Scientifically accepted motor skill accuracy tests, procedures, expert observers and video recording equipment were utilized whenever possible.

Each session was kept to under forty minutes to keep the ATTS CAMS training 'fun'. Theoretically, synaptic improvements are imprinted on the trainee's kinesthetic motor memory during their REM sleep following ATTS training, therefore, sessions were kept to a maximum of one per day. (How many days apart the sessions are doesn't seem to matter.) With only a few exceptions, it took the trainees from 5 to 12 sessions to complete their ATTS training.

THE TYPICAL ATTS TRAINING SEQUENCE

A trainee's first session starts with a quick demonstration to show her how much fun it is. Then she is given the ten minute test battery to determine the numeric timing accuracy of each of her limbs and to get her familiar with the ATTS's changing sounds. The test battery includes: 1) both hands clapping together, 2) left hand, 3) right hand, 4) both toes alternately tapping on a floor trigger, 5) right toe, 6) left toe, 7) both heels alternately tapping on a floor trigger, 8) right heel, and 8) the left heel.

For the remainder of the first session the trainee is helped to deliberately force herself to tap way before and after the beat. This helps her to clearly hear her tap moving back and forth from side to side in the headphones, and helps her recognize its changing tonal sounds. Trainees typically exhibit facial expressions and jerky motions that are indicative of the internal argument they experience when, for the first time, they actually hear their existing motion 'bad habits'. However, the experience quickly changes into a fun and challenging internal learning game for them.

The second session begins by helping the trainee break her (typical) synaptic "bad habit" of continually staying way in front of the beat. Again, she is helped to very consciously 'force' her motions in order to make her tap sound go to both sides in the phones. When she gains enough gross motor control to consistently move her tap from side to side, she is then instructed to deliberately keep it on the side opposite of where her 'tendency' is (usually after the beat). After a short period of time, she learns to relax her 'aim' and let her tap automatically move toward the center of the beat. If her tap goes past center and ends up back on her tendency side, she simply learns to move it back to the opposite side and repeats the process. Training after this point is primarily self-administrable.

During subsequent sessions the trainee works on the limbs that have the worst CAMS ms. proficiency first, in order to synchronize her left/right control. As she learns to relax and 'not' aim, her highly accurate autonomic hearing and timing capabilities begin to use the ATTS sounds to correctly direct her physical motions. The ATTS 'right on' reward range automatically narrows as her accuracy and consistency improve.

As a typical trainee, she started at a 'right on' range of about 85 milliseconds either side of the beat. Shortly after gaining gross motor control (below 50 ms.), she learns to recognize and maintain the state of mind and fine motor physical control that allows her to stay close to the beat and to make quick, smooth adjustments in her timing. Once that is achieved, she quickly learns to 'sense' when she's wavering from 'right on' and subconsciously make very minor adjustments without 'falling off' center.

Each ATTS trainee's goal is to repetitively 'experience' performing with a correct CAMS proficiency of below 35 milliseconds. By doing so for a relatively short period of correct repetitions, correct synaptic brain connections are created, and thusly the achieved CAMS improvements become permanently imprinted on the trainee's kinesthetic motor memory.

TYPICAL ATTS TRAINING RESULTS

Regardless of the trainee's impairment, highly specialized skill or age level, the ATTS training results were consistent. Without exception, all trainees quickly demonstrated a significant improvement in their fundamental body control and overall coordination. With only a few severely handicapped trainee exceptions, ATTS trainees were able to achieve a fine motor control proficiency over each of their limbs of 35 milliseconds or better. Follow up testing demonstrated that there was almost complete retention.

OBVIOUS CONCLUSIONS:

Systematically mastering precise fundamental control over their limbs corrects many of an ATTS trainee's existing fundamental movement synaptic 'bad habits'. It also adds new correct subtask brain connections to their foundation of stored correct synapses. This makes the process of learning each future complex physical task much easier and faster for them. ATTS training gives humans more self-confidence, especially in their own physical abilities, and thus they have a broader freedom of choice as to which activities they participate in. They no longer deliberately or subconsciously will have to avoid skilled activities just because they see themselves as a "klutz".

Having excellent body control doesn't mean ATTS trainees can just run out, buy tennis rackets, and instantly become world tennis champs. They still must learn the specific mechanics and mental control needed for whatever complex skill they want to master, to say nothing about building up the proper muscles. However, having a strong CAMS proficiency gives them the opportunity to rationally choose whether or not they do so.

ADVANCED ATTS CAMS TRAINING NOTES

The standard ATTS can also be used for advanced CAMS training programs. It allows trainees to also learn to tap with a small strobe reference light instead of the reference beat in their headphones (their own tapping and the 'right-on' reward sounds are still heard). An optional small tactile reference pad (The "Thumper") can also be attached to the body, which allows trainees to 'feel' the reference beat instead of hearing or seeing it. These advanced CAMS exercises help trainees correct and synchronize their senses of vision and touch with their hearing, and thus improve their overall eye-to-hand coordination and sensory integration even further. (See specialized triggers pg. 16)

A FEW PIONEERS OF THE ATTS TRAINING 'EFFECT': A BRIEF SUMMARY

As I previously stated, all the ATTS trainees demonstrated an obvious improvement in their fundamental body control and overall coordination. The first 'normal' trainees I worked with were typically able to achieve a fundamental control proficiency over each of their limbs of 35 milliseconds or better, and they averaged a little over five sessions to reach that proficiency level. However, the following training pioneers best exemplify those who most need the help that ATTS-CAMS training can quickly provide.

DALE SLOOTHAAK: A 38 YEAR OLD WHO SUFFERED A TRAUMATIC BRAIN INJURY - "THE FIRST FULLY DOCUMENTED ATTS SUCCESS"

Dr. David Sova, from my local medical center, suggested that I train a lifelong friend of his named Dale Sloothaak. He had suffered a massive brain injury in an auto accident they were both involved in nineteen years earlier. Dale was originally told that he would never get out of bed again due to the extent of his brain damage. However, he was able to relearn primary gross motor and speech functions utilizing other areas of his brain.

When Dale began his ATTS training he was living on his own, employed (in a low pay handicapped position) and could carefully drive a car. He had very jerky motions, an unstable waddle-like walk and a severe speech stutter.

I discovered during Dale's first session that his left/right arm response times were significantly out of sync with each other. Within six thirty minute training sessions [during which I was also learning training techniques], Dale regained precise gross motor control over his arms, and we began working on his fine motor control.

At the same time I was working with Dale I was also training a number of other people, including three professional athletes; a tennis pro, a baseball pitcher and a golf pro. The impact sensing practice tee (floor trigger) we developed to train the golf pro became instrumental in Dale's incredibly fast overall improvement.

During Dale's seventh session he noticed the golf trigger and asked if he could try to tap his feet on it. We immediately discovered why he could barely walk; his feet were nearly a half second off from correct time, and they were about one eighth of a second off from each other. Dale relearned how to walk after his accident by shuffling slowly with his feet spread to each side because every time he tried to step with one foot in front of the other he would lose his balance and fall. For nearly 19 years he had been walking "like a duck" because his feet wouldn't be there to stop him from falling when he tried another way of doing it. (Note: Dale helped me to first fully observe the 'effect' and I began documenting each trainee's ATTS 'effect' on video tape beginning with this session.)

After four sessions of training his feet on the stationary floor trigger, Dale had improved to the point where we decided it was time for him to try to walk correctly. We put the ATTS beat through a set of stereo speakers and he began to shuffle back and forth accross the room exactly with the beat. After about 1/2 hour his brain figured it out, without either of our deliberate help! We were both "amazed" when he just leaned forward, pointed his toes and his feet were there when they were supposed to be. Two sessions later we were outside in the parking lot so he could learn to maintain his balance while walking with his feet straight and within the painted lines on the pavement. Again, he just leaned over and began to trot, and again he didn't fall! The next session we put on music and he learned how to dance again, and Dale's19 year dream to do so was fulfilled.

We contacted Dr. Sova and invited him to come to the next evening's training session. He had not seen Dale since before he began his training and his reaction was the same as Dale's and my own. Dr. Sova stated in no uncertain terms that Dale's "dramatic overall improvement was literally amazing". The next week Dale and Dr. Sova were featured in a Grand Rapids TV 8 News "medical break-through" Special Report about his marked improvements. Dale has had "a major pay raise" due to his improved productivity at work. He now stutters much less and says that "for the first time in 19 years I don't stand out in a crowd, kids no longer point and call me a 'duck' when I go to the mall". He says he feels "80% normal" again.

JIMMY: AN EIGHT YEAR OLD BORN WITH ONE LEG AND A SEVERE DEVELOPMENTAL COORDINATION DISORDER

Jimmy was recommended to me by the Franciscan Child Development Center (FCDC) in Lowell, Michigan. His mother is a noted pediatrician and his father is the Chief Operating Officer of one of the largest companies in Michigan. Jimmy was born with one leg and has ligaments missing in that knee. He has a prostheses attached to his other leg, well above where the knee would be. He also had severe motor skill, coordination and balance impairments, and could only go a few steps without falling.

Jimmy was very determined, although he got frustrated very easily. He actually kicked the ATTS floor trigger several times when he couldn't keep his balance. However, on the third session he had a major breakthrough with the control of his prostheses, and he had an immediate attitude change. He was just beginning to show dramatic improvements when his training unavoidable had to be interrupted.

After a three month delay I resumed Jimmy's training. Testing showed he had retained the improvements he had achieved during his first three sessions. In four additional sessions Jimmy achieved remarkable (23 ms.) control over his hands. He also quickly learned to tap his "feet" without holding on to maintain balance. Shortly thereafter he began to smooth his leg motions, gain control of his prostheses, and maintain his balance for extended periods of time. Like Dale Sloothaak, having Jimmy walk exactly with the ATTS beat quickly resulted in his developing a dramatically more stable and "normal looking" gate, and he now very seldom falls.

The ATTS training brought out, and made readily apparent to his dedicated parents, that Jimmy has gifted control over his hands. Discovering this dramatically improved his self-image and it will likely influence his future educational and career choices. His mother, being a concerned pediatrician, had Jimmy independently tested to determine what affect the ATTS's changing sounds were having on his auditory processing abilities. To her surprise he tested at the twelve year old level, he is now nearly four years ahead of his chronological age group.

Jimmy's desire and ability to learn in school continues to improve, and he is doing much better at learning to play piano at the FCDC. He helped to ATTS train his 4 and 6 year old brothers after completing his own training. I recently drove up Jimmy's driveway and saw him playing basketball with his brothers. He was moving about in control, and was very much enjoying the game. He gave me his own trading card from his youth soccer team, his picture was on the front. He said he now "plays midfielder on the team without using a walker". On the back of the card it said "Most Improved Player", "Most Inspirational" and "Most Sportsmanlike". It made me smile.

PATRICK: A TEN YEAR OLD WITH SEVERE DEVELOPMENTAL COORDINATION DISORDER AND ATTENTION DEFICIT/HYPERACTIVITY DISORDER

Patrick was recommended by Ms. Terry McCormick, a certified Kent Intermediate School District Occupational Therapist. He was diagnosed as having a severe gross motor skill delay (now officially designated as 315.4 - Developmental Coordination Disorder). He walked "like Frankenstein" since he was a baby and was placed in special education upon entering school. His movements were very stiff and his muscles were always tight. Although he was considered bright, he was grossly uncoordinated at all activities and "couldn't keep his letters anywhere near within the lines when writing".

Ms. McCormick had been working with Patrick since he entered school and said "he had shown steady, but slow progress over the last five years". She gave him the standard school test battery (including the Praxis Motor Accuracy Series) just before and after his ATTS training. He completed the training in eight sessions. Ms. McCormick states: "the results were both dramatic and unquestionable, Patrick jumped two (bell curve) Standard Deviations on the Praxis Motor Skill Accuracy test". That is equivalent to jumping from a below average IQ of 85 to an above average score of 115.

Immediately after finishing his ATTS training Patrick began to write much more smoothly within the lines, and to walk and move without the rigid and jerky motions that were previously typical of everything he did. Within weeks of beginning ATTS training, he was permanently removed from special education. His therapist most recently

reported that "Patrick is now actually ahead of his own age group. For the first time he enjoys school and is doing really well in all of his classes".

Patrick told me he wanted "to play football in a real game, instead of always having to sit on the bench". According to his parents, "two weeks after completing ATTS training, when the coach finally put him in a game, he stayed in. To his coach's and everybody else's surprise, Patrick made 16 key plays during the remainder of that game, and he became a starter for the rest of the season. His self image has totally changed and he likes school a lot more and is doing much better." Patrick has been periodically retested and his coordination and motor skills have continued to improve since completing his ATTS training.

JOHNNY: A SEVEN YEAR OLD WITH AUTISM AND SEVERE DEVELOPMENTAL COORDINATION DISORDER

Johnny was recommended to me for training by the Director of Grand Rapids Easter Seals. He was diagnosed as having autism. He was also gross motor impaired (DCD) and speech delayed. His local doctors had predicted he would always be autistic and would never exceed the mental or physical abilities of a seven year old.

Johnny's mother opted to have him receive extensive language training and took him out of state for Auditory Integrative Training (AIT) by Jackie Rockwell, one of the nation's leading autism therapists. She said the AIT training "helped him considerably, but his motor planning and coordination were still major problems." At first, Johnny's mother was afraid to have him do ATTS training because it utilized headphones like the AIT therapy he went through every six months. However, Jackie Rockwell told her that the ATTS sounds were not subliminal like those of AIT, and therefore would not conflict with his AIT therapy. She urged Johnny's mother to have him complete the ATTS training so that she could monitor the results.

Because of his short attention span and communicating problems, it was difficult to get Johnny started on the ATTS training. It took short sessions over several days for him to begin to grasp how to tap along with the beat. But once he got it, he became very enthused and learned fast. The change in his self-control over his hands and feet was dramatic.

The day after Johnny's sixth full session his mother called me and said "he began playing on the monkey bars at school for the first time. He fell off four times but wouldn't quit, he was having too much fun". Several sessions later she said "he began to run for the first time, and respond to verbal compound sentences. He is also now doing very significantly better in school and seems to enjoy it a lot more than he used to.' His mother most recently stated that "Johnny is no longer autistic, maybe he never was. His original doctors were wrong when they said he would never develop past being a seven year old; he is now progressing like any other normal child."

Based on her examination of Johnny after he completed ATTS training, Jackie Rockwell and her staff decided to become Certified ATTS Trainers themselves. They want to begin ATTS CAMS training each of their autistic patients as soon as possible.

POSTSCRIPT:

While writing this paper, I began preparing to initiate the first institutionalized ATTS/CAMS beta training program in a school district near Grand Rapids, Michigan. It is my sincere hope and belief that the ATTS will soon be able to help our education professionals begin the long overdue process of providing all children with an equal opportunity to become happy and highly productive citizens of the 21st century.

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ADDITIONAL ATTS NOTE RE: SPECIALIZED PROGRAM EXPANSIONS & TRIGGERS

The following highly specialized ATTS program expansions and triggers are currently under development and will soon be available:

- For K-12 Education
  - Multiple trainee progress tracking program,
  - CAMS test analysis graphic printout program,
  - CAMS group cooperation training games and triggers,
  - "Hop scotch" type floor trigger, and
  - Medium range two-way FM transmitter.
- For Occupational, Developmental and Rehabilitation Therapy;
  - Specialized limb, torso and facial muscle triggers,
  - Touch feedback pad (The Thumper) for the blind and deaf, and
  - Multi-limb walking and aquatic triggers.
- For Sports;
  - Long range, two-way, multi-function, FM transmitter,
  - Football - Quarterback/Receiver practice synchronizer & helmet headphones,
  - Baseball - Batting eye-to-hand coordination trigger,
  - Basketball - Free throw practice hoop trigger and amplified court speakers,
  - Swimming - Aquatic triggers and headphones,
  - Aerobics & Physical Fitness - scheduled use timer,
  - Golf - practice tee trigger, and
  - Tennis - serve practice trigger.
- For Music, Dance, Theater and Film;
  - Musical instrument triggers,
  - Dance triggers,
  - Group synchronization triggers,
  - MIDI compatibility adaptors, and
  - Beat Averager for syncing with prerecorded (non-MIDI) music.
- Custom triggers and program expanders can also be designed, built and/or adapted by to meet other special training and therapy needs.

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Motor Skills Disorder

315.4 Developmental Coordination Disorder

Diagnostic Features

The essential feature of Developmental Coordination Disorder is a marked impairment in the development of motor coordination (Criterion A). The diagnosis is made only if this impairment significantly interferes with academic achievement or activities of daily living (Criterion B). The diagnosis is made if the coordination difficulties are not due to a general medical condition (e.g., cerebral palsy, hemiplegia, or muscular distrophy) and the criteria are not met for Pervasive Developmental Disorder (Criterion C). If Mental retardation is present, the motor difficulties are in excess of those usually associated with it (Criterion D). The manifestations of this disorder vary with age and development. For example, younger children may display clumsiness and delays in achieving development motor milestones (e.g., walking, crawling, sitting, tying shoelaces, buttoning shirts, zipping pants). Older children may display difficulties with the motor aspects of assembling puzzles, building models, playing ball, and printing or writing.

Associated Features and Disorders

Problems commonly associated with Developmental Coordination Disorder include delays in other nonmotor milestones. Associated disorders may include Phonological Disorder, Expressive Language Disorder, and Mixed Receptive-Expressive Language Disorder.

Prevalence

Prevalence of Developmental Coordination Disorder has been estimated to be as high as 6% for children in the age range of 5-11 years.

Course

Recognition of Developmental Coordination Disorder usually occurs when the child first attempts such tasks as running, holding a knife and fork, buttoning clothes, or playing ball games. The course is variable. In some cases, lack of coordination continues through adolescence and adulthood.

Differential Diagnosis

Developmental Coordination Disorder must be distinguished from motor impairment that are due to a general medical condition. Problems in coordination may be associated with **specific neurological disorders** (e.g., cerebral palsy, progressive lesions of the cerebellum), but in these cases there is definite neural damage and abnormal findings on neurological examination. If **Mental Retardation** is present, Developmental Coordination Disorder can be diagnosed only if the motor difficulties are in excess of those usually associated with the Mental Retardation. A diagnosis of Developmental Coordination Disorder is not given if the criteria are met for a **Pervasive Developmental Disorder** . Individuals with **Attention-Deficit-Hyperactivity Disorder** may fall, bump into things, or knock things over, but this is usually due to distractibility and impulsiveness, rather than to a motor impairment. If criteria for both disorders are met, both diagnoses can be given.

- **Diagnostic criteria for 315.4 Developmental Coordination Disorder**

A. Performance in daily activities that require motor coordination is substantially below that expected given the person's chronological age and measured intelligence. This may be manifested by marked delays in achieving motor milestones (e.g., walking, crawling, sitting), dropping things, "clumsiness," poor performance in sports, or poor handwriting.

B. The disturbance in Criterion A significantly interferes with academic achievement or activities of daily living.

C. The disturbance is not due to a general medical condition (e.g., cerebral palsy, hemiplegia, or muscular dystrophy) and does not meet criteria for a Pervasive Developmental Disorder.

D. If Mental Retardation is present, the motor difficulties are in excess of those usually associated with it.

Coding note: If a general medical (e.g., neurological) condition or sensory deficit is present, code the condition on Axis III.