beyond their control, and undervalued any success they had while overemphasizing their failure (none of them improved their problem-solving strategy, 14 remained the same, and 45 deteriorated). "LD children are less likely to attribute failure to a controllable factor, namely insufficient effort" (Borkowski et al., 1989, p. 66). Interventionists should target LD children's beliefs about failure—it does not have to be interpreted as a reflection of one's self-worth, but as an opportunity to learn more effective ways to complete tasks and solve problems.

Motivational processes are an essential element of intervention with learning disabled children, but I do not know of other intervention studies with learning disabled children that incorporated the dimensions of motivation. Borkowski et al. (1989) concluded their paper on metacognition and strategic processing with these words:

Attention also should be directed to the implied value and importance of

> academic tasks for LD children and adolescents. Researchers have found that after repeated failure experiences in the classroom, LD children need more than the promise of academic success to persist on school tasks... Increasing the value and significance of academic tasks for LD children requires creative and innovative approaches, such as an emphasis … on what each students aspires to become, and how daily tasks lead to the fulfillment of personal goals. (p. 68)

In this study, an emphasis on honoring and encouraging each child's interests and developing awareness of their strengths and limitations may have helped to improve participant's motivation, focus, and self-confidence. Future research on MF interventions with LD children should use validated and reliable scales for self-efficacy, motivation, focus, self-confidence, and self-talk during problem-solving tasks in order to investigate whether or not MF has a significant impact on these behaviors.

Summary of metacognitive strategies. As can be seen from this section on metacognitive strategies, there are a wide variety of metacognitive strategies that can be employed during a seemingly simple task like reading—using text-based cues, word recognition strategies, general strategy knowledge (including self-efficacy beliefs), metacognitive acquisition procedures (e.g., executive or self-regulatory processes), and metacognition about motivational processes. MF as a metacognitive strategy for training executive processes and attributional beliefs by becoming aware of one's own thought processes and emotions without attempting to *change* such thoughts and emotions has not been studied by other researchers investigating metacognition, problem-solving, and academic progress in children with learning disabilities or dyslexia.

In this study, response times during a decoding task (i.e., the lexical decision test) became significantly longer in experimental participants after the intervention, indicating increased reflectiveness or self-regulatory processes. Interestingly enough, the words on this decoding task did not appear in the context of a reading passage; they appeared as single words, so the broadly-criticized multiple cues (text-based) metacognitive strategy was not being employed at that moment by the children—they were perhaps reflecting on prior knowledge about letter-sound relationships, focusing on the letters, monitoring their own emotional state or thoughts, etc. Future research using fMRI might be helpful in investigating brain activation during decoding tasks after a MF intervention that focused on developing thought, emotion, and body awareness in underachieving children. However, a focus on increasing reflectiveness in children may be counterproductive in a national school system that consistently emphasizes *quantity* over *quality*—or speed over thoughtfulness.

Speed testing: The DIBELS

Our study findings indicated that training in metacognitive strategies increased children's reflectiveness (and thus their response times) during decoding. However, one of the study measures we used--the Dynamic Indicators of Early Literacy Skills (DIBELS)—penalizes children for reflection during decoding.

The DIBELS is a reading test used in thousands of schools with millions of children across the United States. The DIBELS is comprised of six subtests, all designed to be quickly administered in one minute: Letter Name Fluency, Initial Sound Fluency, Phoneme Segmentation Fluency, Nonsense Word Fluency, Oral Reading Fluency, and

Retell Fluency. Children from kindergarten to third grade (and in some school districts, in fourth and fifth grade as well) are taking these tests at least three times a year. Teachers are required to use the results of the DIBELS to create reading groups and design lesson plans. They are also evaluated on the DIBELS scores their students receive at the end of the year. The DIBELS was used in this study because it is the standardized reading test used by the state, the school district, and the school where this study took place. The New Mexico Public Education Department (n.d.) states on its website that the DIBELS is "brief, efficient, cost-effective, individually administered, standardized, and formative" (para. 2). This last word, "formative"—or having a lasting influence or a child's development—may indeed be true, but the DIBELS could have a detrimental influence instead of as a positive one.

Dr. Goodman (2006), Professor Emeritus of Language, Reading, and Culture at the University of Arizona, has edited a book entitled, *The Truth about DIBELS: What it is, what it does.* In the chapter he wrote entitled, "A Critical Review of DIBELS," he asserts that one of two key assumptions made by the authors of the DIBELS is "that a few minutes performance on a set of reduced discrete tasks can usefully and fairly represent progress in reading development" (p. 9). The DIBELS authors are also convinced that what happens in sixty seconds of reading can be considered an authentic representation of what happens in *all* of reading.

The authors of the DIBELS also proclaim that formalized reading instruction (and formalized testing!) should begin in kindergarten. Almost as soon as a five-year-old walks into kindergarten for her very first day of school, she is timed on how many alphabet letters she can read in a minute. Just as she is warming up to the task, the timer interrupts with a strident *Beep-beep-beep!*

Kindergarten used to be considered as a garden where children learned to play and socialize with other children. Many early childhood educators question whether it is developmentally appropriate to have formalized reading instruction and testing at this young age. As Goodman (2009) writes:

> Should five year olds be repeatedly tested with timed tests? Should those who can't perform on these one-minute tests be drilled on naming letters and sounding out words while their classmates play? And should children come to see themselves as failures before they even start first grade? (p. 11)

As indicated in the first paragraph of this section, every DIBELS test is designed to be administered in one minute. The use of timed tests advantages the learner who is impatient, impulsive, energetic, or drilled for the DIBELS. Learners who are slow, reflective, thoughtful, careful, distractible, talkative, and/or inquisitive will be more likely to have lower scores on timed tests. Also, children who are in the process of discovering that reading needs to make sense will also perform more slowly on the DIBELS test as they try to make sense out of what they read (Goodman, 2009).

The authors of the DIBELS acknowledge that children, as well as teachers, may learn that completing each test as quickly as possible is the most important part of scoring well. Students learn that it does not matter *how* they read, but instead, *how many* words they read. So, instead of trying to figure out an unknown word, they skip over it in the race to read only the words they already know. Or, since the test protocol is to give students the answer if they pause for more than three seconds, some children learn to wait for the tester to supply them the word or letter instead of trying to figure it out themselves. One teacher wrote (Goodman, 2009):

> I saw immediate negative carryover from this assessment, particularly among children reluctant to take chances. It seemed as though the assessment inadvertently gives children permission not to think about unknown words and reinforces those who play the waiting game, hoping someone will just tell them a word. (p. 29)

Telling the reader the word after three seconds assumes that the reader is pausing because they do not know the next word. But it could also be the case that the reader has already identified the word but is trying to make sense of the word in this context. For example, if the text reads "the boy is a bicycle thief," a reader might pause before the word "bicycle" because "the boy is a bicycle" does not make sense. When the tester gives the word after three seconds, the child learns that she is not supposed to make sense while reading, but instead to just call out words as fast as she can.

Goodman (2009) wrote that eye movement studies have shown that reader's eyes fixate on less than ten percent of the words in a text because "the reader is constructing meaning and anticipating many of the words without needing to specifically identify them" (p. 34). Miscue research, Goodman continues, demonstrates that it takes as long as thirty seconds for a reader to figure out a word. The DIBELS punishes emerging readers who take too long to make sense out of print or who attempt to decode a word.

Another concern with the DIBELS is that it places the child under continuous stress. All students in grades kindergarten through third grade are tested three times a year using the benchmark DIBELS tests. Their progress is monitored monthly with the DIBELS tests. Children who fail to meet the benchmarks are often tested weekly, a constant reminder of their reading failure. And what happens in between the tests? Students spend a lot of time practicing for the test. There is little time for anything that is not test-related—like art, social studies, science, music, physical education—all the "fun" subjects that children like to learn. According to Kim (2011):

> The increased emphasis on standardized testing may have shifted the emphasis in schools toward drill exercises and rote learning, and away from critical, creative thinking. The high-stakes testing environment has led to the elimination of content areas and activities including electives, the arts, enrichment and gifted programs, foreign language, elementary sciences, and elementary recess (playtime), which leaves little room for imagination, scholarship, critical or creative thinking, and problem solving... This may eliminate opportunities for creative students to release their creative energy in school. When their creative needs are not met, students often become underachievers. (p. 36)

Interventionists, educators, and researchers who are investigating or implementing MF training and/or other metacognitive strategies to help ameliorate the symptoms of DYS and learning disabilities need to be aware that the transfer of such strategy training to the classroom may be impeded by the frequent use of timed tests like the DIBELS and the national stress on the importance of speed over thoughtfulness.

Low Heart Rate

In our study, the chronic stress of continual standardized testing may have been relieved by MF practice, indicated by the significant decrease in the experimental students' heart rate over the course of the intervention. Future research could investigate whether or not heart rate remained low after breathing practice, especially during reading/writing.

The perception of a perceived threat (e.g., when the learning disabled child hears the *Beep! Beep! Beep!* of the DIBELS timer) causes the release of adrenaline, which increases heart rate and muscle tension and raises blood pressure. Repeated stimulation of the stress-response system over long periods of time can cause numerous mental and physical problems including anxiety, depression, sleep problems, impairment of memory and concentration, high blood pressure, irregular heart rhythms, digestive problems, and a weakened immune system (Cleveland Clinic, 2013; Mayo Clinic, 2013).

Breathing slowly can reverse some of the adverse effects of stress by increasing oxygen saturation in the cells, alpha waves, and heart rate variability and lowering heart rate, thereby releasing energy and improving cognitive abilities (Thompson, 2009). Interventionists, educators, and researchers endeavoring to improve the educational futures of children with DYS and learning disabilities need to remember that the present environment of continual standardized testing is extremely stressful for the underachieving child. They need to implement and/or continue to research more holistic methods for assessing children's academic skills and for relieving the stress of continual failure.

Study Limitations

Some limitations of this study were the small sample size and the reliance on qualitative data analysis; this limits the generalization of the results. Another limitation is that because I was a participant observer (both an instructor and a data analyst), some bias may have come into the qualitative analysis. However, there were significant findings in the quantitative data that helped to support the prediction that MF training ameliorates symptoms of dyslexia and/or learning disabilities. Future research needs to investigate whether these results, and some of the qualitative *Improvement* themes, generalize to larger samples with differing patterns of disability.

Conclusion

This work was intended to provide clinicians, teachers, and school districts with a research-based intervention that will enable students with DYS and/or learning disabilities to be more positive and productive. It was also intended to investigate more deeply how the self-regulation of attention (in this case, mindfulness) improved the mental and emotional capacities of children with DYS (specifically in the areas of reading, writing, self-awareness, and emotional wellbeing). Quantitative results suggested that participants became more reflective during decoding and their average heart rate became lower over the course of the intervention. Qualitative results pointed to possible improvements in self-expression, motivation, focus, self-confidence, positive affect, and use of metacognitive strategies. Future research and educational reform movements need to examine the high cost of timed tests on mental and physical health *and* on academic performance and find more holistic ways to assess both the strengths and limitations of underachieving children.

Appendix A

Interview Questions (family)

1. How many brothers and sisters does *X* have? How does he/she get along with them?

2. What can you tell me about X's life as a baby and as a small child?

3. When did you first think that X might have a LD?

4. What did the doctors say about X?

5. How does X feel about school?

6. What do X's teachers think about him/her? How has he/she done in school?

7. How does X feel about himself/herself?

8. How does X behave at home?

9. What does X do when he/she is frustrated?

10. What does X like doing?

11. What do you think are X's strengths?

12. What do you think X needs to work on?

13. How has X's LD affected his/her life? How does he/she feel about their LD?

Interview Questions (student)

1. What do you like about school?

2. What do you <u>not</u> like about school?

3. What do your teachers say about you?

4. Do you work hard in school? Why or why not?

3. Do you have a favorite teacher? Why?

4. Do you have a teacher you don't like? Why?

5. Do you get in trouble at school? At home? Why or why not?

6. What are some things that you're good at?

7. What are some things that are hard for you? Do you think you can get better at them?

8. What do you like to do for fun?

9. What do the words "learning disability" mean to you?

10. Is it okay to have a learning disability?

11. (If student recognizes they have a LD): How do you feel about having a learning disability?

Appendix B

Six Traits Writing Rubric

	6 Exemplary	5 Strong	4 Proficient	3 Developing	2 Emerging	1 Beginning
Ideas & Content ➢ *main theme* ➢ *supporting details*	• Exceptionally clear, focused, engaging with relevant, strong supporting detail	• Clear, focused, interesting ideas with appropriate detail	• Evident main idea with some support which may be general or limited	• Main idea may be cloudy because supporting detail is too general or even off topic	• Purpose and main idea may be unclear and cluttered by irrelevant detail	• Lacks central idea; development is minimal or non-existent
Organization ➢ *structure* ➢ *introduction* ➢ *conclusion*	• Effectively organized in logical and creative manner • Creative and engaging intro and conclusion	• Strong order and structure • Inviting intro and satisfying closure	• Organization is appropriate, but conventional • Attempt at introduction and conclusion	• Attempts at organization; may be a "list" of events • Beginning and ending not developed	• Lack of structure; disorganized and hard to follow • Missing or weak intro and conclusion	• Lack of coherence; confusing • No identifiable introduction or conclusion
Voice ➢ *personality* ➢ *sense of audience*	• Expressive, engaging, sincere • Strong sense of audience • Shows emotion: humour, honesty, suspense or life	• Appropriate to audience and purpose • Writer behind the words comes through	• Evident commitment to topic • Inconsistent or dull personality	• Voice may be inappropriate or non-existent • Writing may seem mechanical	• Writing tends to be flat or stiff • Little or no hint of writer behind words	• Writing is lifeless • No hint of the writer
Word Choice ➢ *precision* ➢ *effectiveness* ➢ *imagery*	• Precise, carefully chosen • Strong, fresh, vivid images	• Descriptive, broad range of words • Word choice energizes writing	• Language is functional and appropriate • Descriptions may be overdone at times	• Words may be correct but mundane • No attempt at deliberate choice	• Monotonous, often repetitious, sometimes inappropriate	• Limited range of words • Some vocabulary misused
Sentence Fluency ➢ *rhythm, flow* ➢ *variety*	• High degree of craftsmanship • Effective variation in sentence patterns	• Easy flow and rhythm • Good variety in length and structure	• Generally in control • Lack variety in length and structure	• Some awkward constructions • Many similar patterns and beginnings	• Often choppy • Monotonous sentence patterns • Frequent run-on sentences	• Difficult to follow or read aloud • Disjointed, confusing, rambling
Conventions ➢ *age appropriate, spelling, caps, punctuation, grammar*	• Exceptionally strong control of standard conventions of writing	• Strong control of conventions; errors are few and minor	• Control of most writing conventions; occasional errors with high risks	• Limited control of conventions; frequent errors do not interfere with understanding	• Frequent significant errors may impede readability	• Numerous errors distract the reader and make the text difficult to read

Appendix C

Example of Running Record

Sample Running Record

Hey diddle diddle,	√ -el -el fiddle, fiddle
The cat and the fiddle	√ √ √ √ √
The cow jumped over the moon.	√ √ jump √ √ √ jumped
The little dog laughed	√ √ √ looked laughed
To see such a sport	√ √ √ √ sp sc sport
And the dish ran away with the spoon	√ √ √ √ √ √ √ √

Analysis – There are 4 errors and 1 self-correction. In the first error, "el" for "fiddle", the child looked at the last part of the word. She did not use meaning or syntax cues. With the next two errors, the child focused on the root word and did not use the "ed" ending to pronounce the word. This error was meaningful with the use of some visual cues; however, the child did not look at the whole word. With "sport", the child went back and self-corrected, which is a good behavior to note. The score of 88% accuracy indicates that the book is at a frustration level for her.

$\frac{\text{Running Words}}{\text{Errors}} \quad \frac{31}{4}$

Error Rate 1:8 (a ratio)

Accuracy 88% $100 - \frac{E}{RW} \times \frac{100}{1}$

Appendix D

Self-Report Scales

How do I feel right now?

1=I feel bad					
2 = I feel a little bad					
3 = I feel nothing					
4 = I feel a little good					
5 = I feel very good					
Date					

How do I feel about reading right now?

1=I am very worried					
2 = I am a little worried					
3 = I feel nothing					
4 = I am a little calm					
5 = I am very calm					
Date					

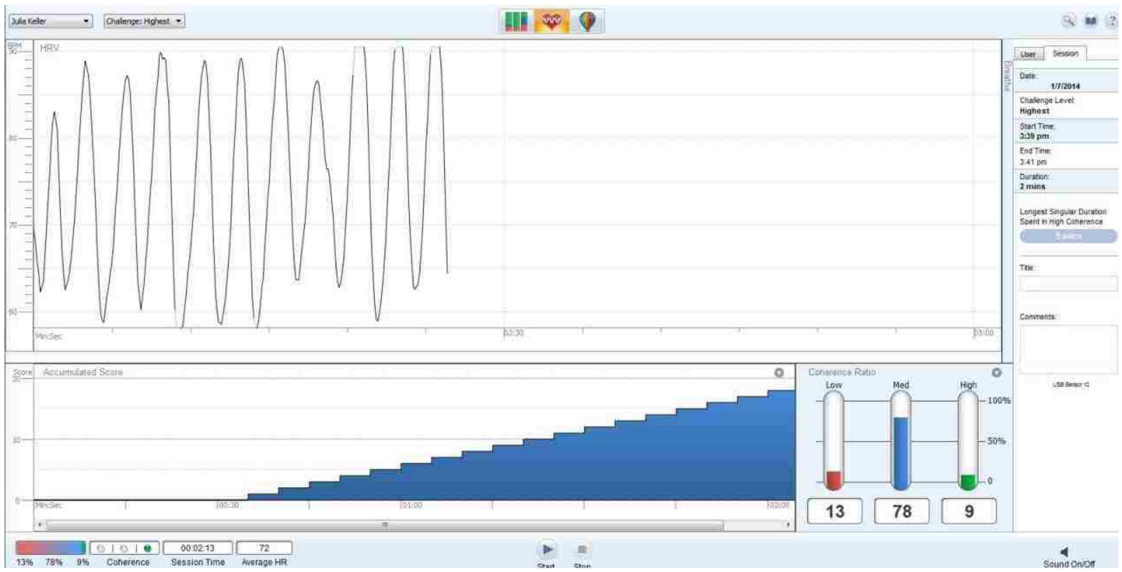
How confident am I that I will do a good job reading today?

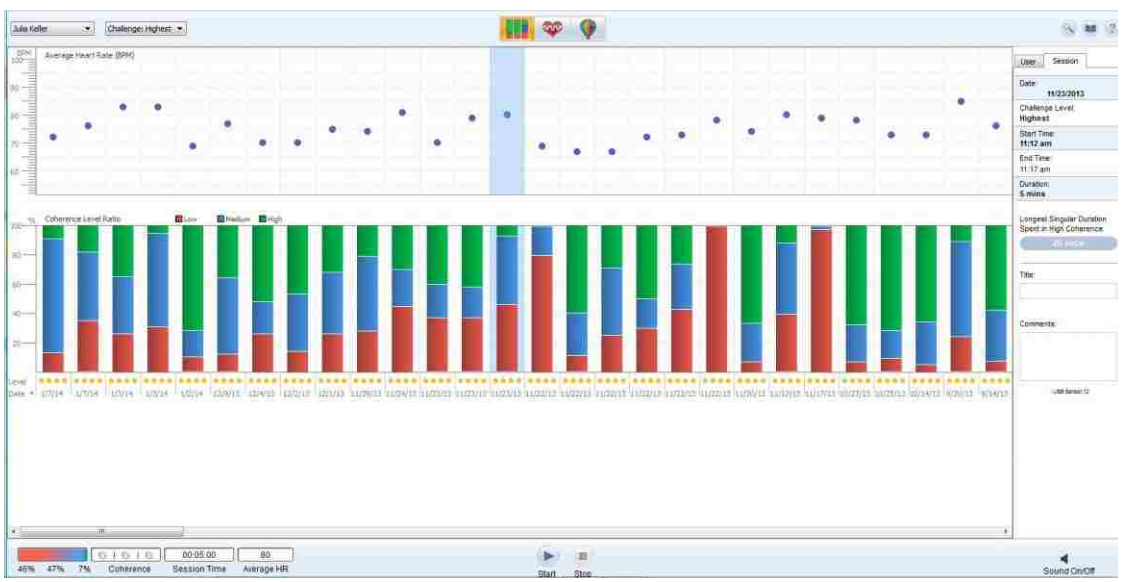
1=Not at all					
2 = A little bit					

3 = A lot					
Date					

Appendix E

Example of HeartMath Data





References

Achenbach, T. M. (2001). *The Child Behavior Checklist and Youth Self-Report form*. Burlington, VT: ASEBA, University of Vermont.

Ahissar, M. (2007). Dyslexia and the anchoring-deficit hypothesis. *Trends in Cognitive Sciences, 11,* 458-465. doi:10.1016/j.tics.2007.08.015

Anderson, N. D., Lau, M. A., Segal, Z. V. & Bishop, S. R. (2007). Mindfulness-based stress reduction and attentional control. *Clinical Psychology and Psychotherapy, 14,* 449-463. doi: 10.1002/cpp.544

Araújo, S., Bramão, I., Faísca, L., Petersson, K. M., & Reis, A. (2012). Electrophysiological correlates of impaired reading in dyslexic pre-adolescent children. *Brain and Cognition, 79*(2), 79-88. doi: 10.1016/j.bandc.2012.02.010

Ary, D., Jacobs, L. C., & Razavieh, A. (1990). *Introduction to research in education.* Fort Worth, TX: Harcourt Brace College Publishers.

Attree, E. A., Turner, M. J., & Cowell, N. (2009). A virtual reality test identifies the visuo-spatial strengths of adolescents with dyslexia. *Cyberpsychology and Behavior, 12,* 163-168. doi: 10.1089/cpb.2008.0204

Baer, R. A., Smith, G. T., & Allen, K. B. (2004). Assessment of mindfulness by self-report: the Kentucky inventory of mindfulness skills. *Assessment, 11*(3), 191-206. doi: 10.1177/1073191104268029

Bailey, E. (2011, August 8). Stopping ADHD medications: Withdrawal symptoms. *HealthCentral.* Retrieved February 16, 2016, from http://www.healthcentral.com /adhd/c/1443/142573/stopping-medications/

Baraldi, A. N. & Enders, C. K. (2010). An introduction to modern missing data analyses. *Journal of School Psychology, 48,* 5-37. doi: 10.1016/j.jsp.2009.10.001

Beauchemin, J., Hutchins, T. L., & Patterson, F. (2008). Mindfulness meditation may lessen anxiety, promote social skills and improve academic performance among adolescents with learning disabilities. *Complementary Health Practice Review, 13,* 34-45. doi: 10.1177/1533210107311624

Bishop, D. V. M. (2007). Using mismatch negativity to study central auditory processing in developmental language and literacy impairments: Where are we, and where should we be going? *Psychological Bulletin, 133*(4), 651-672. doi: 10.1037/0033-2909.133.4.651

Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., . . . Devins, G. D. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 2*(3), 230–241. doi: 10.1093/clipsy/bph077

Boder, E. (1970). Developmental dyslexia: A new diagnostic approach based on the identification of three subtypes. *Journal of School Health, 40*(6), 289-90.

Borkowski, J. G., Estrada, M. T., Milstead, M., & Hale, C. A. (1989). General problem-solving skills: Relations between metacognition and strategic processing. *Learning Disability Quarterly, 12*(1), 57-70. doi: 10.2307/1510252

Bornstein, P. H., & Quevillon, R. P. (1976). The effects of a self-instruction package on overactive preschool boys. *Journal of Applied Behavioral Analysis, 9,* 179-188. doi: 10.1901/jaba.1976.9-179

Bowie, C. R., & Harvey, P. D. (2006). Administration and interpretation of the Trail Making Test. *Nature Protocols, 1,* 2277-2281. doi: 10.1038/nprot.2006.390

Bresnahan, S. M., Anderson, J. W., & Barry, R. J. (1999). Age-related changes in quantitative EEG in attention-deficit/hyperactivity disorder. *Biological Psychiatry, 46*(12), 1690-1697. doi: 10.1016/S0006-3223(99)00042-6

Chakravarty, A. (2009). Artistic talent in dyslexia: A hypothesis. *Medical Hypotheses 73,* 569-571. doi: 10.1016/j.mehy.2009.05.034

Chapman, J. W., Prochnow, J. E., & Arrow, A. A. (2015). Eleven myths about literacy education in New Zealand. In W. E. Tunmer, , & J. W. Chapman, (eds.) *Excellence and Equity in Literacy Education: The Case of New Zealand* (pp. 214-235). Palgrave Macmillan.

Chapman, J. W., Tunmer, W. E., & Prochnow, J. E. (2001). Does success in the Reading Recovery program depend on developing proficiency in phonological-processing skills? A longitudinal study in a whole language context. *Scientific Studies of Reading, 5*(2), 141-176. doi: 10.1207/S1532799Xssr0502_2

Chiesa, A., Calati, R., & Serretti, A. (2011). Does mindfulness training improve cognitive abilities? A systematic review of neuropsychological findings. *Clinical Psychology Review, 31,* 449-464. doi: 10.1016/j.cpr.2010.11.003

Cleveland Clinic. (2013). Stress and heart disease. Retrieved from http://my.clevelandclinic.org/services/heart/prevention/emotional-health/stress-relaxation/stress-management-your-heart

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Cohen, J. (1992). A power primer. *Psychological Bulletin 112*(1), 155-159. doi: 10.1037/0033-2909.

Connoly, C. (1969). The psychosocial adjustment of children with dyslexia. *Exceptional Children, 36*(2), 126-127.

Conners, C. K. (1997). *Conners' rating scales-revised*. Toronto: Multi-Health Systems.

Cresswell, J. W., & Plano Clark, V. L. P. (2011). *Designing and conducting mixed methods research (2nd ed.).* Los Angeles, CA: Sage.

Dastjerdi, M., Foster, B. L., Nasrullah, S., Rauschecker, R. F., Dougherty, R. F., Townsend, J. D., . . . & Parvizi, J. (2011). Differential electrophysiological response during rest, self-referential, and non-self-referential tasks in human posteromedial cortex. *PNAS, 108*(7), 3023-3028. doi: 10.1073/pnas.1017098108

Davidson, R. J., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S. F., . . . Sheridan, J. F. (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic Medicine, 65*, 564-570. doi: 10.1097 /01.PSY.0000077505.67574.E3

Davidson, R. J. (2010). Empirical explorations of mindfulness: Conceptual and methodological conundrums. *Emotion,10*(1), 8-11. doi: 10.1037/a0018480

Dean, R. S., & Rattan, A. J. (1987). Measuring the effects of failure with learning disabled children. *International Journal of Neuroscience, 37*(1-2), 27-30. doi: 10.3109 /00207458708991798

Dedoose Version 6.1.9, web application for managing, analyzing, and presenting qualitative and mixed method research data (2015). Los Angeles, CA: SocioCultural Research Consultants, LLC (www.dedoose.com).

Denzin, N. K., & Lincoln, Y .S. (1994). The Sage handbook of qualitative research. Thousand Oaks, CA: Sage.

Diener, C. I., & Dweck, C. S. (1978). An analysis of learned helplessness: Continuous changes in performance, strategy and achievement cognitions following failure. *Journal of Personality and Social Psychology, 36*(5)*,* 451-462. doi: 10.1037/0022-3514.36.5.451

Di Leo, J. H. (1973). *Children's drawings as diagnostic aids.* New York: Brunner/Mazel.

Dilts, R. (1998). Eye movements and NLP. Retrieved February 19, 2016, from http://www.nlpu.com/Articles/artic14.htm

Dowd, T. E. (2004). Expanding the cognitive therapy model: Imagery, meditation, and hypnosis. *Journal of Cognitive Psychotherapy, 18*(4), 351-359. doi: 10.1891 /jcop.18.4.351.65005

Dyslexia. (n.d.) In *Wikipedia*. Retrieved August 1, 2013, from http://en.wikipedia.org /wiki/Dyslexia

Eide, B. L. & Eide, F. F. (2011). *The Dyslexic Advantage: Unlocking the hidden potential of the dyslexic brain.* New York, NY: Hudson Street Press.

Everatt, J., Warner, J., Miles, T. R., & Thomson, M.E. (1997). The incidence of Stroop interference in dyslexia. *Dyslexia, 3*(4)*,* 222-228. doi: 10.1002/(SICI)1099-0909(199712)3:4<222::AID-DYS12>3.0.CO;2-P

Everatt, J., Steffert, B., & Smythe, I. (1999). An eye for the unusual: Creative thinking in dyslexics. *Dyslexia, 5, 28-46.*

Fan, J., McCandliss, B. D., Sommer,T., Raz, A., & Posner, M. I. (2002). Testing the efficiency and independence of attentional networks. *Journal of Cognitive Neuroscience, 14,* 340-347. doi: 10.1162/089892902317361886

Fisher, B. L., Allen, R., & Kose, G. (1996). The relationship between anxiety and problem-solving skills in children with and without learning disabilities. *Journal of Learning Disabilities, 29*(4), 439-446.

Fisher, R. (2006). Still thinking: The case for meditation with children. *Thinking Skills and Creativity, 1*(2), 146-151. doi: 10.1016/j.tsc.2006.06.004

Flook, L., Smalley, S. L., Kitil, M.J., Galla, B. M., Kaiser-Greenland, S. K., Locke, J., . . . & Kasari, C. (2010). Effects of mindful awareness practices on executive functions in elementary school children. *Journal of School Psychology, 26,* 70-95. doi: 10.1080/15377900903379125

Franceschini, S., Gori, S., Ruffino, S. V., Molteni, M., & Facoetti, A. (2013). Action video games make dyslexic children read better. *Current Biology, 23,* 462-466. doi: 10.1016/j.cub.2013.01.044

Gabrieli, J. (2009). Dyslexia: A new synergy between education and cognitive neuroscience. *Science, 325,* 280-283. doi: 10.1126/science.1171999

Galotti, K. M. (2008). *Cognitive psychology: In and out of the laboratory* (4th ed.). Australia: Thomson Wadsworth.

Gaskins, I. W., Downer, M. A., Anderson, R. C., Cunningham, P. M., Gaskins, R. W., & Schommer, M. (1988). A metacognitive approach to phonics using what you know to decode what you don't know. *Remedial and Special Education, 9*(1), 36-41. doi: 10.1177/074193258800900107

Gaskins, I. W., Ehri, L. C., Cress, C., O'Hara, C., & Donnelly, K. (1997). Procedures for word learning: Making discoveries about words. *The Reading Teacher, 50*(4), 312-328.

Gioia, G. A., Isquith, P. K., Guy, S. C., & Kenworthy, L. (2000). *Behavior Rating Inventory of Executive Function*. Lutz, FL: Psychological Assessment Resources.

Goodman, K. S. (2006). A critical review of DIBELS. In K.S. Goodman (Ed.), *The truth about DIBELS: What it is, what it does* (1-39). Portsmouth, NH: Heinemann.

Greaney, K. T. (2011). The multiple cues or "searchlights" word reading theory: Implications for Reading Recovery. *Perspectives on Language and Literacy*, *37*(4), 15-19.

Gresham, F. M., & Elliott, S. N. (1990). *Social skills rating system manual*. Circle Pines, MN: American Guidance Service.

Guttorm, T. K., Leppanen, P. H. T., Richardson, U., & Lyytinen, H. (2001). Event-related potentials and consonant differentiation with familiar risk for dyslexia. *Journal of Learning Disabilities, 34,* 534. doi: 10.1177/002221940103400606

Haydicky, J., Wiener, J., Badali, P., Milligan, K., & Ducharme, J. M. (2012). Evaluation of a mindfulness-based intervention for adolescents with learning disabilities and co-occurring ADHD and anxiety. *Mindfulness.* Online publication. doi: 10.1007

/s12671-0120089-2

Horner, S. L. & O'Connor, E. A. (2007). Helping beginning and struggling readers to develop self-regulated strategies: A Reading Recovery example. *Reading &Writing Quarterly, 23,* 97-109. doi: 10.1080/10573560600837727

Hudson, R. F., Pullen, P. C., Lane, H. B., Torgesen, J. K. (2009). The complex nature of reading fluency: A multidimensional view. *Reading & Writing Quarterly, 25,* 4-32. doi: 10.1080/10573560802491208

Hunter, A., Lusardi, P., Zucker, D., Jacelon, C., & Chandler, G. (2002). Making meaning: The creative component in qualitative research. *Qualitative Health Research, 12*(3), 388-398. doi: 10.1177/104973202129119964

Insular cortex. (n.d.) In *Wikipedia.* Retrieved August 17, 2013, from http://en.wikipedia.org/wiki/Insular_cortex

Jeffries, S., & Everatt, J. (2004). Working memory: Its role in dyslexia and other specific learning difficulties. *Dyslexia: An International Journal of Research and Practice, 10,* 196-214. doi: 10.1002/dys.278

Jha, A. P., Krompinger, J., & Baime, M. J. (2007). Mindfulness training modifies subsystems of attention. *Cognitive, Affective, & Behavioral Neuroscience, 7*(2), 109-119. doi: 10.3758/CABN.7.2.109

Julca, M., Nenert, R., Chaix, Y., & Demonet, J. (2010). Remediation effects on N170 and P300 in children with developmental dyslexia. *Behavioural Neurology, 22,* 121-129. doi: 10.3233/BEN-2009-0257

Jung-Beeman, M. (2005). Bilateral brain processes for comprehending natural language. *Trends in Cognitive Sciences, 9,* 512-518. doi: 10.1016/j.tics.2005.09.009

Kabat-Zinn, J. (2003). Mindfulness-based stress reduction (MBSR). *Constructivism in the Human Sciences, 8*(2), 73-107.

Kabat-Zinn, J. (2004). Wherever you go, there you are: Mindfulness meditation in everyday life. New York: Hyperion.

Kim, K. H. (2011). The creativity crisis: The decrease in creative thinking scores on the Torrance Tests of Creative Thinking. Creativity Research Journal, 23(4), 285-295. doi: 10.1080/10400419.2011.627805

Kozhevnikov, M., Louchakova, O., Josipovic, Z., & Motes, M. A. (2009). The enhancement of visuospatial processing efficiency through Buddhist deity meditation. Psychological Science, 20(5), 645-653. doi: 10.1111/j.1467-9280.2009.02345.x

Kristeller, J. (2003). Mindfulness, wisdom and eating: Applying a multi-domain model of meditation effects. *Journal of Constructivism in the Human Sciences, 8*(2), 107-118.

Lazarus, P. J., Ludwig, R. P., & Aberson, B. (1984). Stroop color-word test: A screening measure of selective attention to differentiate LD from non LD children. *Psychology in the Schools, 21,* 53-60.

Lingual gyrus. (n.d.) In *Wikipedia*. Retrieved August 3, 2013, from http://en.wikipedia .org/wiki/Lingual_gyrus

Lovett, M. W., Lacerenza, L., & Borden, S. L. (2000). Putting struggling readers on the PHAST track: A program to integrate strategy-based remedial reading instruction and maximize outcomes. *Journal of Learning Disabilities, 33*(5), 458-476. doi: 10.1177/002221940003300507

Lutz, A., Slagter, H. A., Dunne, J. D., & Davidson, R. J. (2008). Attention regulation and monitoring in meditation. *Trends in Cognitive Sciences, 12*(4), 163-169. doi: 10.1016/j.tics.2008.01.005

Majumdar, M., Grossman, P., Dietz-Waschkowski, B., Kersig, S., & Walach, H. (2002). Does mindfulness meditation contribute to health? Outcome evaluation of a German sample. *Journal of Alternative and Complementary Medicine*, *8*(6), 719-730. doi: 10.1089/10755530260511720

Manly, T., Nimmo-Smith, I., Watson, P., Anderson, V., Turner, A., & Robertson, I. H. (2001). The differential assessment of children's attention: The Test of Everyday Attention for Children (TEA-Ch), normative sample and ADHD performance. *Journal of Child Psychology and Psychiatry, 42,* 1065-1081. doi: 10.1111/1469-7610.00806

Marie Clay. (n.d.) In *Wikipedia*. Retrieved August 15, 2013, from http://en.wikipedia.org /wiki/Marie_Clay

Maurer, U., Brem, S., Bucher, Kerstin, K., Kranz, F., Benz, R., Hans-Christoph, S., & Brandeis, D. (2007). Impaired tuning of a fast occiptio-temporal response for print in dyslexic children learning to read. *Brain, 130,* 3200-3210. doi: 1 0.1093/brain/awm193

Maxwell, S.E., & Delaney, H.D. (2004). *Designing experiments and analyzing data: A model comparison perspective.* New York, NY: Psychology Press.

Mayo Clinic. (2013). Chronic stress puts your health at risk. Retrieved from http://www.mayoclinic.com/health/stress/SR00001

McCraty, R. (2005). Enhancing emotional, social, and academic learning with heart rhythm coherence feedback. *Biofeedback 33*(4), 130-134. Retrieved January 5, 2014, from http://humancair.com/image/pdf/Enhancing%20Learning%20 %20with%20heart%20coherence%2014-10-10.pdf

McCraty, R., Atkinson, M., Tomasino, D., & Bradley, R. T. (2006). *Heart-brain interactions, psychophysiological coherence, and the emergence of a system-wide order*. Retrieved from http://www.HeartMath.com/wp-content /uploads/2014/04/coherent_heart.pdf

McKiernan, K. A., D'Angelo, B. R. D., Kaufman, J. N., & Binder, J. R. (2006). Interrupting the "stream of consciousness": An fMRI investigation. *NeuroImage 29,* 1185-1191. doi: 10.1016/j.neuroimage. 2005.09.030

Meiklejohn, J., Phillips, C., Freedman, M. L., Griffin, M. L., Biegel, G., Roach, A., . . . Saltzman, A. (2012). Integrating mindfulness training into K-12 education: Fostering the resilience of teachers and students. *Mindfulness.* Online publication. doi: 10.1007/s12671-012-00945

Melby-Lerväg, M. & Hulme, C. (2013). Is working memory training effective? A meta-analytic review. *Developmental Psychology, 49*(2), 270-291. doi: 10.1037 /a0028228

Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. San Francisco, CA: Jossey-Bass.

Merzenich, M. M., & deCharms, R. C. (1996). Neural representations, experience, and change. In R. R. Llinas (Ed.) *The mind-brain continuum: Sensory processes*. (pp. 61-81). Cambridge, MA: MIT Press.

Molfese, D. L. (2000). Predicting dyslexia at 8 years of age using neonatal brain responses. *Brain and Language, 72,* 238-245. doi: 10.1006/brln.2000.2287

Moore, A., & Malinowski, P. (2009). Meditation, mindfulness and cognitive flexibility. *Consciousness and Cognition: An International Journal 18*(1)*,* 176-186. doi: 10.1016/j.concog.2008.12.008

Moore, A., Gruber, T., Derose, J., & Malinowski, P. (2012). Regular, brief mindfulness meditation practice improves electrophysiological markers of attentional control. *Frontiers in Human Neuroscience, 6,*1-15. doi: 10.3389 /fnhum.2012.00018

Moore, M. & Wade, B. (1998). Reading recovery: Its effectiveness in the long term. *Support for Learning, 13*(3), 123-128.

Napoli, M., Krech, P., & Holley, L. (2005). Mindfulness training for elementary school students: The Attention Academy. *Journal of Applied School Psychology*, *21*(1), 99-125. doi: 10.1300/J370v21n01_05

New Mexico Public Education Department. (2011). *Technical evaluation and assessment manual: Determining eligibility for IDEA Part B Special Education services.* Santa Fe, NM: Author.

New Mexico Public Education Department. (n.d.) *What is DIBELS?* Retrieved from http://ped.state.nm.us/ped/LiteracyEarlyChildhoodEd_K3plus_DIBELS.html

Nicolson, R. I, & Fawcett, A. J. (1990). Automaticity: A new framework for dyslexia research? *Cognition, 35,* 159-182.

Oka, E. R., & Paris, S. A. (1987). Patterns of motivation and reading skills in underachieving children. In S. J. Ceci (Ed.), *Handbook of cognitive, social, and neuropsychological aspects of learning disabilities* (pp. 115-145). Hillsdale, NJ: Erlbaum.

Ostafin, B. D., & Kassman, K. T. (2012). Stepping out of history: Mindfulness improves insight problem solving. Consciousness and Cognition, 21, 1031-1036. doi: 10.1016/j.concog.2012.02.014

Paris, S. G. & Winograd, P. (1990). How metacognition can promote academic learning and instruction. In B. F. Jones & L. Idol's (Eds.), *Dimensions of thinking and cognitive instruction (*pp. 15-52). Hillsdale, NJ: Lawrence Erlbaum Associates.

Patton, M. Q. (2002). *Qualitative research & evaluation methods* (3rd ed.) Thousand Oaks, CA: Sage.

Pearson, P. D. (2006). Foreword. In K. S. Goodman (Ed.), *The truth about DIBELS: What it is and what it does* (pp. v-xix). Portsmouth, NH: Heinemann.

Pennington, B., & Welsh, M. (1995). Neuropsychology and developmental psychopathology. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology, Vol. 1: Theory and methods* (pp. 254-290). New York, NY: Wiley.

Posner, M., Rothbart, M. K., Sheese, B. E., & Kieras, J. (2008). How arts training influences cognition. In C. Asbury and B. Rich (Eds.), *Learning, arts, and the brain: The Dana Consortium Report on arts and cognition* (1-10). Washington, D.C.: Dana Press.

Precuneus. (n.d.) In *Wikipedia*. Retrieved August 3, 2013, from http://en.wikipedia .org/wiki/Precuneus

Pressley, M. (2006). *Reading instruction that works: The case for balanced teaching.* New York: The Guilford Press.

Raskind, M. H., Goldberg, R. J., Higgins, E. L., & Herman, K. L. (1999). Patterns of change and predictors of success in individuals with learning disabilities: Results from a twenty-year longitudinal study. *Learning Disabilities Research and Practice 14,* 35-49.

Read Tennessee. (n.d.). *Emergent writing.* Retrieved from http://www.readtennessee .org/teachers/prek_reading/language_and_literacy/emergent_writing.aspx

Rousseau, J. (1762). *Emile, or, on education.* (B. Foxley, Trans.). Auckland, New Zealand: The Floating Press.

Sarason, I. G. (1978). Test Anxiety Scale: Concept and research. In C. D. Spielberger & I. G. Sarason (Eds.), *Stress and Anxiety, Vol.5.* Washington, DC: Hemisphere Publishing Corporation.

Sarason, I., Sarason, B., Keefe, D., Hayes, B., & Shearin, E. (1986). Cognitive interference: Situational determinants and traitlike characteristics. *Journal of Personality and Social Psychology, 51,* 215-226.

Seligman, M. E. P. (1975). *Helplessness: On depression, development, and death.* San Francisco: Freeman.

Shapiro, S. L., Carlson, L. E., Astin, J. A., & Freedman, B. (2006). Mechanisms of mindfulness. *Journal of Clinical Psychology, 62*(3), 373-386. doi: 10.1002/jclp

Shaywitz, S. E., Shaywitz, B. A., Pugh, K. R., Fulbright, R. K., Constable, R. T., Mend, W. E., . . . Gore, J. C. (1998). Functional disruption in the organization of the brain for reading in dyslexia. *Proceedings of the National Academy of Sciences, USA, 95,* 2636-51.

Schneps, M. H., Rose, L. T., & Fischer, K. W. (2007). Visual learning and the brain: Implications for dyslexia. *Mind, Brain, and Education, 1*(3), 128-139.

Schulte-Körne, G., Ludwig, K. U., el Sharkawy, J., Nöthen, M. M., Müller-Myhsok, B., & Hoffman, P. (2007). Genetics and neuroscience in dyslexia: Perspectives for education and remediation. *Mind, Brain, and Education, 1*(4), 162-172.

Schwartz, J. M. & Begley, S. (2002). *The mind and the brain.* New York, NY: HarperCollins.

Semple, R. J., Lee, J., Rosa, D., & Miller, L. F. (2010). A randomized trial of Mindfulness-Based Cognitive Therapy for Children: Promoting mindful attention to enhance social-emotional resiliency in children. *Journal of Child and Family Studies, 19,* 218-229. doi: 10.1007/s10826-009-9301-y

Semple, R. J., Reid, E. F. G., & Miller, L. (2005). Treating anxiety with mindfulness: An open trial of mindfulness training for anxious children. *Journal of Cognitive*

Psychotherapy: An International Quarterly, 19(4), 375-392. doi: 10.1891/jcop.2005.19.4.379

Shapiro, D. H. (1992). A preliminary study of long term meditators: Goals, effects, religious orientations, cognitions. *Journal of Transpersonal Psychology, 24*(1), 23-29.

Siegel, D. J. (2007). *The mindful brain.* New York, NY: W.W. Norton & Company.

Silverman, D. (2010). *Doing qualitative research* (3rd ed.). Log Angeles, CA: Sage.

Six Traits Writing Rubric. (n.d.) Retrieved January 4, 2014, from http://6traitsofwriting.org/wp-content/uploads/2013/06/6-Traits-Writing-Rubric.jpg

Smith-Spark, J. H. & Fisk, J. E. (2007). Working memory functioning in developmental dyslexia. *Memory, 15,* 34-56. doi: 10.1080/09658210601043384

Somerville, L. H., Jones, R. M., Ruberry, E. J., Dyke, J. P., Glover, G., & Casey, B. J. (2013). The medial prefrontal cortex and the emergence of self-conscious emotion in adolescence. *Psychological Science, 24*(8), 1554-1562. doi: 10.1177 /0956797613475633

Spear-Swerling, L. (2006, November). The use of context cues in reading. Retrieved from: http://www.ldonline.org/spearswerling/The_Use_of_Context_Cues_in _Reading

Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. (1970). *Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA. Consulting Psychologist Press.

State of New Mexico House Bill 230--49th Legislature, Second Session, 2010. An act relating to special education; requiring interventions for students displaying characteristics of dyslexia.

Sullivan, K. R. & Ebrahim, G. J. (1995). *Mother and child health research methods.* Book Aid.

Swanson, S. & Howell, C. (1996). Test anxiety in adolescents with learning disabilities and behavior disorders. *Exceptional Children, 62*(5), 389-397.

Tanaka, H., Black, J. M., Hulme, C., Stanley, L. M., Kesler, S. R., Whitfield-Gabrieli, S., . . . & Hoeft, F. (2011). The brain basis of the phonological deficit in dyslexia is independent of IQ. *Psychological Science, 22*(11), 1442-1451. doi: 10.1177 /0956797611419521

Tang, Y., & Posner, M. I. (2009). Attention training and attention state training. *Trends in Cognitive Sciences, 13*(5), 222-227. doi: 10.1016/j.tics.2009.01.009

Temple, E., Deutsch, G. K., Poldrack, R. A., Miller, S. L., Tallal, P., Merzenich, M. M., & Gabrieli, J. D. E. (2003). Neural deficits in children with dyslexia ameliorated by behavioral remediation: Evidence from functional fMRI. *Proceedings of the National Academy of Sciences of the United States of America 100* (5), 2860-2865. doi: 10.073/pnas.0030098100

Thompson, C. (2009). You're breathing all wrong. *Men's Journal.* Retrieved from http://www.mensjournal.com/magazine/you-re-breathing-all-wrong-20130227

Torgesen, J. K. (2006). Recent discoveries from research on remedial interventions for children with dyslexia. In M. Snowling and C. Hulme (Eds.), *The Science of Reading: A Handbook.* Oxford: Blackwell Publishers.

Tunmer, W. E., Chapman, J. W., Greaney, K. T., Prochnow, J. E., & Arrow, A. W. (2013). Reading Recovery and the failure of the New Zealand national literacy strategy. *Learning Difficulties Australia, 45*(3), 13-17.

Turkeltaub, P. E., Gareau, L., Flowers, D. L., Zeffiro, T. A., & Eden, G. F. (2003). Development of neural mechanisms for reading. *Nature Neuroscience, 6,* 767-73. doi: 10.1038/nn1065

Ullmann, R.K., Sleator, E.K., & Sprague, R.L. (1997). *ADD-II Comprehensive Teacher Rating Scale (ACTeRS),* Champaign, IL: MetriTech. Inc.

Varela, F.J. (1996). Neurophenomenology: A methodological remedy for the hard problem. *Journal of Consciousness Studies, 3*(4), 330-249.

von Károlyi, C., Winner, E., Gray, W., & Sherman, G.F. (2003). Dyslexia linked to talent: Global visual-spatial ability. *Brain and Language, 85*(3), 427-431.

Wah, L. L., Yeah, M. C., & Low, H. M. (2012). Lessons learned from piloting a treatment decoding program with a young Malay student with dyslexia. *The Asia-Pacific Education Researcher, 21*(2), 286-295.

Wenk-Sormaz, H. (2005). Meditation can reduce habitual responding. *Advances in mind-body medicine, 21*(3/4), 33-49.

Williams, E. L. & Casanova, M. F. (2010). Autism and dyslexia: A spectrum of cognitive styles as defined by minicolumnar morphometry. *Medical Hypotheses,* 74, 59-62. doi: 10.1016/j.mehy.2009.08.003

Williams, J. M. G. (2010). Mindfulness and psychological process. *Emotion, 10*(1), 1-7. doi: 10.1037/a0018360

Wine, J. D. (1971). Test anxiety and direction of attention. *Psychological Bulletin, 76,* 92-104.

Wodka, E. L., Mahone, E. M., Blankner, J. G., Larson, J. C. G., Fotedar, S., Denckla, M. B., & Mostofsky, S. H. (2007). Evidence that response inhibition is a primary deficit in ADHD. *Journal of Clinical and Experimental Neuropsychology, 29*(4), 345-356. doi: 10.1080/13803390600678046

Wolff, P. H., & Melngailis, I. (1996). Reversing letters and reading transformed text in dyslexia: A reassessment. *Reading and writing, 8*(4), 341-355. doi: 10.1007/BF00395113

Yin, R. K. (2009). *Case study research: Design and methods.* Los Angeles, CA: Sage.

Zylowska, L., Ackerman, D. L., Yang, M. H., Futrell, J. L., Horton, N. I., Hale, S., . . . Smalley, S. L. (2008). Mindfulness meditation training in adults and adolescents with ADHD: A feasibility study. *Journal of Attention Disorders*, *11*(6), 737-746. doi: 10.1177/1087054707308502