Dyspraxia Foundation
Professional Journal

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**Movement Disorders in early childhood – an epidemic**

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Having completed a recent survey to examine the motor-competency of more than 400 three-year old pupils in nurseries in County Durham, I was not surprised to discover that just over half of those assessed achieved at the level of skill expected for children of that age. One cannot assume that almost 50% of 3-year olds should be labelled as having a ‘developmental coordination disorder’ but what is the explanation and what is the effect on future learning outcomes?

There is increasing awareness of rising levels of obesity in children. The effects of dietary changes and reduction in exercise are evident. There is also evidence suggesting that increasing numbers of children are identified with specific learning difficulties Dyspraxia, Dyslexia, Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD). Parents and teachers are concerned about diminishing levels of concentration in their pupils and the effects this has on educational performance.

As the percentage of children failing to develop competent motor skills increases, we can make some assumptions as to the origin of the problem. Lack of opportunity appears to be the major contributing factor with children spending much of their time at home in front of the video and Play Station games. The development of motor skills is crucial to the development of cognitive skills and if we can be proactive in supporting pupils at nursery age then we will diminish the requirements for resourcing in later years in education.

Children spend much less time engaged in the development of physical skills than was the case as recently as 10 years ago. With increasing pressure upon children to develop what are considered to be ‘learning skills’ sometimes with the best of intentions, children’s opportunities to develop motor skills are restricted as they are encouraged to spend more time indoors and less outdoors. In Scandinavian countries, where children do not enter ‘Formal’ Education until the age of seven, the incidence of Dyslexia, for example is only a tenth of that evident in the UK.

Goddard and Hyland (1998) identified significant differences in the early development of groups of 7 and 8-year-old children who had reading, writing and copying difficulties when compared with matched controls. The children identified with subsequent learning difficulties had a ‘cluster’ of factors evident in their early development which related to balance, motor skills and auditory processing. May did not crawl and they learnt to walk later (16+ months). As the two groups were tracked the discrepancy in the educational attainments between the two groups increased. The delays in early motor development continued to have an effect on learning in activities which were dependent upon motor skills for expression i.e. reading, writing and copying.

Difficulties in the development of motor skills are often linked with problems of development in other areas. Wolff (1999) links impaired motor skills with language delay. He studied a group of dyslexic children and discovered that 90% of those with motor coordination
difficulties also appeared to present with motor speech deficits which were measured by a task involving repetitious syllable production. He concludes, “The analysis of co-articulation in speech production may be one pathway by which impaired timing precision in motor action impinges on reading and writing deficits in developmental dyslexia.”

The co-occurrence of motor difficulties with other learning disorders appears to be the rule rather than the exception Dewey et al (2000) and Kaplan et al (2000). This research was carried out at the University of Calgary and the Alberta Children’s Hospital where 58% of children with ADHD displayed reading difficulties and in addition 27% of the children with ADHD also had problems with coordination. Of the children identified with developmental coordination disorder 82% displayed some other co-morbid disorder. Gilberg (1998) and Rasmussen et al (2000) have identified autistic features, behavioural problems and depression as co-occurring with developmental coordination disorder.

Childhood developmental disorders are classified into discreet categories and in the majority of cases, children display the characteristics of several: co-morbidity is widespread (Dewey et al 2000). Research evidence suggests that between 50% and 80% of children with a diagnosis of DCD meet the criteria for at least 2 disorders (Biederman et al 1990). Children with coordination difficulties commonly have other conditions such as Attention Deficit/Hyperactivity Disorder (ADHD), dyslexia and speech and language impairments (COT/NAPO 2003). Substantive research connecting dyslexia with deficits in motor skills was published by Duffy and Geschwind (1985).

The majority of children who experience problem with the development of motor skills do not grow out of them. These children require access to specific programmes to develop these skills. Delays in motor development are usually associated with deficits in perceptual skills and difficulties with the speed of information processing.

By identifying the specific rather than generalised difficulties in the acquisition of physical skills and by providing structured activities to develop them learning outcomes improve. It is important that we ‘normalise’ coordination difficulties. As there are increasing numbers of children who are exhibiting problems, purely through lack of experience and opportunity, then early intervention is paramount.

**A study of nursery children**

A recent pilot project carried out with more than 100 children in five nurseries in County Durham illustrates the benefits of structured movement programmes.

At the start, the children were screened using a motor-skills assessment (Wetton 1997) detailing the skills expected of three year olds. Only 54% achieved the required level of competence. More than 20% of the group were unable to walk sideways without tripping over.

The nursery staff were provided with a structured programme of activities comprising 15 modules, which concentrated on the development of balance, movement and coordination skills. The children accessed the programme for 15 minutes a day (weekdays) for 12 weeks.

At the end of the term the children were re-assessed and 93% had developed their motor skills to the expected level of competence. The remaining 7% continue to exhibit movement
difficulties – a percentage much closer to the acknowledged figure of 3%-6% used to describe the prevalence of developmental coordination disorder in the UK population.

Without a dramatic change in lifestyle, we are producing a nation of young people who have increasing problems with learning and difficulties with concentration. Structured motor programmes should be integrated into all Early Years settings to prevent the possibility of a future epidemic of children with motor-learning difficulties.

References


Biomedical Approaches to Dyspraxia and Related Disorders

Paul Shattock & Paul Whiteley

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The Autism Research Unit has been investigating the biological mechanisms that may underlie Pervasive Developmental Disorders (PDDs) such as autism for over 20 years. We have conducted studies in many areas and published numerous articles in peer-reviewed journals, professional journals, conference proceedings and unofficial publications.

The Unit has become involved in some controversial areas (the MMR / autism debate; Gulf War Syndrome; Munchausen Syndrome by Proxy for example) which have diverted us from one of our main objectives:- to determine and promulgate interventions which may ameliorate the symptoms which may seriously affect the quality of life of affected individuals. We have performed and published no formal studies on dyspraxia but have noted many similarities between dyspraxia and autism in terms of symptoms and biological abnormalities.

Our attention was drawn to a number of features including the following:-

1) The presence of dyspraxic symptoms in people diagnosed with autism (or, more specifically the “milder variant”, Asperger Syndrome). We have conducted studies on the proprioceptive systems in people with Asperger Syndrome and found them to be affected.

2) In many instances, the diagnosis given seems to reflect the training of the diagnoser as much as the symptoms being presented. If diagnosis is made by an “Occupational Therapist” the diagnosis of Dyspraxia is much more likely than if made by an Educational Psychologist (Dyslexia), Clinical Psychologist (Asperger Syndrome or ADHD) or Speech Therapist (Speech and Language Disorder). Some Psychoanalytically inclined professionals are still using diagnoses such as “Affective Disorder” or “Emotional Abuse” to describe what are, essentially, the same people.

3) The presence of so many of these issues in the siblings and immediate families of people diagnosed as having autism spectrum disorders (ASDs).

It is difficult to conceive that these collections of symptoms are totally unrelated and yet turn up so often in the same individual or families. It is more likely that there are common genetic fragilities that result in the manifestation of a variety of symptoms to different extents in different individuals. The presentation will be dependent upon the precise nature of the genetic fragility and the environmental triggers which operate in each individual.

During the course of our studies we have examined urine samples from over 10,000 individuals with ASDs and related conditions. A substantial minority of these samples were obtained from individuals diagnosed with dyspraxia; dyslexia or ADHD and certain similarities are immediately apparent.
Figure 1. High Performance Liquid Chromatogram of a urine sample from an asymptomatic (control) subject.
Alcorn et al (2004) reported on the results of attempts to identify people with autism and Asperger Syndrome by blind examination of such urinary profiles. Results of such efforts were, for the higher functioning individuals at least, quite impressive. Identification was made on the basis of two features.

a) The vast majority of individuals with autism showed elevated (higher than normal) levels of Indolyl-AcryloylGlycine (IAG) (Bull et al 2003). In the profile above, this is the large peak that appears at 20.020 minutes

b) The levels of components in the region which eluted at between 20 and 25 minutes was elevated in those identified as having an ASD. For a number of reasons we believe these to be “peptide” in nature (see below).

We have found that the majority of samples we have examined from people diagnosed with ADD (with or without Hyperactivity), Dyslexia or Dyspraxia are identical with those from individuals diagnosed with Asperger Syndrome. For the time being, at least, we are unable to distinguish between these groups. It is tempting to suggest that the differences in diagnoses are reflective of minor symptomatic variations than of differing aetiologies.

It should be mentioned that in those individuals where the diagnosis was “autism” the majority showed the characteristic peak for IAG but that the “peptide peaks” were more numerous and/or present at a higher level than in the groups diagnosed with ADD, Dyspraxia, Dyslexia or Asperger Syndrome.
It must be stressed that we would never regard this test as having usefulness for diagnostic purposes. The findings are insufficiently specific (unpublished data from ourselves and from others suggest that around 25% of the symptomatic population would provide similar profiles).

**The Opioid Excess Theory of Autism**

There were two lines of that pointed towards the involvement of opioid substances in the aetiology of autism.

Firstly, Panksepp (1979) noted the similarities between the symptoms of autism and the long-term effects of morphine (an opioid). He suggested that the symptoms of autism could be the consequence of activity by naturally occurring opioids in the Central Nervous System (CNS). These substances, known as endorphins (=endogenous morphines), act as natural painkillers but will also affect other senses such as taste, vision, hearing and proprioception (see later).

They are present at all times but tend to increase at times of stress (physical, mental or other), which may explain the increase in symptoms we see at such times.

The other line of evidence was, at the time, difficult to relate to Panksepp’s original observations. Parents had for many years reported that their children’s (autistic) symptoms diminished when certain foods were removed from the diet. Usually the foods implicated, in parental anecdote, were gluten (the protein from wheat and other cereals) and casein (the protein from mammalian milk).

It was subsequently realised that during digestion of these large proteins to the component amino-acids there was an intermediate stage which consisted of short chains of amino-acids called peptides. Beta-endorphin itself is a peptide but a comparatively large one extremely unlikely to be found during breakdown of such foodstuffs. However, peptides called casomorphins are produced by the breakdown of casein. This should then be broken down to amino-acids. Similar components called gluteomorphins (or gliadinorphins) occur when wheat is digested.

Received wisdom at that time (early 80s) was that intact peptides would not be absorbed from the intestines so the hypothesis was dismissed on these grounds. There is now ample evidence that this is not the case and that peptides are absorbed with ease from the intestines into the blood stream. This is not an abnormal process. It is generally accepted that when a baby drinks milk from the mother’s breast, the casein is broken down into (amino-acids) and casomorphins. These will cross from the intestines to the satiety centre of the brain and the baby will stop sucking and go to sleep.

Casein from bovine milk differs in significant ways from casein from human milk. The most well studied component is “bovine beta casomorphins 1-7” (BC1-7). Not only is this bovine casomorphin more difficult to break down than the human equivalent but bovine milk contains, in any case, higher concentrations of casein than does human milk.

Researchers have also shown the appearance of very similar peptides, with opioid activity, when gluten is digested in mixtures with compositions designed to mimic stomach contents.
Along with other research groups in various parts of the world, we have examined urine for many years. The components described in Figs 1 and 2 have been shown to have properties very similar to these peptides but absolute proof of identity remains elusive at the present time. The circumstantial evidence remains very strong.

Our theoretical model may be illustrated visually in Figure 3.

*Figure 3. Autism as a metabolic disorder*

In *Figure 3*, the stars represent peptides. **Figure 3A** represents the normal situation. We all produce low levels of peptides when we digest proteins. Small quantities will pass from the intestines into the bloodstream and thence on to the Central Nervous System (CNS). **Figure 3B** represents the situation where there are excessive levels of peptides in the urine. This could be for a variety of reasons but the result will be the passage of elevated levels of peptides to the CNS. There may be, (as in **Figure 3C**) excessive permeability of the intestines, which will encourage passage of peptides. Some of the reasons for this are given below but this could also result from a lingering infection in the intestinal wall. It is suggested that this permeability could be the result of a sub-acute intestinal measles infection resulting from a vaccination programme that includes multiple infections with attenuated strains of the diseases. In **Figure 3D**, there is excessive permeability of the Blood Brain Barrier. This could result from physical injury or infectious or other diseases.

The process by which intact peptides can pass from the intestines to the brain and affect development and activity may be complex but the notion is, in itself, comparatively simple.
If peptides with opioid activity do reach the CNS there are many effects possible. Development of neuronal circuits will be affected; transmission in all systems will be modified. Thus the primary senses (taste, vision, hearing, touch, pain, proprioception) will all be affected. In the same way, habituation and filtration processes will be impaired.

IAG is an abnormal metabolite of the amino-acid tryptophan. The limited amount of available evidence suggests that IAG itself is comparatively innocuous (although this may not prove to be the case). As tryptophan is being converted into IAG, it is converted to Indole Acrylic Acid (IAcra) and it is this compound that may have the more serious consequences. IAcra is a planar and very reactive molecule and could have a variety of effects in the body. We speculate that it becomes involved in the lipids that make up cell membranes. It could, by replacing fatty acids, become directly incorporated into the fats themselves but this is not certain. Alternatively (or additionally) it could become deposited between the lipid layers that make up membranes. These would, under these conditions, greatly reduce the flexibility of these membranes (including those surrounding red blood corpuscles). If these effects do occur (and work is proceeding to test these hypotheses) the consequence would be greatly increased permeability of the intestinal wall and of the blood brain barrier. In the presence of this compound, the passage of peptides from the intestines to the brain would be greatly facilitated.

There are other reasons for increased permeability of these membranes. Deficiencies in sulphation processes would cause this, as would severe infections with yeasts or some other intestinal parasites. Physical damage to the intestines could be involved. Chronic infections of the intestinal wall could also result in this increased...
4) Exacerbation of symptoms at times of stress or when certain other foods (citrus fruits for example) are consumed;
5) Sensory abnormalities (taste; pain and, in particular, proprioception.

We accept that ours may be an unusual population since members are so often the siblings of people diagnosed with ASDs and it was on account of these that we were first contacted.

We have developed a protocol ("The Sunderland Protocol") that lists interventions in what we consider to be a logical sequence. It is designed to maximise the benefits whilst, at the same time, minimising problems. This has formed the basis for many treatment regimes now in use throughout the world for autism and, to a lesser extent, ADD and dyslexia although we have never promoted it for these purposes.

A summary follows but, for a fuller description, we would refer to our website http://osiris.sunderland.ac.uk/autism where "The Sunderland Protocol" can be accessed.

The Autism Research Unit’s main objectives are to investigate the biological mechanisms, which may underlie autism, and the implications these may have for the development of therapeutic regimes. In the course of this work we have obtained clinical information, including urinary peptide analyses on over 8,000 subjects with ASDs and other related disorders such as Chronic Fatigue Syndrome; Gulf War Syndrome; Obsessive Compulsive Disorder; Dyspraxia and others. More often than not, as a result of our investigations, we are requested to advise parents and carers on appropriate interventions. We would question the ability or the right of anyone, medically qualified or not, to make recommendations for subjects they have not seen and that they know only through a series of clinical notes and chemical tests.

The protocol is divided into three sections and is based loosely upon the Northern Ireland Peace Process.

We strongly advise the active involvement of an experienced dietician (UK) or nutritionist (US) and the support of a medical practitioner when implementing these interventions. We would also prefer to see allergy testing for possible Celiac Disease performed before embarking on this process.

We are of the opinion that even without biological testing, there is sufficient evidence to support the use of these interventions sequentially. There can be no guarantees that any particular intervention will benefit any one particular child. We have been proven wrong so many times in our predictions of efficacy or otherwise that we regularly introduce the following system for consideration.

There will be those who opt for a different sequencing (DMG or Yeast removal first for example). We suggest that people revisit a failed intervention from time to time and that they test the effectiveness of the interventions they are using from as we have found, repeatedly that the effectiveness of a particular intervention will alter with development and with the nature and extent of other programmes.
# THE SUNDERLAND PROTOCOL

(Shattock & Whiteley, 2000)

<table>
<thead>
<tr>
<th>“CEASEFIRE”- Remove source of bullets</th>
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<tbody>
<tr>
<td>1. CASEIN - 3 weeks</td>
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<tr>
<td>2. GLUTEN - 3 months</td>
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## PRELIMINARY AGREEMENT

3. OTHER FOODS - Food diary (Corn; Soya; Tomatoes; Aubergines; Beef et al)

4. TESTING - Vitamins
   - Minerals
   - Amino Acids
   - Allergies (IgG, IgE)

5. PARASITIC ORGANISMS
   - Yeasts
   - Others

## ACTIVE RECONSTRUCTION

6. SULPHATION ISSUES - Epsom Salts (Internal/External)
   - MSM
7. ENZYME ACTIVITY - Betaine Hydrochloride
8. FATTY ACIDS - Evening Primrose Oil
   - Fish Oils
   - Cod Liver Oil (Vitamin A)
   - Flax Seed Oils
9. L-GLUTAMINE - Correct Imbalance
   - Intestinal Nutrient
10. ENZYME SUPPLEMENTATION - Bromelain
    - Seren-Aid
11. 5-HYDROXY TRYPTOPHAN 14. MEGADOSE B6 & Mg
12. PIGMENT-FREE 15. DIMETHYLGLYCINE (DMG)
13. SALICYLATE-FREE 16. SECRETIN

Supplement as appropriate: Zn, Ca, Mg, Mb, A, C, B1, B3, B6
**Stage 1 - The Cease-fire.**

This involves removal of the guns and the bullets, in this case gluten and casein for an appropriate period.

**Stage 2 - The Preliminary (Good Friday) agreement.**

Keeping a diary to look for other dietary insults; consideration of vitamin, mineral, and allergy irregularities; consideration of other intestinal parasites.

It is our experience that testing is best performed at this stage, after the removal of the smokescreen caused by the gluten and casein products. We have found that many of the myriad allergies detected before the exclusion of these products disappear at this stage whilst others become unmasked. Similarly, we have found that vitamin and mineral status irregularities may have dissipated as the intestinal function returns.

**Stage 3 - The Active Reconstruction Process.**

The ultimate intention must be to re-establish the efficiency of the processes of digestion and absorption. If this can be achieved, it is conceivable that dietary regimes could be much less severe. The sequence we propose can be found on the accompanying page.

This section includes a number of possibilities some of which (DMG and High doses of Vitamin B6 and Magnesium) have an excellent record. Also included are other therapies (secretin, for example) where supportive evidence is, at best, equivocal. The use of very exclusive diets devoid of phenols (pigments) or salicylates are placed at this stage purely because they are more intensive and obtrusive into a normal lifestyle. There are very rational reasons for suggesting a trial of 5-HTP but, as yet, we have only anecdotal evidence for efficacy.

Experience in County Durham would certainly support the use of omega-3 (\(\omega-3\)) based supplements (fish oils) for people with dyspraxia. Evidence of efficacy for people with autism although substantial, at present, is purely anecdotal.

We are aware that parents are experimenting with diets devoid of all complex carbohydrates (the Selective Carbohydrate Diet (SCD)). There may be justification for this in specific instances but the requirements of the diet are difficult to fulfil and could even attract the attention of Child Protection Units.

**Stage 4 – Other Interventions.**

We would never suggest that these interventions are the only possibilities. Many other interventions, which initially seemed ludicrous or without scientific validation are being utilised by parents who report benefits. Chelation of heavy metals, organic diets (free from pesticide residues), cranial osteopathy and many other therapies may yield benefits.
Some Additional Considerations

The use of any of these interventions must be seen as part of a total programme for each individual child. Such programmes should include educational, social and health inputs. These interventions are complementary not alternative.

All of the above interventions can be introduced without the use of prescription drugs. Physicians in other parts of the world are employing other interventions (such as reduced glutathione and methyl cobalamin injections) and claiming considerable, if variable, resultant benefits. Discussion of these interventions is beyond the scope of this presentation.

Do not cease other prescribed medication without the authorisation and approval of the prescribing physician.

Conclusions

There are many biomedical interventions that are believed to be useful in ameliorating symptoms of people with autism or Asperger Syndrome. Some of these have been the subject of trials which demonstrate efficacy but the majority have not. It may be considered to be an unwarranted example of “lateral thinking” but given the perceived similarities between dyspraxia and ASDs it would be appropriate to consider similar interventions in cases of dyspraxia. Scientifically based testing is desirable and necessary.

References


Developing handwriting through kinaesthetic training

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The most familiar characteristic shared by children with dyspraxia is poor handwriting. It is a concern universally shared by teachers and parents alike. These difficulties are exacerbated by an educational curriculum which, despite progression in technology, still demands considerable ‘written’ evidence. Handwriting epitomises the range of difficulties experienced by children with dyspraxia as it exposes their poor motor coordination, difficulties in visual perception, inadequacies in monitoring limb pressure, and distorted sense of body and limb schema.

During the formative years (Foundation and Key Stage 1) when perceptual and motor developmental are receptive to tuition, it is possible to make considerable progress in developing the handwriting skills of children with dyspraxia (Addy, 1995, 1996; Olsen 1998).

However the progression onto Key Stage 2 makes increasing demands on the child to the extent that children aged 7/8 years area expected to be are able to:

- a) Build up handwriting speed.
- b) Increase fluency
- c) Be proficient in the implementation of the 4 basic joins introduced in year 2.
- d) Ensure consistency in size and proportions of letters and the spacing between letters and words.

(National Curriculum Literacy Standards, DfEE, 1997)

It is often at this stage that children with dyspraxia experience further problems regarding their handwriting especially if they have struggled with the transition from print to cursive writing in the first place. It is not unusual to observe children from the age of 8-13 years whose writing is extremely laboured and heavy; lacking fluency and rhythm, often the child will struggle to know where to join and break letters within a word, they will be confused as to when to lift the writing instrument from the page, leaving the child unable to produce the volume of writing required; in addition wrist aches and hand cramps become frequent complaints. The consequence of this is children whose motivation to write is at an all time low (Schneck, 1991). (See page 17 - handwriting example ‘before’)

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In order to develop fast, fluent handwriting, children need to have refined kinaesthesia, efficient motor planning, accurate hand-eye coordination, intact visuo-motor integration, and in-hand manipulation (Cornhill and Case-Smith, 1996). The child will also need to appreciate the rhythmic qualities of writing, knowing where and when to join according to letter form, where to position and lift the wrist, and comprehend word construction. They also need to apply appropriate pressure through the writing instrument - too much will slow down the movement, too little will reduce fine motor control. The child will need to be able to spatially organise the page; knowing where to start, how to track across horizontally, and where to finish. It is also important to be able to write without viewing every letter and word in order to copy from books, black or white boards, or take dictation.

We know that many children with dyspraxia, for unknown reasons, struggle with the component skills described above, in particular kinaesthetic processing (Miller and McIntosh, 1998). For some reason the information from the various joint and muscle receptors either mis-fire or provide incorrect information (Daly, 1992). Subsequently they quickly learn to compensate by using other sensory cues in particular vision (which is the strongest sense) and hearing, to the neglect of their kinaesthetic sense.

Therefore to address this imbalance, it could be hypothesised that an intervention which stimulates the use of kinaesthetic sense, and encourages the use of all sensory modalities will improved handwriting fluency and speed.

**What is kinaesthesia?**

Kinaesthesia is the sense of movement and an awareness of the position of the limbs that arises from information from the joints and skin of one's body parts (McClosky, 1978). Complex fine motor skills such as handwriting require high level processing and memory of kinesthetic input (Lynch et al, 1992). Accuracy in kinaesthetic perception helps to regulate pressure through the limbs and monitor patterns of movement. In occupations requiring fine motor coordination accurate kinaesthetic perception is required.

There are two key sensory mechanisms which provide kinaesthetic sense; proprioceptors and touch receptors. Proprioceptors such as muscle spindles and golgi tendon organs are specialised devices which relay specific information about pressure through the limb, muscle response, and joint movement to the brain. This information is processed and translated into motor actions. Touch receptors such as Meissner’s corpuscles, Pacinian corpuscles and Ruffini endings, detect subtle changes in pressure through the skin. Information received from the proprioceptors together with information from the touch sensors provide a perfect map of precise limb position and even minute movements.

In addition the vestibular system whose receptors are located in the inner ear, signal any head and trunk movement, this helps us to maintain an upright position against gravity. This postural stability is very important as it ensures that the shoulder girdle, in particular, remains in a relatively secure position to ensure that fine motor tasks can be successfully achieved.

It is important to note is that kinaesthetic ability is refined with age and also is dependent upon early experiences. We know that children with dyspraxia neglect this skill to a certain extent in favour of visual and auditory feedback. It is also evident that certain kinaesthetic skills are not are not fully developed and generalised from one part of the body to another, especially in the hands till approximately 12 years of age(Hoare and Larkin, 1991) Therefore
we have the opportunity to enhance and guide correct kinaesthetic movements relevant to handwriting up to this age and beyond.

**Kinaesthesia and Handwriting**

There is evidence to suggest that a lack of kinaesthetic sensitivity can account for many handwriting difficulties especially in the older child (Levine et al. 1981). Both Roy, (1982) and Seitz, (1989) found that children with a lack of proprioceptive-kinaesthetic feedback, compensated by continuing to visually monitor their hands. In turn pencil pressure increased which served to provide extra proprioception through his/her joints. This slowed down the writing process.

Information regarding patterns of movement and pressure are stored in our memory to be recalled when we are required to undertake a similar movement. As we develop complex patterns of movement, particularly those needed to produce handwriting; we are dependent upon the store of information to inform us of our motor actions in relation to muscle position, limb placement, and pressure of touch. When practised, these patterns of movements become automatic. Rubin and Henderson (1982) suggest that speed and level of skill in handwriting depend on script being produced automatically. According to Sudsawad et al (2002) ‘storage of this input leads to improved programming in subsequent attempts at handwriting and is responsible for improvement in handwriting skill’.

According to Griller, (1985, cited by Verschuuren et al 1999) rhythmic patterns of motor control can be achieved if sensory input; in the form of proprioception, vestibular stimulation, and touch is promoted. Laszlo and Bairstow (1983, 1985) suggested that by enhancing a child’s kinaesthetic sense through activities, games and training, improvements would be seen in motor performance including handwriting. Their kinaesthetic training programme involved intensive daily training, with positive results.

**Kinaesthetic training and handwriting**

Kinaesthetic training programmes such as Speed-Up! (Addy, 2004) ‘Write-Dance’ (Oussoren Voors, 2000) and ‘Loops and other Groups’ (Benbow, 1991) aim to stimulate the body’s kinaesthetic sense while developing the child’s mental image of the patterns of movement and form required in fluent writing. This stimulation will increase movement sensitivity; augment motor control (without the need to depend on vision), it will regulate pressure control and reduce the tension of a potentially stiff and rigid arm/hand (Grant and Watter,1998).

It is based on the premise that…

‘Before a child can produce a letter he/she must develop a precise image of the letter and of the way in which the strokes are formed to serve as a guide for motor development. This image, or perception, is essential as a guide in initial practice for motor control and also to inhibit the gradual development of incorrect formational habits’ (Furner, 1970, p 61)

The Speed-Up! Kinaesthetic handwriting programme (Addy, 2004) for example, is an 8 week intensive programme for children aged between 8-13 years. It involves a 1 hour tutorial and regular daily rehearsal. It can be used by teachers or therapists and can be introduced on either an individual or small group basis. Initially the children are introduced to a series of carefully selected physical exercises which take approximately 10 minutes to complete.
These exercises serve to increase shoulder and hip girdle stability while stimulating the proprioceptors of the upper limbs. These activities are incorporated into a daily regime and particularly before handwriting activities. Speed-Up! also incorporates the use of a double-sided blackboard which stimulates bilateral integration through the bimanual patterning techniques with vision occluded by the position of the blackboard in relation to the child. The vibrations produced from the friction of chalk against the surface stimulate upper limb kinaesthetic sense whilst increasing stability at the shoulder girdle. Much of the 8 week programme involves non-visual activities relating to handwriting and it is only during the latter stages that vision and speed writing are introduced.

**Effectiveness of kinaesthetic training**

The research regarding the effectiveness of using kinaesthetic training to improve handwriting has varied. Laszlo and Bairstow (1984) found positive results in handwriting using a kinaesthetic training approach as did Harris and Livesey (1992). Parents and teachers in Sim et al’s (1996) study believed that kinaesthetic training had a significant effect on their children’s handwriting. Teasdale et al, (1993) and Verschueren et al, (1999), also support the benefits of enhancing proprioception to improve fluency of handwriting. Sudsawad, et al (2002) were more reserved about of the gains of kinaesthetic training, although, their studies involved young children aged between 6 to 7 years. The research underpinning the Speed-up! Programme is ongoing although results have been promising. *(See page 17 – handwriting example ‘after’)*

**Conclusion**

‘Handwriting’s importance to youngsters is derived from the fact that once they have learned this important manual skill, it becomes an essential means of ‘demonstrating’ mastery of subject matter throughout their educational experiences and into later life.’ Williams (1991). It is evident that many children with dyspraxia have difficulties utilising their kinaesthetic sense owing to poor proprioceptive feedback and a dependence upon visual feedback. It can be assumed that by increasing kinaesthetic sensitivity while guiding the child carefully through the patterns of movements and forms required to effect handwriting that improvements will ensue. Kinaesthesia is viewed as virtually the most important influence on perceptual and motor development (Laszlo (1991) and subsequently the most important influence on the development of fast, fluent handwriting.

**References**


Conductive Education and the Child with Dyspraxia

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ABSTRACT
This article examines the system of Conductive Education in relation to children with dyspraxia or developmental co-ordination disorder. Specific detail is given around the philosophy of the system and the practical application of this to these children. The author qualified as a conductor from the Petö Institute in Hungary in 1992 and since that time has been working at The National Institute of Conductive Education in Birmingham, UK. The work with children with dyspraxia has been developing, at this institute, for the past 7 years. Over this time the aim has been to examine the philosophy of CE and ways of applying this to this specific group of children. This article aims to provide an understanding of the system on which this work is based and to give readers a greater understanding of the theories behind this system.

Background
This article will provide an overview of the system of Conductive Education (CE) and examine its application to children with ‘dyspraxia’ or ‘developmental co-ordination disorder’ (DCD). The use of terminology must firstly be clarified as there is much debate around the use of terms (Kirby & Drew, 2003). One view suggests that:

“The child with dyspraxia has a praxis/planning problem and does not know what to do and how to move, whereas the child with DCD has difficulties with co-ordination and execution”

(ibid, p. 6)

On the other hand Sugden (2002) suggests that DCD covers a range of ‘labels’ such as clumsy, perceptual motor disorders and dyspraxia. Due to a general lack of consensus on the use of terminology and taking into consideration that all intervention should start with the child rather than a diagnosis the term ‘dyspraxia’ will be used throughout this article. This however recognises that children will display a range of individual abilities and difficulties, each of which require specific observation and teaching.

Introduction
CE, as a method of teaching and learning for people with motor disorders has been developed in Hungary, at the Petö Institute since the 1940s. Interest in this system in the UK began in the 1960s (Cotton, 1965) however did not make a significant impact until the late 1980s (Read, 1992). In 1986 The Foundation for Conductive Education, a registered charity, was formed to ‘bring the science and skill of CE to the UK’. Over the past 16 years the focus of CE has been largely around children with cerebral palsy with a more limited focus on adults with conditions such as Parkinson’s, multiple sclerosis and strokes. The work with children with dyspraxia, at the National Institute of Conductive Education in Birmingham, began in 1997 following a number of enquiries from parents. Since this time the institute has worked with over 100 children aged between 3 and 14 years. Some of these children may not have a
specific diagnosis but are displaying delay in the development of a range of skills, primarily motor.

CE is delivered by ‘conductors’, a profession which remains unrecognised in the UK in spite of the existence of a University level degree training. The conductor is a specialist in the field of teaching and motor disorder, a combination which is unique to CE. In order to gain a degree a conductor in the UK will study for three years full time. The course involves a combination of education, pedagogy, neurology, motor learning, rehabilitation, motor disorders, and psychology. The basis of these subjects being embedded in the overall philosophy of CE where motor disorders are seen in an educational context rather than a medical one (Coles & Zsargo, 1998).

Conductive Education
The philosophy of CE encompasses children and adults alike and whilst age related characteristics have an effect on the delivery of the philosophy the essential elements remain the same irrespective of diagnosis and age. András Petö died in 1967 and bequeathed a living practice. One of the significant factors in the system is the combination of medical and educational models.

“What was revolutionary about András Petö’s approach was that he sought to combine educational methods to complement his medical knowledge and, as his knowledge increased, he continually shaped and perfected his mobility teaching methods.” (Horváth 1997, p.2)

The factors which influenced this approach will remain unknown but perhaps one factor was Petö’s belief in human potential and the capacity for the central nervous system to establish new connections through teaching and active learning (Hári, 1980; Kozma, 1995). Whilst the diagnosis of dyspraxia is often seen in an educational context the requirement of a diagnosis suggests a medical condition. If we consider that “dyspraxia results when parts of the brain have failed to mature properly” (Portwood, 2001) then we can place this condition under the broader term of neurological motor disorders. CE therefore, as an educational approach to such conditions is able to bridge the gap between these two, often distinct, fields.

An important consideration in the philosophy of CE is the actual Hungarian term. In Hungary CE is still called konductiv pedagógia, this was however translated as ‘education’ rather than pedagogy. Watkins & Mortimore (1999) say “the term pedagogy is seldom used in English writing about education” (ibid. p.1) and this may account for the change in the name to education. Simon (1999) draws a distinction between education and pedagogy by focusing on the starting point. He comments that education starts from the individual child and suggests that this stems back from as far as the Plowden report (1967) where the child-centred approach was a key feature, whereas pedagogy starts from a different standpoint.

“What ... to start from the standpoint of individual differences is to start from the wrong standpoint. To develop effective pedagogy means starting from the opposite standpoint, from what children have in common as members of the human species; to establish the general principles of teaching and, in light of these, to determine what modifications of practice are necessary to meet specific individual needs.” (Simon 1999, p.42).

For the child with dyspraxia this means that firstly the conductor needs to analyse and understand human movement behaviour and learning, as well as the wider factors influencing these. From this will emerge teaching strategies alongside the individual needs of each child.
CE can “make a contribution towards an ‘educational’ model of disability, in which children are seen as being disabled by a lack of appropriate education to meet their needs” (Coles & Zsargo, 1998 p.73). Kirby and Drew (2003) comment that in relation to normal development it is when the child enters formal education that the difference between peers is more evident. Whilst it is accepted that all children have the right to education we frequently need to examine teaching strategies for children with specific conditions such as dyspraxia. If we are to continue to look from a pedagogical point of view then it is essential, for these children, to consider the process of motor learning and the role of all other aspects of development alongside this. Children do not develop skills in a uniform manner, one area of development has an effect on other areas, on the whole personality of the child. CE places a focus on the development of this personality (Wilson, 2001), frequently referred to as an ‘orthofunctional personality’. This is seen as ‘a general capacity for adaptation and learning which enables the person throughout his life to adjust more and more comprehensively to his natural and social environment” (Hári & Ákos, 1988 p. 141) and is judged by ‘the ability to adapt to new situations, the development of the ability to solve problems (Sutton, 1988 p.216).

For the child with dyspraxia this involves teaching him/her not only how to increase motor skill but also all aspects of development associated with this such as cognitive, social, psychological and language. In CE all aspects of development are addressed simultaneously (Hapnes, 2001).

**Learning Motor Skills**

It is generally accepted that the primary problem the child with dyspraxia faces is motoric (Kirby, 1999; Ripley et al 1997; Boon, 2001). In order to understand ‘how’ to teach the child it is essential to understand how the human species ‘learn’ motor skills. All motor skills are learnt, even if we are not consciously aware of this e.g. walking (Magill, 1998). If we consider the nature of voluntary movements the first, most important area to consider is that of ‘intention’. All voluntary actions include both a cognitive and a physiological process, “a representation of the intended action outcome and some movement pattern carried out to actually produce the outcome” (Hommel, 2003 p.35). This intention is linked to the goal set e.g. if the child intends to kick a ball a series of physiological movements will be initiated in relation to the goal.

To simplify this process it can be seen as:

```
INTENTION

ACTION

FEEDBACK
```
Intention therefore is more than the will to perform an action; it also triggers the appropriate physical response. During the process of performing an action there is interaction of both the perceptual and action systems (Shumway-Cook & Woollacott, 1995). This means that once the child has initiated the action there is a continual series of messages moving between the brain, the muscles and joints and back to the brain, to enable him/her to carry out this action in a skilled manner. When learning a motor skill the most important part in this learning cycle is the feedback. The success of any action performed by a human being is measured in the difference between the ‘intended’ action and the ‘actual’ action. If a child is learning to play tennis and intends to hit the ball over the net the results of their action will be measured by whether the ball goes over the net or not. The feedback must then relate back to the intention i.e. to the physiological structures required during the performance in order to correct the action. If we return to the example of playing tennis and the ball falls into the net the child will need to adjust the position of their racket head in order to lift the ball further. During the next stroke they will then use this information prior to making contact with the ball in order to correct their action. This process of learning will continue until the intention equals the action. The changes therefore do not occur at the level of action but prior to this, at the level of intention. If we are teaching the acquisition of motor skills we therefore need to be focusing on intervention prior to action and not at the level of action. Once the physiological process has been initiated only minor corrections can be made. This obviously depends on the type of motor skill being learnt but to varying degrees applies to all of our movements.

One of the most important sources of feedback is that of proprioception (Magill, 1998), the ability of the central nervous system to provide specific information on the position of limbs, timing of movements and the co-ordination of different parts of the body. The information received from the environment is also processed in a continual manner, meaning that cognitive processes will play a role throughout the action and perceptual stages of movement (Shumway-Cook & Woollacott, 1995 p.45)

Once a skill has been learnt in one context it then needs to be applied into a different context. It is in this way that we build our ‘repertoire’ of skills.

“To successfully perform the wide variety of motor skills we use in everyday life we must co-ordinate various muscles and joints to function together. These muscle and joint combinations differ for many skills” (Magill, 1998 p.36)

If we teach each motor skill as a function e.g. how to catch a football, without teaching the underlying ‘rules’ of movement then the child will find it very difficult to catch a tennis ball. It is therefore important to work at the level of intention, teaching the child generalisable skills which they can use as tools for problem solving when faced with new situations. This is a key concept in the adaptation of the central nervous system of human beings.

When teaching intention we are therefore working at a cognitive level. This will also include the use of instruction to assist with the planning and sequencing of complex movements. This enables us to indirectly impact on action, using action as a result of the intention. However there are implications on how we then present feedback. Feedback should not be a statement of results, rather concrete information which can feed into the intention. E.g. if the child hits the ball into the net then feedback of you must hit the ball higher is not beneficial. What the child needs to know is ‘how’ do I hit the ball higher, what do I need to do with my grip, my stance, the movement of my arm etc. The same is true of any complex daily skills e.g. writing. The child, when learning to write, needs to have specific feedback on how to find the
appropriate grip on their pen or pencil. Feedback such as ‘do not press so hard’ does not give
the child enough information to enable them to change their intention. This may result in the
child although understanding the feedback not being able to actually carry it out.

For many of us the acquisition of daily motor skills is a painless, semi-automatic process. We
are able to use our own internal feedback to assist in adapting the intention and moving closer
towards our goal. For the child with dyspraxia this is not so. They need to be specifically
taught ‘how’ to change their motor skills and control rather than ‘what’ they need to correct.
This is the starting point in the system of CE for children with dyspraxia.

One other important factor in the concept of intention is that of ‘the will’ to perform a
movement. This is often referred to as motivation. It is not the intention to discuss motivation
in detail here but to register that we must consider how we can motivate the child with
dyspraxia to continually perform the same skill when they are not in fact receiving
appropriate feedback to execute change. This area will be discussed further in the following
sections as it is a vital starting point for any teaching and subsequent learning.

The Child with Dyspraxia as a Learner
As mentioned above, the starting point in CE is to see central nervous system problems as
problems of learning. This means that in order to understand the structure and context of the
CE session we must first understand the effects on learning faced by children with dyspraxia.

We can broadly place the areas of development affected, either directly or indirectly, as
motor, language, psychological, cognitive and social. Boon (2001) specifies these in greater
detail including: balance, co-ordination, fine motor skills, speech and language, social skills,
attention and concentration, learning and visual motor skills. Kirby and Drew (2003) add to
this list with areas such as body awareness, co-ordinating both sides of the body, motor
planning, perception of movement and touch. It would be impossible and inappropriate to
consider each one of these in detail for the purposes of this article but all of these aspects
need to be taken into consideration when devising teaching strategies for each individual
child.

This next section looks at key factors from the above range of difficulties faced and how
these can impact the ability of the child to learn. This then provides the base for ‘what’ and
‘how’ we need to teach children with dyspraxia in order to assist them in overcoming their
specific difficulties and becoming ‘achievers’ rather than children with a disability or a
special educational need.

Psychological factors
In CE the focus is on developing the personality of the child, providing them with
confidence, self-esteem and the ability to problem solve in new situations. All of this will be
the starting point when structuring our programme. Whilst motor development naturally plays
a key role the psychological development is emphasised throughout the programme. As
discussed above intention requires a range of cognitive and psychological processes to enable
the child to learn motor control. The child with dyspraxia will frequently lack motivation,
confidence and self-esteem (Ripley et al, 1997). This can lead to a range of social problems
including isolation and bullying (Kirby, 1999). If we consider that these factors come
primarily from the ability to change intended action into actual performance then we should
not be surprised. Within CE the focus is on praise and reward for effort rather than results,
this coupled with specific teaching on ‘how’ to change intention enables the child to enter the
process of learning. It is often said that in CE we teach the child how to ‘learn’.

Tasks are carefully constructed to ensure that the child is able to show their abilities rather
than their problems. It is for this reason that CE takes place in groups rather than a one-to-one
session. In a group situation the child is able to improve social skills, confidence,
communication as well as specific movement problems (Hapnes, 2001). The group acts as a
motivating force for the child, enabling him/her to show a level of achievement and success.

“Each individual can see how others solve similar problems and can learn from them. The
conductors use group dynamics to motivate members. A group may wait for an individual to
solve a problem, may urge him/her on, praise his/her success and delight in his/her
achievement.” (UKFCE 1998, p.8)

Whilst retaining the focus on the above points it is not possible to give the child confidence
and self-esteem if they lack the basic motor skills on which to build this. The programme
therefore is a movement-based programme but with the focus on success and building on
ability. In order to ensure that the tasks set are relevant for the child we must consider key
features in relation to the nature of the problem faced by the child.

**Motor Development**

One of the main problems faced is that of **lack of resting muscle tone**. The child with
dyspraxia is frequently described as being ‘floppy’, they generally will have ‘**lax joints**’
making their ability to stabilise movements very difficult. This in turn leads to problems with
performing **compensatory movements**. If we consider the child as a learner then they will
need to learn how to perform isolated movements e.g. lifting their arm up to answer a
question in school. Due to the motor problems they face many children, when lifting their
arm up, will fall backwards or sideways off their chair. For the child this is a ‘surprise’ as
they cannot understand why other children do not do the same. Their inability to use
boundaries of movements, which we find through joint range and resting muscle tone, mean
that they are not receiving appropriate feedback in order to correct the intention to equal the
desired action. The child is lifting their arm up; they do not receive the perceptual
information from the joint receptors which tell them that they are moving outside of their
gravity point. In the absence of this information the child will subsequently intend the
movement in the same way. I.e. not be able to correct their movement even though they know
that this is not the action they want. In this instance the child needs to be taught how to assess
relevant boundaries of movements. The problem of stabilising also means that they are
frequently ‘fidgety’, when asked to sit still they are not able to. This can be misunderstood as
disobedience when in fact the child does not know ‘how’ to sit still. They watch other
children to try and gain information but cannot see any specific movements. They are now at
a loss as to ‘how’ to correct their movements. Within the CE session we see this as a primary
skill which the child needs to be taught, this is achieved through the concept of rhythmical
intention which will be discussed in detail later on.

Other common difficulties faced are those of **body awareness** and **symmetry**. The problems
faced in this area have a knock-on effect into **lateralisation** and the **co-ordination of**
**complex movements**. The child with dyspraxia can frequently name body parts but not have
a concept of where they are on their own body. They are capable of learning these but not of
understanding their meaning. During the CE session when a great deal of movement language
is used we are surprised at the number of children who can explain movement concepts to us
but are unable to link these to a specific movement. As a result of this many of the children will automatically copy movements of others. Unfortunately copying movements will not enable them to learn the rules of movement as there is a different cognitive input for copying and for voluntary movement as described above. If the child is not able to link their own movements to language then they will find it very hard to follow instructions and to plan movement sequences. These therefore being seen as further key concepts which the child needs to learn.

The child who is now able to find a symmetrical position has the starting point for coordinating both sides of the body. Tasks which involve movement from a central position, learning how to move limbs at the same tempo will indirectly have an impact on fine motor co-ordination. Tasks to teach this are therefore seen as an essential component in the CE session.

**Perception of depth and distance**, the problems faced by the child in this area will have an enormous impact on social and academic development. It is essential that the child is taught how to judge both distance and depth as these areas will not necessarily happen develop. The tap on the shoulder of a friend which knocks them off their feet is seen as ‘inappropriate’ behaviour. Equally the child who consistently writes so hard that their letters mark through a number of pages, without correcting this, is seen as being disobedient. Through teaching the children the boundaries of movement, giving them a set rhythm and distance of movement we are able to indirectly practice such tasks. Tasks which involve moving from a stationary point to a new one at an appropriate tempo enable the child to learn to judge distances required. The use of rhythm described later, together with teaching boundaries for movements and compensatory movements enable the child to learn how to judge distance and depth.

**Balance and gait problems** – these problems frequently link to the difficulty in stabilising joints and in performing compensatory movements. By teaching the child how to perform these skills in a safe, lying position with accuracy, it is possible to improve balance indirectly. These children respond very well to indirect tasks, particularly as they get older and have been attempting some tasks for many years without success. The co-ordination of both sides of the body also plays an important role in our ability to balance and have a fluent gait, as of course does the perception of depth and distance. Specific tasks are also carried out in a standing position to help the child learn how to apply movements learnt in one position to another.

**The link between language, thought and action – rhythmical intention.**

One of the key teaching tools used in CE is called ‘rhythmical intention’. Hári & Tillemans (1984) describe rhythmical intention as:

.. the person’s mental preparation via a symbolic representation for overt behaviour... Every skill, also those involved in the production of a spoken word, require a well-developed sequencing of rhythmic actions. The ability to analyse and carry out this sequence is gradually controlled by the person himself. This is because intention, initially conscious, will eventually lead to an unconscious control of the sequencing process. And now in turn the spoken word may in itself become a facilitator of other sequencing processes.

(ibid. pp.31-32)
In practice, the conductor verbalises the task for the child, s/he repeats the verbalisation and the task is carried out within a defined time limit.

For example: the task is to roll onto the right side, in a lying position. First the conductor says “I roll onto my right side”, the group repeats “I roll onto my right side” and then the whole group begins to count out loud, to 3 or 5, to provide the boundaries for the movement. For the child with dyspraxia a count of 1 – 2 – 3 is always used. The child is then asked to perform the movement in three equal parts. This enables them to learn how to judge distances as well providing the boundary for their movements.

The task becomes the intention, the time given to perform this, the rhythm (Brown & Mikula-Toth 1997, p.46). The conductor, in most instances, gives the instruction of ‘I’ to ensure the individual realises the intention i.e. that they are going to perform the task rather than the conductor. By giving the task in this form the individual is able to internalise the instruction i.e. I roll onto my right side, and apply this in other situations.

The use of language, in voluntary actions, is seen as a means of expressing relationships between stimulus and response (Goschke, 2003 p. 62). Goschke also talks about the use of verbal self-instructions in order to plan and organise thought processes into action. This is very much based on the work of Luria (1973) and Vygotsky (Donaldson, 1978), on which it is thought that the concept of rhythmical intention is based. The internalisation of verbal instructions is seen as a crucial step in the development of intentional self-control. In everyday terms if we consider how we use ‘inner speech’ to organise thought processes then it can be seen that this a tool frequently used when we need to concentrate on the task at hand. By teaching the child with dyspraxia how to use inner speech we are providing them with a valuable tool which they can use in everyday activities. A young child, when learning a new task will initially frequently talk out loud, the language they use will often be the same as the one the ‘teacher’ used. Over time this language concept is linked to an appropriate physiological response and the child no longer needs to verbalise. At this stage we can say that they have ‘internalised’ the skill.

The use of rhythmical intention is therefore a pivotal concept in CE, it combines language with cognitive thought processes e.g. planning which in turn assist with action. The way in which this is used will depend on the nature of the damage to the central nervous system, as mentioned above for children with dyspraxia it enables them to learn to rhythmically connect sequences of movements and to internalise a language concept to increase skill. The use of rhythm for children with dyspraxia is commented on by Boon (2001) who recognises that it has long been thought of as beneficial for children with movement problems.

**The CE Session**

The following section describes the session for children with dyspraxia as practised at The National Institute of Conductive Education. The session takes place in a small group of between 5 and 6 children and lasts for one hour. During this time the child will complete a range of tasks in a lying, sitting and standing position. All of these tasks use rhythmical intention in the form of a count and are designed to encompass a range of motor problems which have been discussed earlier. By working in groups each child is able to perform tasks which they can already perform, tasks which they are practising and new tasks they are learning. The balance of these tasks between each individual is crucial when considering how we can ensure motivation and success. At the end of the session the child should be able to report the tasks they have been able to perform rather than the ones they could not.
Conductors will facilitate and correct ‘how’ the child performs the movement in order to ensure learning.

**Conclusion**
CE as an educational approach to a range of motor disorders enables the child with dyspraxia to learn how to overcome the specific difficulties s/he faces in everyday life. The combination of psychological development, alongside motor development enables a child to gain confidence in his/her abilities. The final words however come from the parents of children with dyspraxia:

“Self esteem used to be an issue for James as he was aware there was something different about him. Since coming to Conductive Education he has noticed an improvement in himself, and his self-esteem has improved. The conductors know how to find the potential in a child and exactly how to bring it out.” (Conduct, 2004 p.4)

“She is more outgoing and able to perform tasks with greater ease. She seems able to deal with situations better”

“I feel that he is progressing well in all areas that he struggles with. I have noticed he does not fall over quite as much. His ball skills have improved. He has now achieved his 100m in swimming which he enjoys. He loves horse riding. Generally he seems more confident with adults and his peers although he still needs lots of reassurance.”

**Further Information**
CE services for children with dyspraxia may be held at a number of CE centres. For more information on the availability of these please look at: www.conductive-education.org.uk

For information on services and workshops for professionals please contact:

The National Institute of Conductive Education
Cannon Hill House
Russell Road
Birmingham B13 8RD
Tel: 0121 449 1569
e-mail: nicky@conductive-education.org.uk

For information on services and professional study days please contact:

The Scottish Centre for Children with Motor Impairments
Craighalbert Centre
1, Craighalbert Way
Cumbernauld
Scotland
G68 0LS
Tel: 01236 456100
anna@craighalbert.org.uk
References


Changes in interests following physiotherapy treatment for Children with Dyspraxia

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AIM:
The aim of this study was to consider whether the interests of children, who had dyspraxia, changed following physiotherapy treatment

INTRODUCTION:
There has been some information reported on the specific interests that children with dyspraxia have and whether these change following treatment. Lee and Smith (1998 and 2000) reported that children showed more interest and were keener to attempt new activities following a course of 8 week physiotherapy treatment. Sports and activities that the children enjoyed were listed. However, there is little other literature that specifically considers the likes at school, the child’s hobbies at home and outside activities and how these alter post treatment.

This study compared the likes at school, hobbies and outside activities prior to treatment and how these altered immediately following treatment and one year later.

METHODOLOGY:
Subjects: Twenty children who were referred to the physiotherapy department with a diagnosis of dyspraxia between January 2001 and June 2003 were included in the study. All these children had completed an 8 week block of once a week physiotherapy treatment, a review 3 months following treatment, and another review one year later.

Procedure: The children were asked to complete a questionnaire at the following times: prior to treatment, the review three months following treatment and at the annual review. The questionnaires specifically included questions related to the child’s likes and dislikes at school, home hobbies and outside activities. The questionnaires were either returned when the children attended the assessments or they were returned to the practice, using a stamped addressed envelope.

RESULTS:

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DISCUSSION:
The results show that the likes, hobbies and outside activities had all increased and this was particularly evident from figures taken before treatment and at the annual review. This may well be accounted for by the fact that the children were reported to find games and sports at school easier, they were more willing to attempt new activities following treatment and had improved self-confidence and self-esteem. Similar findings related to improvement in self-esteem and the willingness to attempt more activities have been documented in the past (Addy, 1996; Lee & French, 1994: Lee & Smith, 1998 and 2002: Lee, Yoxall & Smith, 2003: Portwood, 1996 & 2000). However, these authors apart from the research carried out by Lee & Smith in 2002, only considered the immediate effects following treatment. Lee & Smith, (2002) confirmed that after 3 years, the children continued to improve with their skills, were still more willing to attempt new activities and that parents had reported that self-confidence had continued to improve. The results from this study would correlate with these findings and that a year following treatment their interests and hobbies continued to grow.
The authors had expected that the number of school subjects that the children disliked, would have reduced following treatment, however, this was not the case. Most children had reported initially a dislike to games, writing, Mathematics and English. Following treatment and at the annual review none of the children reported a dislike to games. However, a number of children did state a dislike to spelling, French, Science, Mathematics, tests, as well as writing and English. There may be a number of reasons attributing to these dislikes. Even though in many cases writing improves, many children with Dyspraxia continue to struggle with lengthy writing that subjects such as English and History require. Short-term memory often remains a difficulty which may be reflected in subjects such as with Mathematics, spellings and French. In addition, these children often continue to have organisational difficulties, a skill required for writing essays and Mathematics. Lee and Smith 2002, reported that three years following physiotherapy treatment, 36% of parents continued to have concerns about their children’s academic work. This was seen, in particular with mathematics, spelling, reading, writing essays and short-term memory. These points may well be added reasons why the children continued to have dislikes for these subjects.

The number of likes of school subjects showed an increase of 62%. Most children were able to write at least 3 –4 likes and some even quoted 8 – 9 subjects. The list of their likes at school at the annual review included Games, PE, Art, I.T. CDT, Drama, Geography, Music, story time, reading and some stated that they now enjoyed Mathematics and Science which they had not initially. The authors were pleased that many of the children showed a wide range of interests at school and that so many now enjoyed sports. This would compare well with previous research where parents reported that their children were happy to participate in sports and P.E at school following treatment (Lee & Smith 1998 & 2002).

The authors were particularly pleased with the significant increase in number of outside activities reported at the annual review. This had seen a rise of 100%. The children stated a number of new activities such as fencing, football, swimming, judo and other martial arts, climbing, drama, dance, playing musical instruments, golf, cubs and beavers and horse riding. In addition, the increase in home hobbies rose by 37% at the annual review. The children had shown more interest in hobbies related to outside play or games involving other children than previously. Initially, many children had stated that their favourite hobby was playing on the computer, with Gameboys or game consuls. After treatment more children reported an interest in playing on their bicycles, playing football in the garden, playing on the trampoline and playing ball games as well as playing Warhammer and starting collections with friends.

**CONCLUSION:**

The results of this survey show that following physiotherapy treatment, children show more interest in hobbies, outside activities and have more likes at school. Although dislikes did not fall as had been expected, these in many cases were related to ongoing difficulties that the children had in the classroom. In addition, the results indicate the importance of encouraging children with Dyspraxia to have a wide range of interests. This will assist with promoting and strengthening their gross motor skills and in particular assist
Case Study: A Practical Montessori response to the education of dyspraxic children

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Wendy Fidler discusses links between movement organisation and learning in this case study of one very special little girl’s interaction with a prepared Montessori learning environment.

When I first met Elizabeth, she was attending special school full-time, and her parents were committed to helping their only child to fulfil her unique potential. They had heard about the work we were trialling at Wildwood Montessori School, with children with specific and non-specific learning difficulties, and they were eager to know more!

Montessorians were few and far between in Lancashire, and much of our work was ‘experimental science’ in that we were charting unknown waters without the drawbacks of predetermined levels of expected achievements. We had high expectations for the children’s achievements, and achieve they did!

Elizabeth, a happy, gregarious, healthy ten year old with a shock of golden curls, had been diagnosed dyspraxic several years before. My initial observations included poor coordination in both her gross and fine motor skills, and she was continually jumping up from her work and knocking things over. Because she had little facility for processing information, and because her attention span was so short, she was seldom able to listen to instructions or information for long enough to interpret them.

Elizabeth was easily distracted because she was not able to ‘sift out’ sensory stimuli which were not appropriate to her situation. Any new sound, smell or movement became an exciting and immediate cause for investigation; altogether, she was a very distracted and distracting little girl.

At this stage, I had very little experience of, and a very open mind about the condition now most usually called dyspraxia (or developmental coordination disorder), but which in the past has also been known as floppy child syndrome or minimal brain dysfunction. But, what I could see in Elizabeth were some of the characteristics of a healthy, inquisitive toddler, for example, her need to pick up everything within reach; spontaneously moving from one stimulus to another, apparently without a clearly defined motive.

Further discussion with Elizabeth’s mother indicated that, as a baby Elizabeth had been late to reach many of the milestones of child development and, most pertinent of all was her complete lack of curiosity as a baby and toddler. Elizabeth had not explored her environment, interacted, strived, made mistakes and succeeded as most babies do.

She had missed out on the ‘fine-tuning’ of selecting and dismissing sensory stimuli, or repeating and perfecting favourite activities, of simply getting herself everywhere and into everything as babies usually do.
The rapid cerebellum development and cycles of activities (2), which normally occur due to an innate desire to learn, had been delayed, and Elizabeth was only now exhibiting these characteristics.

Elizabeth lacked comprehension because she had not learned to discriminate between desires in the usual cycle of work, repetition and practice. She lacked coordination because she had not experienced purposeful, independent movement. Or as Montessorians would say, her “prehension had not become purposive”.(3)

About this time I came across some literature published by the Dyspraxia Trust (now the Dyspraxia Foundation) in which the words “praxis makes perfect” were used.(4)

Praxis is the facility by which we work out how to use our hands and bodies on skilled tasks. Practicability includes three components:

a) ideation: forming the idea and knowing what to do (c.f. discriminating between desires)

b) motor planning: organising the sequence of movements involved in the task (c.f. work, repetition, practice)

c) execution: carrying out the movements in a smooth sequence (c.f. prehension becomes purposive)

“Praxis is to the physical world what speech is to the social world. It is unique in human skills and a critical link between brain and behaviour.”(5)

Dyspraxia is an impairment or immaturity of the organisation of movement, which often also affects the child’s language, perception, thought and emotional behaviour with consequent difficulties in learning situations.

And so it seemed that because Elizabeth’s essential curiosity for life had been delayed (there is no room in this paper to discuss the possibilities for the regressions), whole areas of her prehension and cognitive reasoning ability had also been delayed.

The appropriate Montessori response was to introduce exercises of practical life to help Elizabeth organise the movements she needed for graceful, socially acceptable daily living: the “social graces” usually encouraged and perfected in a Montessori environment.

The environment was prepared to meet Elizabeth at her own developmental level, working one-to-one, and to tap into her delight in sensory stimuli – her newly found curiosity:

“The essential thing is for the task to arouse such an interest that it engages the child’s whole personality.”(6)

The role of the teacher as part of the prepared environment is fundamental to capturing the dyspraxic child’s interest: the presentation of the exercises must be captivating but not theatrical, dynamic but not dramatic. The pose, or attitude assumed by the teacher when presenting the apparatus designed to discriminate between different lengths, weights etc. needs to indicate profound consideration, for as the child catches the pose, by repetition of hand and eye movements associated with the apparatus, the necessary link into mental integration of the sensory perceptions will begin. In this way, the dyspraxic child is effectively ‘taught’ thinking.
As with younger children in a Montessori nursery, the material may have to be presented several times before an appropriate response is achieved. It is good to calmly congratulate the dyspraxic child in order to encourage further curiosity and success, and to develop a healthy self-esteem often lacking when children have been confined within the limits of an alien environment. (7)

Elizabeth responded remarkably well in all areas of the Montessori curriculum: the first delightful improvements resulted from her work with insets for design. The steady tracking of the pencil across the page (and across the body midline) as she gained increasing mastery of the parallel lines, helped her to achieve a sense of centre, of body image, and spatial awareness of her body parts. She began to develop a reference point from which to determine left to right. (8)

Elizabeth’s increasing finely controlled use of the pencil, with well coordinated hand and eye movements, enabled her to work for longer periods and with less physical and mental exhaustion. She was at a double disadvantage because she is left-handed, and could not at first see the work she had attempted. As she learned to track from left to right, a skill used in reading, writing and spelling, these learning skills also began to improve as Elizabeth located and retained her place on the page more easily.

As she acquired central stability, she began to use her eyes and arms independently of her body. In order to scan a page of print, or to catch a ball it is necessary to be able to isolate hand and eye movement: the body needs to be still for effective visual skills such as copying from a board.

Through our early sensorial work with the long rods, Elizabeth was encouraged to use each hand independently, and to coordinate using her eyes with her right hand only. Although Elizabeth is left-handed the presentation remained the same - the left hand stationary, holding the rod still with the right hand and eyes tracking the length of each rod, from left to right. Perfecting this skill freed Elizabeth to position her paper and stabilise it with her right hand whilst tracking left to right with her left hand for writing.

Whilst we may never fully understand how these exercises, broken down into isolated individual movements of each body part, trigger a response in the creative individual nebulae of the dyspraxic child’s brain, we can certainly see the results. The joy which diffused Elizabeth’s countenance when she had completed a piece of work to her own satisfaction, was as profound as for any other Montessori child.

Isolating and organising individual movements is a key feature of a Montessori presentation: for Elizabeth the long rods, the pink tower and the cylinder bars were particular favourites. With an increasing sense of centre and midline, Elizabeth was encouraged to practice crossing the midline with exercises of ‘practical life’, which help children perfect the hand and eye movements necessary for everyday personal independence. For example, transferring dried peas, using spoons, tweezers or chopsticks, from one dish to another; repeatedly pouring lentils and water from jug to jug, or podding fresh peas to enjoy eating afterwards. The aim is to continually vary the method of transfer with tiny items and dishes which are aesthetically attractive. (9)

Right from the beginning Elizabeth responded well to the rhythm and rhyme of reading and to poetry and music. Nursery rhymes were a particular favourite – another indicator of her infantile stage of development. Although she loved to listen, and had some reading ability,
the actual process of reading exhausted her. As linear sequential organisation was mastered, through continual tracking from top to bottom and from left to right, (for example, filling in the insets for design), reading became less physically and mentally demanding, and Elizabeth began to chooses her books and write reviews. This suggested a marked increase in the level of her enjoyment and comprehension of reading. Particular favourites were the Ginn “Supersonics Fun With Phonics” which come as a breath of fresh air to Montessorians!

Ongoing work with the Montessori ‘sensorial equipment’ enabled Elizabeth to organise her writing on the page and on the writing line more efficiently. Work with sandpaper letters helped her to identify the shapes and sounds of lower case letters, to isolate initial, middle and final sounds, to build words and sequence upper case letters into the alphabet. She also perfected a new cursive script.

The psychometric test used to diagnose dyspraxia is the Wechsler Intelligence Scale for children – a detailed assessment which includes verbal and non-verbal responses. Elizabeth’s progress in reading and spelling during these assessments was very encouraging. Her ability to discriminate height and breadth, and to use and interpret those discriminations in her written work, was also reflected in some fine observational drawings.

Dyspraxic children need to be ‘taught’ the link between their bodies and learning, and Elizabeth’s parents encouraged her to practice her new skills at home. This was particularly effective with her number work and mathematics, and was reflected in Elizabeth’s emerging perception of number. Prior to her Montessori classes she had been able to recognise the symbols for very small numbers. Number value, sequencing, addition, subtraction, elements of multiplication and division, halving, pairing, fractions, etc and concepts, such as ‘more’ and ‘less’, ‘in front of’ or ‘next to’, differences in length or height were outside her comprehension. She has a very immature stereognostic sense. Progress in these areas met with a long plateau of delay as we worked through the sensorial exercises for early maths and Elizabeth began the long process of integrating the many visual and spatial discriminations necessary before even counting could begin.

By degrees we introduced the Montessori number rods, the decimal bead system, the sandpaper numbers and counters, the snake game, the coloured number chains. Over time Elizabeth’s visual discrimination improved (and was assessed on the 91st percentile) although there was clearly still much work to do. Elizabeth progressed through counting, measuring, adding and subtracting numbers, ordering numbers in sets and pairs and learning her two times table. Her understanding of place value, shape, size and concepts of relativity were all consolidated.

As Elizabeth has reached what Montessorians call ‘normalisation’ (usual or ‘accepted’ social responses to everyday living and learning activities) in her movement organisation, so her learning difficulties lessened. Elizabeth appeared to have suffered a chronological delay in the appearance of ‘sensitive periods’ for leaning, but her newly acquired kinaesthetic awareness of movement and position was simultaneously accompanied by order in the whole of her personality.

Access to a Montessori learning environment helped Elizabeth blossom into a better coordinated, more graceful child, with a new facility for mental abstraction. She progressed to full time education in a mainstream school and college, with special provision. She is well integrated socially, self-motivated, and able to complete her own cycle of work. 

40
Although she still acknowledges distracting stimuli, she can disassociate her work from them, and she can organise her choice of work.

Work is inseparable from movement. The very existence of social order depends on movement directed to constructive ends.(10) Socially desirable behaviour is rooted in finely coordinated social skills – the social graces of the Montessori curriculum.

The prognosis for Elizabeth is good, and it is clear the Montessori education has an effective role to play in the treatment of dyspraxia. However, it is important that professional Montessori interventions are welcomed alongside other clinicians and education providers.

Elizabeth is one of several children who have achieved exceptional progress. It’s not surprising when we remember that the Montessori apparatus and exercises were originally designed for use under similar conditions in the Casa dei Bambini in Rome with children with special educational needs (including emotional and behavioural difficulties) and social problems.

references:

3. ibid

This article was first published in Montessori International Magazine Issue 70’ Jan – March 2004
Published Research into Dyspraxia / Developmental Coordination Disorder

Below are listed references to some of the publications from 2002 – 2004. This will be updated through the Dyspraxia Foundation Website, which also gives details of earlier publications.


Bartlett DJ, Fanning JEK. Relationships of equipment use and play positions to motor development of preterm infants at 8 months corrected age. Pediatric Physical Therapy. 2003;15:8-15


Edmund J. S. Sonuga-Barke 2003 On the Intersection Between AD/HD and DCD: The DAMP Hypothesis Child and Adolescent Mental Health Volume 8 Issue 3 Page 114


Henriques, D.Y.P., Medendorp, W.P., Gielen, C.C.A.M, Crawford, J.D.
Geometric computations underlying eye-hand coordination: orientations of the two eyes and the head
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IT Press Cambridge

Keijzers, N.L.W., Horstink, M.W.I.M., and Gielen, C.C.A.M.
Automatic Assessment of Levodopa-Induced Dyskinesias in Daily Life by Neural Networks.


Mandich, A. Polatajko HJ. Developmental coordination disorder: Mechanisms, measurement and management

Mandich A, Buckolz E, Polatajko H I. Brain Cogn. 2003 Apr;51(3):346-56 Children with developmental coordination disorder (DCD) and their ability to disengage ongoing attentional focus: more on inhibitory function.


Exp. Brain Res. 150 (2), 163-170, 2003


Intervention in children with Developmental Coordination Disorder: The role of parents and teachers
Sugden D.A.; Chambers M.E.
British Journal of Educational Psychology, 1 December 2003, vol. 73, iss. 4, pp. 545-561(17) British Psychological Society


DYSPRAXIA FOUNDATION
ADVISORY PANELS

Main duties of panel members: to respond to letters, email, and telephone enquires from Foundation members, professionals and the general public on issues related to dyspraxia; to write articles and factsheets as requested by the Board of Trustees; to peer review articles for the Professional journal; to give presentations and workshops at Foundation conferences and study days; to foster awareness of dyspraxia and the work of the Foundation.

EDUCATION

Chair        Madeleine Portwood          Educational Psychologist
Michele Lee  Physiotherapist
Pam Williams Speech and Language Therapist
Wendy Fidler Education/SEN Consultant & Expert Witness
Barbara Hunter Educational Consultant/Advisory Teacher

MEDICAL

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Michele Lee  Physiotherapist
Madeleine Portwood Educational Psychologist
Amanda Kirby Medical Practitioner
Sally Payne Occupational Therapist
Lynda Foulder-Hughes Occupational Therapist
Lois Addy Occupational Therapist
Veronica Connery Speech & Language Therapist
Anne Finlayson Physiotherapist
Marion Hankey Physiotherapist
## DYSPRAXIA FOUNDATION – CORPORATE MEMBERS

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## DYSPRAXIA FOUNDATION – PROFESSIONALS MEMBERS

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The mission of the Dyspraxia Professional Journal is to disseminate current practices, research and facilitate continuing education for all professionals working with children and adults with dyspraxia. The Journal is dedicated to the advancement of professional work in Dyspraxia through critical review and through clinical application, education of practitioners, research and management of services. We welcome submissions of English language manuscripts from all professionals.

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*recognising developmental co-ordination disorders*

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The objects of the Dyspraxia Foundation are:

- To support individuals and families affected by dyspraxia
- To promote better diagnostic and treatment facilities for those who have dyspraxia.

The Foundation

- Publishes leaflets, booklets, books and guides for parents, those who have dyspraxia and professionals.
- Organises conferences and talks about dyspraxia and related topics for parents, carers and professionals.
- Supports a network of local groups across the United Kingdom.
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