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DRAMATIC FAVORABLE RESPONSES OF CHILDREN WITH LEARNING DISABILITIES OR DYSLEXIA AND ATTENTION DEFICIT DISORDER TO ANTIMOTION SICKNESS MEDICATIONS: FOUR CASE REPORTS[1]

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Summary.—Responses of four learning disabled children who showed dramatic improvements to one or more antimotion-sickness-antihistamines and -stimulants are described qualitatively. These cases were selected from a prior quantitative study in which three antihistamines (meclizine, cyclizine, dimenhydrinate) and three stimulants (pemoline, methylphenidate, dextroamphetamine) were tested in variable combinations (using a specific clinical method) for favorable responses by 100 children characterized by diagnostic evidence of learning disabilities and cerebellar-vestibular dysfunctioning. Pending validation in double-blind controlled studies, these qualitative results suggest that the "cerebellar-vestibular (CV) stabilizing" antimotion-sickness medications, Piracetam included, and their combinations may be shown to be therapeutically useful in treating children with learning disabilities or dyslexia and attention deficit disorder.

Recently, Levinson (submitted) showed (1) that symptomatic improvements characterized a majority of 100 learning disabled children given any one of three antimotion-sickness antihistamines [meclizine (Antivert), cyclizine (Marezine), and dimenhydrinate (Dramamine)]; (2) that the antimotion-sickness stimulants [pemoline (Cylert), methylphenidate (Ritalin), and dextroamphetamine (Dexedrine)] triggered improvements in concentration and activity for a majority of those who were learning disabled with attention deficit disorder (ADD), as well as milder and less frequent improvements in the typical learning disability-related symptoms expressed in reading, writing, spelling, memory, speech, etc.; (3) that the above-mentioned antihistamines also improved ADD-related symptoms of concentration and activity, albeit significantly less than did the stimulants; and (4) that the frequency of improved learning disability-related general symptom-categories (i.e., reading, writing, spelling, mathematics, etc.) and the extent of improvement (proportion of dramatic vs mild and moderate responses) increased with the number of antimotion-sickness drugs and their combinations used. These findings are consistent with those indicating (1) that the stimulants used for ADD are potent antimotion-sickness medications (Wood & Graybiel, 1970; Wood, Cramer, & Graybiel, 1981; Kohl, Calkins, & Mandell, 1986; Lerer, Lerer, & Arner, 1977; Conners & Werry, 1979) and so may be considered "cerebel-

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lar-vestibular (CV) stabilizers" and (2) that Piracetam, the only drug independently shown to be effective in dyslexia, is an antivertigo agent which improves such CV-modulated symptoms as ocular pursuit and associated reading fluency and speed (Wilsher, Bennett, Chase, Connors, DiIanni, Feagans, Hanvik, Helfgott, Koplewica, Overby, Reader, Rudel, & Tallal, 1987; Lenzi & Milanesi, 1969; Boniver, 1974; Oosterveld, 1980; Fernandes & Samuel, 1985; Levinson, 1989a).

Four qualitative descriptions (anecdotal self-reports based on parents' and patients' observations), presented in this paper, illustrate the intensity and spectrum of possible learning-disability-related symptomatic responses to six antimotion-sickness medications used in various doses and combinations for therapeutic purposes. These case descriptions are intended to depict (1) the specific clinical methodology previously used to test these drugs (Levinson, submitted), (2) the patterns of symptomatic improvement, as triggered by specific drugs and doses and as spontaneously observed by parents or reported to them by their children, (3) the manner by which these favorable responses provide insight into the many and varied symptoms and determining mechanisms which characterize learning disabilities or dyslexia and attention deficit disorder, and (4) the observations used to develop diagnostic and therapeutic response questionnaires for dyslexia or learning disabilities.[2,3]

Method

Subjects and Diagnosis

Four learning disabled children who responded dramatically to treatment are described: two boys (aged 12 and 9½ years) and two girls (aged 8 and 8½ years). They were selected from a sample of 100 whose age, sex, socioeconomic, and diagnostic cerebellar-vestibular (CV) and learning-disability-related characteristics have been described (Levinson, submitted).

Procedure

To test the efficacy of a group of antimotion-sickness medications in improving dyslexic-related symptoms, 100 learning disabled children were treated with diverse combinations and doses of three antimotion-sickness antihistamines (meclizine, cyclizine, dimenhydrinate) and three antimotion-sickness stimulants (pemoline, methylphenidate, dextroamphetamine). Clinical responses were recorded using a questionnaire for reporting favorable responses as well as the anecdotal self-reports of parents and their treated chil-

[2]The Historical or Symptom Questionnaire is on file in Document NAPS-04640. Remit $12.25 for photocopy or $4.00 for fiche to Microfiche Publications, POB 3513, Grand Central Station, New York, NY 10163.

[3]This Therapeutic Response Questionnaire to the CV stabilizing medications in dyslexia or learning disabilities is on file in Document NAPS-04897. Remit $11.05 for photocopy or $4.00 for fiche to Microfiche Publications, POB 3513, Grand Central Station, New York, NY 10163.

dren.[3] Favorable responses were counted only when they unequivocally appeared, disappeared, and reappeared after medications were started, stopped, and restarted, respectively. Also, favorable responders were subjectively classified into mild, moderate, and dramatic. The *verbatim statements* of treated children and critical observers were also used to describe qualitatively and score effects of treatment with the antimotion-sickness medications, including their function- and dose-specific nature, periods required for favorable responses to occur after medications were started and of regression when medications were stopped, side-effects, etc.

To organize the treatment protocol as much as possible in a clinical setting, the antimotion-sickness antihistamines and stimulants were most often but not invariably used in the above mentioned orders. Specifically, meclizine [(¼ to 1) 25-mg tablet 2 ×/day] was tested first on all children. Then cyclizine [(¼ to 1) 50-mg tablet 2 ×/day] was added for those children showing favorable responses to meclizine or used alone for those who did not improve on meclizine. Dimenhydrinate [(¼ to 1) 50-mg tablet 2 ×/day] was given only to children who did not respond to either meclizine or cyclizine.

When impaired concentration, distractibility, and activity levels of an ADD-like quality also characterized the subjects' symptomatic profile, then one of three alerting medications useful in ADD, pemoline [(¼ to 1) 37.5-mg tablet AM], methylphenidate [(¼ to 1) 5-mg tablet 2 or 3 ×/day], or dextroamphetamine [(¼ to 1) 5-mg tablet 2 or 3 ×/day], was added to the antihistamine(s). Exceptions aside, these medications were also tested in the above order and doses to maximize therapeutic benefits (which have been previously reported when these medications are combined) while minimizing the risk of side effects.

Because prior studies had clearly shown that therapeutic doses as well as those giving side effects were highly specific for these learning-disabled subjects, each antimotion-sickness medication used was started at one-fourth of the usual or minimal dosage recommended for vertigo, motion sickness, ADD, or ADD-H. Then, the dosage was slowly increased until either a side effect or an improvement in symptoms was observed. Using this protocol, a series of medications, doses, and combinations were evaluated for efficacy while the children were given the best chance of maximizing their favorable responses in the shortest possible time.

Results

Based on prior psychoeducational testing, all four treated children had normal or higher IQs and were severely deficient in such functions as reading, writing, spelling, and mathematics. Table 1 summarizes these findings quantitatively and qualitatively. Also, the specific dyslexic-related symptoms characterizing each subject and sample are improved by the children's favorable responses to the medications. In Table 2 is a list of the various med-

TABLE 1
WRAT—R AND WISC—R SCORES FOR FOUR LEARNING DISABLED CHILDREN

Measures	Case I (Michael)	Case II (Tim)	Case III (Shelly)	Case IV (Meredith)
Age, yr.	12	9.5	8	8.5
Grade	6	4	2	3
WISC—R IQs				
Full Scale	103	109	115	115
Verbal Scale	98	108	114	109
Performance Scale	109	109	112	118
WRAT—R Grade-equivalent Scores				
Reading	4-E	2-M	1-M	2-M
Spelling	3-E	2-B	1-M	2-B
Mathematics	4-B	3-B	1-E	1-E
Writing Quality, Rating	Poor	Poor	Poor	Normal

Note.—Grade equivalent scores were independently obtained on Wide Range Achievement Test—Revised (WRAT—R) subtests for reading, spelling, and mathematics at the Beginning, Mid, or End of the school year and IQs on the Wechsler Intelligence Scale for Children—Revised were also from independent prior assessment. Writing is qualitatively described.

TABLE 2
NAMES OF MEDICATIONS AND DOSES WHICH TRIGGERED FAVORABLE, NEGATIVE, AND ABSENT RESPONSES IN FOUR CHILDREN

Medication	Case I (Michael)	Case II (Tim)	Case III (Shelly)	Case IV (Meredith)
Meclizine	25 mg (2x/day)	25 mg (2x/day)	Negative*	½ (25 g) 2x/day
Cyclizine	½ (50-mg) 2x/day	Negative	NC*	NC
Dimenhydrinate	*	Negative	½ (50 mg) 2x/day	Negative
Pemoline	Negative	¼ (37.5 mg) AM	—	—
Methylphenidate	Negative	Negative	—	(5 mg) 2x/day
Dextroampheta-mine	—	—	—	—

*When favorable responses occurred, the dose is included. Negative indicates side effects. NC denotes absent responses without side effects. — indicates medications were never tried.

ications and their respective doses found most beneficial in the four cases presented below.

Case I

Michael is a 12-year-old learning disabled youngster who responded as follows to a trial on the "CV-stabilizing" medication. In his mother's words:

"Michael first noticed some improvement when he was on meclizine (½ tablet AM and 3PM). But he really showed changes only after full doses. Two weeks after starting the meclizine at full doses (25 mg 2 x/day), Michael spontaneously told me: 'Before the medicine, the words kept running off the page. When younger I even tried to push them back on. They also

used to get blurry and dance around. Letters and words would twist and turn. *b* looked like *d* and *was* like *saw*. And I could only see one letter at a time in a word. The others would either be blurry or move. Now all these things are better. And I don't seem to be losing my place as much when I read. Before, I'd need my finger or a marker to know where I was. And sometimes my finger would make things even worse. Because, instead of looking at the letters and the words, I would keep looking at my finger. Now all of it is better.'

His mother noted: "Before treatment, Michael's writing was illegible. And so he avoided drawing. Now he spaces well and stays on the lines when writing. But he still confuses *b* and *d* at times when printing. His drawing has also dramatically improved in both quality and detail. For example, he'll now even draw threads on clothing. In this regard, he has become a perfectionist.

"His memory is much better for what he reads, even for names of people he knows, i.e., friends and teachers. But his spelling has not significantly changed. He now sets and remembers to complete his own goals. Not only is he better organized, but his room reflects it as well. Things are not thrown all over the place, a scrambled mess. As a result of all these changes, he has developed an infinitely more positive attitude about himself. In fact, the best part of all this improvement is that he no longer calls himself 'stupid.'

"When he stops the meclizine on weekends, his writing starts to get worse again—just like before. And he claims that all his reading symptoms return. For example, he'll begin to complain that the words are getting fuzzy and blurry and dancing around. Reversals reoccur. And he starts using his finger more and squinting. When we restart the medication on Monday morning, it takes him until Tuesday or Wednesday for his improvement to really come back to where it was. For this reason, we began giving him his medication on Sunday.

"The starting and stopping of his medication has not only made it clear to us what his improvements are but to him as well. One Monday he told us: 'You know, Mom, my eyes are getting glued to the letters and words again—like they used to.' We never even knew he had this symptom. And, we wonder if he even knew he had any of these symptoms until they improved. On the medication he says his eyes just 'flow' along from letter to letter and word to word and that he doesn't have to blink to read them. I never knew why he was blinking before. And neither did he. In retrospect, blinking enabled him to disconnect or unglue his eyes from the letters and words he was looking at. He also said it made things clearer. I think he put it best when he said, 'My eyes used to stutter.'

"When we put Michael on the Marezine, he noticed his headaches and dizziness lessened. I never knew he even had headaches or was dizzy. His carsickness had improved on the meclizine. But on the Marezine, it seemed

to disappear altogether. Also his fears of heights and loud noises have all but vanished.[4]

"Again, when he stops Marezine, he says his headaches get a little worse and he occasionally gets dizzy, off-balance, and starts to get anxious about heights and noises again. After several weeks on the Marezine, his memory for math seemed to improve. Suddenly he knew the multiplication tables and was able to divide without making errors.

"Before, it took hours and hours to drill in the multiplication facts. And then he seemed to lose them all rapidly. Now he says he just knows the facts and can use them as naturally as he seems to be able to read and write. We were never able to get the Marezine beyond ½ tablet 2 ×/day. Larger doses made him feel worse.

"Although Michael never had a severe concentration problem, he would become frustrated very easily. It was hard for him to concentrate on his reading and academics for any length of time. Since starting meclizine, we note that his concentration is much better and he doesn't get as distracted as much as he did before. The Marezine didn't seem to make any difference in this respect. He's the same on and off.

"He still complains about teachers with loud voices. But I don't think that's related to his fear of noises anymore. That's simply because teachers who don't understand tend to yell. And so did I. Observing his improvements on the medicine and then seeing him regress off the medicine has made me understand and feel for Michael in a way I could never do before. I just couldn't understand why a bright boy should do so poorly. I had felt he just wasn't trying hard enough and that he was just rebelling. And I think his teachers felt the same way.

"You asked us to try Cylert. We tried ¼ (37.5 mg) tablet in the morning first. He started to get very irritable and moody. So we discontinued it as you advised. We then tried Ritalin next. Even ¼ (5 mg) tablet made things blurry for him. And ½ tablet 2 ×/day made him tired and his symptoms worse. So we didn't try anything else. And besides, Michael was doing so well, we didn't want to gamble."

Case II

Tim is a 9½-year-old youngster whose mother wrote as follows:

"We couldn't give Timmy all the medications we tried. He tolerated the meclizine very well up to 1 tablet (25 mg) twice a day. But anything more than 1/16 on the Marezine made him nauseous and dizzy and gave him headaches. Even an ⅛ of Dramamine (50 mg) made him tired. Both medications

[4]The initially unanticipated favorable response of fears/phobias and anxiety or panic to the CV-stabilizing medications first suggested the presence of a CV-determined basis to these symptoms (Frank & Levinson, 1977; Levinson, 1986, 1989b, 1989c, 1989d).

seemed to make his reading, writing, and concentration symptoms worse. So we discontinued them.

"After 6 weeks on full doses of meclizine we noticed a remarkable improvement. He shows more interest in reading on his own. He doesn't use his finger to follow along nearly as much as he did before. And, he seems to be able to focus more readily without squinting, blinking, rubbing his eyes, or looking the other way as if distracted by everything and anything. His reading speed has improved tremendously also. In fact, he used to read very slowly before so he would not lose his place. But by the time he reached the end of the sentence, he couldn't remember the beginning. Now he can remember what he reads more easily.

"He also seems to be able to sound-out words he couldn't before. Maybe that's why his spelling is so much better. He even writes longer and bigger words. I think it's because he can not only write better, but he can spell words he couldn't before. Obviously, rather than embarrass himself, he used to write small-worded sentences. And, his reports were never more than a short paragraph. Then he'd ask me to count the words for him to see if that was sufficient to get away with. Now he writes several-page reports on his own.

"Numbers don't seem to give him as much trouble as before. It's easier for him to calculate and even to write the numbers in straighter columns than before. In fact, he's even stopped guessing at answers. Unfortunately, he still has difficulty with subtraction. But, we are tackling one thing at a time.

"Tim's verbal ability has shown a surprising improvement. Although there is still some slurring, there is much less. He seems to use bigger words to express himself. His verbal flow seems smoother and easier without hesitation and periodic stuttering. And he seems to grasp what we are saying to him and process it much faster and more naturally. In fact, I now understand better why he used to say 'what?' all the time. He needed extra time to process what we were saying. I used to get annoyed at him because I found myself repeating things over and over again until it finally sunk in or I'd give up in frustration. I'm embarrassed to say it, but I used to take this symptom personally—as if he didn't care enough to listen to me. Now he also doesn't seem to hesitate in finding words and thoughts to say. In other words, he's verbally swifter or faster on the intake and output. In fact, one day he spontaneously told me, 'Mom, the words you say seem clearer and slower.' I then realized that before he must have heard the words too fast to understand them.

"His memory for many things seems much better. For example, he can now remember the days of the week and the months of the year in sequence. And now, he usually knows what day of the week it is and what

time it is without looking at his digital watch. Before it seemed he was lost in his own fog. And, he'd forever ask what time it was. For the first time ever, I'm able to give Timmy a task in school work, and he has done some if not all of it on his own with little supervision. This is a big improvement when compared to the way things were before.

"In terms of directionality, Tim seems more confident about left and right in relation to his own body. However, he still has uncertainty about these directions in his everyday functions.

"Tim's balance and coordination both improved tremendously. He's hitting the ball so much better in baseball. He claims to be able to see the ball coming faster and clearer and then better coordinate his swing with the ball. Before treatment, he couldn't do more than one thing at a time. He'd have to concentrate on the moving ball with such intensity that he couldn't swing. In fact, my husband has now jokingly threatened to move the dimensions of the field! In the past two months, Tim has become involved in ice skating and bowling lessons. The fact that he felt confident enough to participate with other children is a big step forward. Despite poor initial attempts, he came back and tried again and again, thoroughly enjoying himself. Even Tim finally recognized the importance of what he had done—telling everyone, 'I made it all the way around the rink!' Before he would have become frustrated and given up easily. And, he seems to be able to bowl straighter and keep track of the score.

"While all this seems so wonderful (and it is!), let me mention that on some occasions we still see his unsteadiness and vertigo that we were all too familiar with prior to going on the meclizine. But his headaches after school are gone.

"We were not able to get beyond ¼ tablet of Cylert each morning without side effects. On ¼ tablet, he seems to be able to concentrate better on his various tasks. And, it seems to have helped his concentration when playing ball and when ice skating. I think it has also helped his balance and coordination somewhat. Even when writing. When we stop the Cylert, he still does well in these tasks. But the Cylert helps even more. For example, before a game, he will ask for both medications, not just one. On the Cylert, his mood seems to become even better than it was before. When it got much better on Cylert, I realized that he was even less moody than previously on the meclizine. With both medications together, he is much more self-assertive than on any one alone. When we tested out Ritalin in place of Cylert, Timmy became more moody, irritable, and hyper—even on ¼ (5 mg) tablet 2 or 3 ×/day. So we went back to the Cylert. By the way, anything more than ½ a (37.5 mg) tablet of Cylert made it difficult for Tim to fall asleep at night. And I think it may have been responsible for his nightmares. Both these symptoms disappeared when we cut back the dose.

"Tim has recently discovered the power of speech. For example, we've had battles over his name-calling, especially with his older brother. Even though these situations have been far from pleasant, I guess you might say that even this is an improvement. In the past, he would have come to one of us (his parents) for protection from whomever was insulting him. Now, he strikes back on his own, using insults that are particularly appropriate but deadly to the individual he is responding to. Before, he seemed to lack either the confidence, the words, or the flow to express his anger and frustration at others. I never thought we would have to worry about this problem. If he can only now contend with the simple concept of courtesy!

"Tim also shows definite signs of an improved self-image. He doesn't give up automatically. And his frustration level shows a remarkable improvement in many different areas: academic, social, sports. I believe the Cylert has helped although he was already sticking it out with sports and reading and other academic subjects while taking the meclizine.

"It's very difficult to get him to cooperate with your request to stop medications, especially if he's involved in sports. In the beginning, both Tim and I were hesitant to begin the medications. It was something new and we were afraid of it. We had read so many negative things about drugs. Now, the opposite appears to have taken hold. I hesitate to think what it would have been like without the help we received."

Case III

Shelly is a delightful 8-year-old, learning disabled girl. Her mother's observations follow:

"Shelly did not respond at all to doses of ½ (25 mg) tablet of meclizine 2 ×/day or Marezine (50 mg) 2 ×/day. And full doses of (25 mg) meclizine made her symptoms worse. We were becoming discouraged. However, Shelly's improvement on the Dramamine was immediate and very obvious. Within days and certainly by the end of the first week, and while on only ½ a (50 mg) tablet, her handwriting had improved tremendously as well as her ability to line up numbers when doing math problems. She also reported that she was finishing her work in school and didn't have much to do after coming home. Needless to say, this made her feel infinitely more confident than before. Increasing the dose to 1 (50 mg) Dramamine AM and 3 PM didn't seem to have any added benefit. In fact, she started to complain of headaches, dizziness, and even blurred vision. So we decreased the dose to ½ tablet 2 ×/day. At this dose, she was fine. Great!

"In the last month, her reading has dramatically improved as well. I think this took longer for us to recognize and for her to talk about. She can read orally now without stumbling and stuttering and losing her place as before. Also, she doesn't panic to read before her peers.[4] She rarely reverses and skips as she did before. Mistakes are rare. Her tutor feels her attention span is much more focused and that she is calmer and less easily distracted

than before. In retrospect, I think she had to feel better before acknowledging how bad she had previously felt. Reluctantly, she admitted having always felt stupid, especially when all the other students kept reinforcing these feelings by criticizing her ability to read and write.

"She's doing much, much better in remembering her homework assignments. She now tends to write them all down, makes sure she completes them at home, and doesn't forget to bring them back to school on time. Before, each of these steps used to be a major problem. Now it is all done automatically, naturally. While she is still not perfect at these things, the improvement is fantastic! Most significantly, this child who would never try to write anything other than the bare minimum required is now writing long (several pages) stories when assigned. But her spelling seems no better. However, she writes out her thoughts anyway—with a renewed confidence.

"Shelly's understanding of numerical relationships also improved. She has actually passed all tests on the times tables without too many errors on each. It was a lot of hard work. But she never responded this way to our tutoring before. She is extremely proud of her achievements! As a result, she is clearly feeling *much* better about herself. And she is having far fewer tantrums than before over her inability to perform academically.

"Also, Shelly suddenly began to tell time. Before medication she even had difficulty with a digital [watch], reversing the numbers. Now she can use a regular watch, although not yet perfectly.

"She says she feels steadier inside herself. I think that is why she is not bumping into things as much and falling less. In fact, I can see it when we walk down the street together. Before, she used to keep bumping into me and stepping on my toes.

"Upon initially stopping the medication on weekends and holidays as you advised, all these improvements rapidly disappeared. In fact, we began to take her progress for granted as if she'd always been this way. All her improvements returned within hours to one day after restarting the Dramamine. She now takes the medicine on a continuous basis. Sometimes we try lowering the dose to ¼ twice a day. But it doesn't seem to work as well.

"Over-all, we are just thrilled at the positive changes we have seen in Shelly over this short period of time. Although I feel there is still room for far more improvement, she is now functioning well enough to get through with school.

"My husband was dead-set against me even trying these medications. But we were desperate. Although I'm tempted to try another one, my husband refuses. He wants to leave well enough alone. And I can't blame him."

Case IV

Meredith is an 8½-year-old dyslexic girl. According to her mother, she responded to the medications as follows:

"Meredith began showing a positive response to meclizine on the sixth day after evaluation. She was able *for the first time in her life* to count money. While driving towards home down the New Jersey Turnpike, we played a game. Meredith counted out various amounts of money: 17 cents, 32 cents, 59 cents, etc. Meredith made *no mistakes at all.* This was particularly gratifying. Just the week before she had been unable to count out 15 cents to make a purchase from her allowance.

"Almost from the start, her sleeping improved. She fell asleep naturally, and the nightmares she always had just about stopped.[4] Also her sense of direction is better. She doesn't get as disoriented. And she is no longer afraid of getting lost.[4] Also knowing right and left seems more natural.

"After two weeks on the meclizine, we decided to drill Meredith on the multiplication tables again. Prior to beginning medication, Meredith had been unable to remember these facts longer than a very few minutes. After only a small amount of review, Meredith is now able to retain the multiplication facts. Upon stopping the medication, all or most of these improvements disappeared within a few days. Fortunately, they all came back within a day or two. Marezine made no apparent difference even when taking 2 tablets 2 × /day. So we discontinued it. Dramamine made her tired at ¼ tablet twice a day. So we quickly stopped that too.

"Meredith's reading skills and concentration improved significantly after she began Ritalin. Indeed, she had her first doses on a Saturday [two ¼ (5 mg) tablet doses], had another dose on Sunday morning, and an hour later was reading from the Prayer Book in church for *the first time ever*!!! Meredith is now taking a whole Ritalin (5 mg) tablet twice daily (AM and 3 PM). Meredith's spelling is still terrible and her mornings at school are much stronger than her afternoons. In examining a set of papers sent home from school it is very easy to tell which ones were done in the morning—perfect or near perfect papers. Her afternoon papers are full of mistakes.

"As you suggested, we discontinued the Ritalin the following weekend and noted a sharp decrease in her reading and mathematics. And, her concentration span also decreased to where it was before medication. When on the Ritalin and off the meclizine, we noted her concentration remained great but her reading and mathematics went down, but not as bad as before we started the medication. Because the dose of Ritalin wore off by noon and we were told by our family doctor to use a larger dose than you advised, we tried. We were shocked. Everything got worse, not better. It was almost as if she were off the medications when on the 20 mg Sustained-release Ritalin capsule. Now we just give her 1 (5 mg) Ritalin tablet AM, noon, and 3 PM." [Cylert was skipped-over because Meredith's parents feared possible liver dysfunction as a side-effect. Also, Meredith was dreadfully fearful of needles and so also of the blood tests needed periodically to measure liver function while on Cylert.]

Discussion

The dramatic responders described above represented a highly selected minority of the sample of 100 learning disabled children in the testing of medications. These four cases were presented to show the potential for medication-triggered responses, especially when eventually combined with other appropriate and function-specific treatment, i.e., tutoring, sensorimotor, oculomotor, and perceptual-motor integration exercises, colored lenses, etc. Moderate and mild responders showed qualitative responses similar to those of dramatic responders, just fewer or less intense, and so less noticeable by parents and teachers alike. The importance of questioning children skillfully about *all* experiences, observable or measurable responses as well as those hidden, became apparent.

By recording *all* the observed and reported therapeutic responses of several thousand treated subjects involved in prior multiple clinical trials (Frank & Levinson, 1976-77, 1977; Levinson, 1980, 1984, submitted, 1991a), better understanding was obtained of the varied symptoms and underlying dysfunctioning vs compensatory overly determined mechanisms which characterize this truly complex and multidimensional disorder. One outcome of the analysis of these medication-triggered symptomatic responses was the development of *historical or symptomatic diagnostic and therapeutic response questionnaires* which were completed by all new patients to assess relevant symptoms and during treatment to evaluate for possible associated changes.[2,3] To facilitate updating with new observations, space was always left for additional reports of changes and new symptoms. Use of this open-ended procedure led to clinical documentation of a relationship between fears/phobias, ADD and dyslexia or learning disabilities and CV-dysfunctioning (Levinson, 1986, 1989c, 1989d, 1991b, submitted).

In retrospect, these qualitative observations of symptoms appeared to be more reliable and informative than quantitative data from numerous scores on tests of reading, writing, spelling, mathematics, and memory. This recognition was consistent with Sir William Osler's almost 90-year-old maxim that history is 90% of diagnosis (and insight)—if only we know what questions to ask (North, 1974). Also, the favorable reading and speech responses to the "CV-stabilizing" medications such as those presented here and elsewhere (Helfgott, Rudel, & Kairam, 1986; Levinson, 1988), as well as their apparent relation to CV-based diagnostic signs, eventually led to the observations that the many and varied reading and speech symptoms which characterize dyslexia or learning disabilities are CV-determined or related and that the underlying disorder which triggers these symptoms is primarily cerebellar-vestibular in nature rather than of dominant cerebral linguistic origin as traditionally thought (Levinson, 1988, 1989a, 1990). These clinically derived considerations (1) were remarkably consistent with the anatomically based

conceptualizations of Leiner, Leiner, and Dow (1986, in press) which indicate a relationship between cerebellar modulation and higher mental, emotional, memory, language, as well as motor functioning and (2) emphasized the inherent fallacy in defining the multisymptomatic and over-determined dyslexic disorder by noting *only* severe degrees of *just* one of its many and highly variable symptoms, i.e., reading scores ($\geq$ 2 years below peers or potential).

Considering all the variables which characterize the treatment of learning disabilities with the antimotion-sickness medications, open-ended exploratory clinical trials such as those presented here appeared to be a logical initial approach, given the limited, rigidly defined, but objective parameters measured in many double-blind studies. Although such studies have justifiably become the *sine qua non* in efforts to minimize biased observations and placebo effects and objectively to evaluate drug responses, this methodology as usually performed is often inappropriate and may be impossible to conduct within a clinical setting unless the crucial effects of the specific drugs, doses, and the response patterns are known.

Indeed, prematurely performed studies, even if double-blind, may unwittingly and "iatrogenically" introduce errors. For example, favorable responses may often be significantly masked by the practical need to examine and test only one drug, one dose, and only one or two general treatment response-scores at a time (i.e., reading and writing scores or spelling and mathematics scores, etc.) without taking into account the multiple subsymptoms and mechanisms (dysfunctional vs compensatory) inferred as determining these scores. Moreover, mild and some moderate favorable change in symptoms experienced by subjects when clinically elicited may not appear in some testing or may require relatively long periods (6 months to 1 year) for measurable effects to be observed. Underlying drug-induced improvements in CV- and related learning disability-triggered mechanisms may frequently be neutralized or masked by secondarily over-determined and overlapping negative emotional and other nonCV vectors (Ferenczi, 1954). Also, relatively "high" doses or an inappropriate choice of medication due to "sensitivity responses" such as those illustrated here may even trigger negative or regressive effects. Secondary drug failures as well as drug-induced compensation for symptoms may occur spontaneously over time and may even be confused with either placebo or maturational effects. Failure to show or record significant improvements in any study, especially when using small samples to test only a few of many possible functions and symptoms, may mistakenly lead to the conclusion that there is no response to a treatment rather than the alternative suggestion, i.e., that the study's design and testing methods may be inadequate to show changes or changes obtainable by use of other related medications, their combinations, and doses.

In recent papers (Levinson, 1991a, submitted), this author reviewed a

study by Fagan, Kaplan, Raymond, and Edington (1988) which appeared to be characterized by most of the above pitfalls. For example, *only* six subjects were tested *just* for improvements in reading for a maximum of *only* 3 months with *one* dose of *one* medication shown to be toxic for some of the treated children. Paradoxically, these researchers erroneously concluded that antimotion-sickness medication was ineffective in the treatment of dyslexia, (1) despite their findings of improved ocular fixation and reading speeds in the treated subjects and (2) despite their confirmation in other published data on this same sample indicating that dyslexics are characterized by an impairment in CV-determined ocular fixation (Raymond, Ogden, Fagan, & Kaplan, 1988; Levinson, 1980, 1989a).

In light of the unique, variable, and complex therapeutic responses of learning disabled children to the specific antimotion-sickness or "CV-stabilizing" medications and doses, plus the need for continuing either medication or placebo for significant but unknown periods before sufficient change is reflected on paper-and-pencil tests (assuming these tests and testers are sufficiently reliable and sensitive to indicate all the possible mild, moderate, and dramatic changes), it appeared that the only scientific approach which currently seemed feasible, expedient, and humane was a clinically based double-blind, within-subject cross-over study. For example, once reliable and repetitive favorable response patterns and improvement-times to specific drugs and doses are clearly established (verified by the loss of these responses with cessation of medications), then these children can be repetitively given either an active drug or placebo under double-blind conditions at, say, 2- to 3-week intervals. A positive association of favorable responses with active drug intake and regression with placebos would support further the efficacy of these medications in the treatment of learning disabilities or dyslexia. Most importantly, subjects who report significant benefits from particular medications would not be deprived of these for any significant periods, i.e., six months to one year per drug per dose per subject on each parameter tested..

In summary, it is anticipated that the present descriptions of the unique and varied favorable responses of dyslexic children to specific antimotion-sickness drugs and doses (as well as their combinations) can be used to implement corroborating double-blind studies and a medical treatment appropriate for helping children with this disorder.

REFERENCES

BONIVER, R. Influence du Piracetam sur le fonctionnement du systeme vestibulaire. *Acta Oto-Rhino-Laryngologica Belgica*, 1974, 28, 293-299.

CONNERS, C. K., & WERRY, J. S. Pharmacotherapy. In H. C. Quay & J. S. Werry (Eds.), *Psychopathological disorders of childhood*. New York: Wiley, 1979. Pp. 336-386.

FAGAN, J., KAPLAN, B., RAYMOND, J., & EDINGTON, E. S. The failure of antimotion sickness medication to improve reading in developmental dyslexia: results of a randomized trial. *Journal of Developmental and Behavioral Pediatrics*, 1988, 96, 359-366.

FERENCZI, S. Disease or pathoneurosis. In J. Richman (Ed.), *Further contributions to the theory and technique of psychoanalysis*. New York: Basic Books, 1954.

FERNANDES, C. M., & SAMUEL, J. The use of Piracetam in vertigo. *South African Medical Journal*, 1985, 68, 806-808.

FRANK, J., & LEVINSON, H. N. Seasickness mechanisms and medications in dysmetric dyslexia and dyspraxia. *Academic Therapy*, 1976-1977, 12, 133-149.

FRANK, J., & LEVINSON, H. N. Antimotion sickness medications in dysmetric dyslexia and dyspraxia. *Academic Therapy*, 1977, 12, 411-425.

HELFGOTT, E., RUDEL, R. G., & KAIRAM, R. The effect of Piracetam on short- and long-term verbal retrieval in dyslexic boys. *International Journal of Psychophysiology*, 1986, 4, 53-61.

KOHL, R. L., CALKINS, D. S., & MANDELL, A. J. Arousal and stability: the effects of five new sympathomimetic drugs suggest a new principle for the prevention of space motion sickness. *Aviation, Space, and Environmental Medicine*, 1986, 57, 137-143.

LEINER, H. C., LEINER, A., & DOW, R. S. Does the cerebellum contribute to mental skills? *Behavioral Neuroscience*, 1986, 100, 443-454.

LEINER, H. C., LEINER, A., & DOW, R. S. The human cerebro-cerebellar-system: its computing, cognitive, and language skills. *Behavioral Brain Research*, in press.

LENZI, P., & MILANESI, I. Etude clinique d'un nouvel antivertigineux: la 2-pyrrolidone acetamide. *Clinica Otorinolaringologa dell'Universita de Milano*, 1969, 24, 513-521.

LERER, R. J., LERER, M. P., & ARNER, J. The effects of methylphenidate on the handwriting of children with minimal brain dysfunction. *Journal of Pediatrics*, 1977, 91, 127-132.

LEVINSON, H. N. *A solution to the riddle dyslexia*. New York: Springer-Verlag, 1980.

LEVINSON, H. N. *Smart but feeling dumb*. New York: Warner, 1984.

LEVINSON, H. N. *Phobia free*. New York: Evans, 1986.

LEVINSON, H. N. The cerebellar-vestibular basis of learning disabilities in children, adolescents and adults: hypothesis and study. *Perceptual and Motor Skills*, 1988, 67, 983-1006.

LEVINSON, H. N. Abnormal optokinetic and perceptual span parameters in cerebellar-vestibular dysfunction and learning disabilities or dyslexia. *Perceptual and Motor Skills*, 1989, 68, 35-54. (a)

LEVINSON, H. N. Abnormal optokinetic and perceptual span parameters in cerebellar-vestibular dysfunction and related anxiety disorders. *Perceptual and Motor Skills*, 1989, 68, 471-484. (b)

LEVINSON, H. N. A cerebellar-vestibular explanation for fears/phobias. *Perceptual and Motor Skills*, 1989, 68, 67-84. (c)

LEVINSON, H. N. The cerebellar-vestibular predisposition to anxiety disorders. *Perceptual and Motor Skills*, 1989, 68, 323-338. (d)

LEVINSON, H. N. The diagnostic value of cerebellar-vestibular tests in detecting learning disabilities, dyslexia, and attention deficit disorder. *Perceptual and Motor Skills*, 1990, 71, 67-82.

LEVINSON, H. N. The use and efficacy of the antimotion sickness medications in the treatment of learning disabilities or dyslexia and attention deficit disorder. (Submitted for publication)

LEVINSON, H. N. Rapid meclizine-induced reversal of cerebellar-vestibular dysfunction in adults with learning disabilities or dyslexia. Paper presented at the 144th annual meeting of the American Psychiatric Association, New Orleans, May, 1991. (a)

LEVINSON, H. N. *Total concentration*. New York: Evans, 1991. (b)

NORTH, A. F. Screening in child health care: where are we now and where are we going? *Pediatrics*, 1974, 54, 631-640.

OOSTERVELD, W. J. The efficacy of piracetam in vertigo. *Arzneimedizinische-Forschung*, 1980, 30, 1947-1949.

RAYMOND, J. E., OGDEN, N. A., FAGAN, J. E, & KAPLAN, B. J. Fixational instability and saccadic eye movements. *American Journal of Optometry and Physiological Optics*, 1988, 65, 174-181.

WILSHER, C. R., BENNETT, D., CHASE, C., CONNORS, K., DIIANNI, M., FEAGANS, L., HANVIK, L. J., HELFGOTT, E., KOPLEWICA, H., OVERBY, P., READER, M. J., RUDEL, R. G., & TALLAL, P. Piracetam and dyslexia: effects on reading tests. *Journal of Clinical Psychopharmacology*, 1987, 7, 230-235.

Wood, C. D., Cramer, B., & Graybiel, A. Anti-motion sickness drug efficacy. *Otolaryngology, Head and Neck Surgery*, 1988, 89, 1041-1044.

Wood, C. D., & Graybiel, A. A theory of motion sickness based on pharmacological reactions. *Clinical Pharmacology and Therapeutics*, 1970, 11, 621-624.

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