

Thesis



Taekwondo and Dyspraxia

*Using Taekwondo as a tool to help special needs students
with emphasis on Dyspraxia*



Master Franks 7th Degree

October 2020

Table of Contents

Table of Contents.....	2
Acknowledgements.....	3
Introduction.....	4
Purpose of this thesis.....	5
Understanding Dyspraxia.....	6
Common Symptoms of Dyspraxia.....	7
Taekwondo and special needs students.....	8
TaeKwon-Do Patterns.....	9
A Suggested Approach.....	10
Case Study.....	12
Saoirse Mullaney.....	12
From being desponded to British Open Champion.....	14
Kelly Mullaney (Saoirse’s Mother) Testimony.....	15
Conclusion.....	17
Annexure A - Resume – Neil David Franks.....	18
Involvement in Taekwondo.....	18
Personal achievements.....	18
Umpiring & Coaching Experience.....	19
Annexure B - Testimony -Thomas Bellasie.....	20
References.....	33
Useful Links.....	33

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People I would like to thank and mention.

- I first of all would like to thank my wife Lize. Lize has taught me so much on how to work with special needs kids. Lize a full-time carer to our two special needs children, Abigael who has autism and battles with sensory issues, Matthew who also has autism and battles with understanding and has a speech delay. Lize has studied and attended courses that have given her the tools to help me develop teaching systems for the kids who have special needs that come to me for training. My wife has believed in me and motivated me when there have been times, I did not believe I could do this, I am forever grateful for her encouragement, wisdom, and inspiration.
- I would like to thank my niece Andrea Daras, who has helped me with correcting context of this and given valuable insight to the overall outcome of this thesis. Andrea is currently studying a degree for Occupational therapy at the University of the Witwatersrand, Johannesburg, South Africa.
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- Last but not least thank you to the society of dyspraxia in Ireland and the HSE for the information provided on their websites.

Introduction

I have two special needs children giving me a some understanding and compassion for children and students with special needs.

My experience working with special needs students started in South Africa when I trained a student who was blind to black belt status.

Over the years in Ireland I, have trained number of students with special needs, including my own children.

This thesis is based on my own experiences, using one of my students, Saoirse Mullaney (with permission of the parents). She is diagnosed with dyspraxia. I have been training her since 2015 with the end result her winning the British Open Championship (Mainstream) for sparring in 2019.

My qualifications are found in Annexure B

This thesis is a guide to Instructors and Parents alike

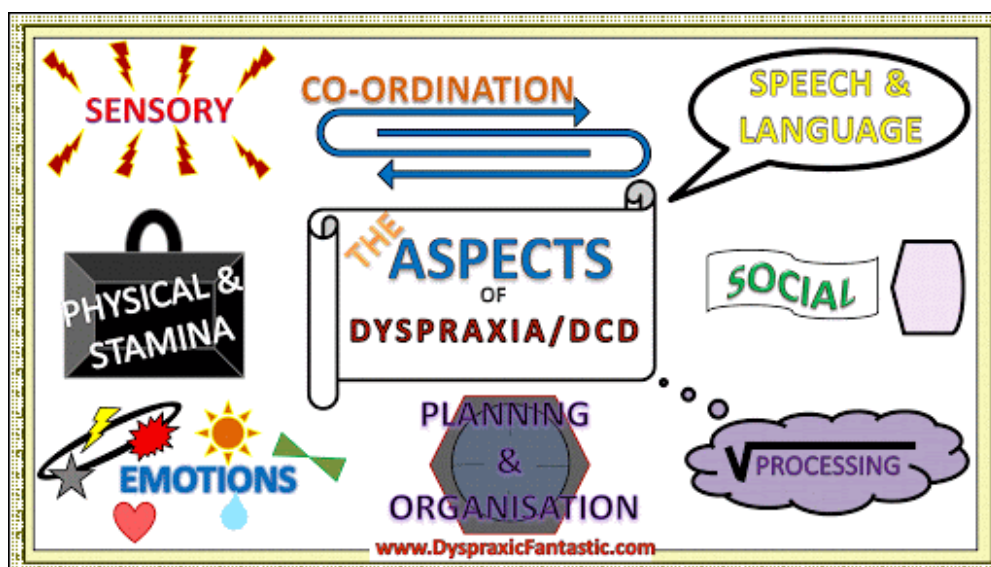
Instructors

This may help Taekwondo instructors to widen their knowledge by giving them the confidence to help special needs students having a more fulfilled life and at the same time play a role in their social responsibility.

Parents & Students

Taekwondo is very good for the development of motor skills and co-ordination helping with body movement

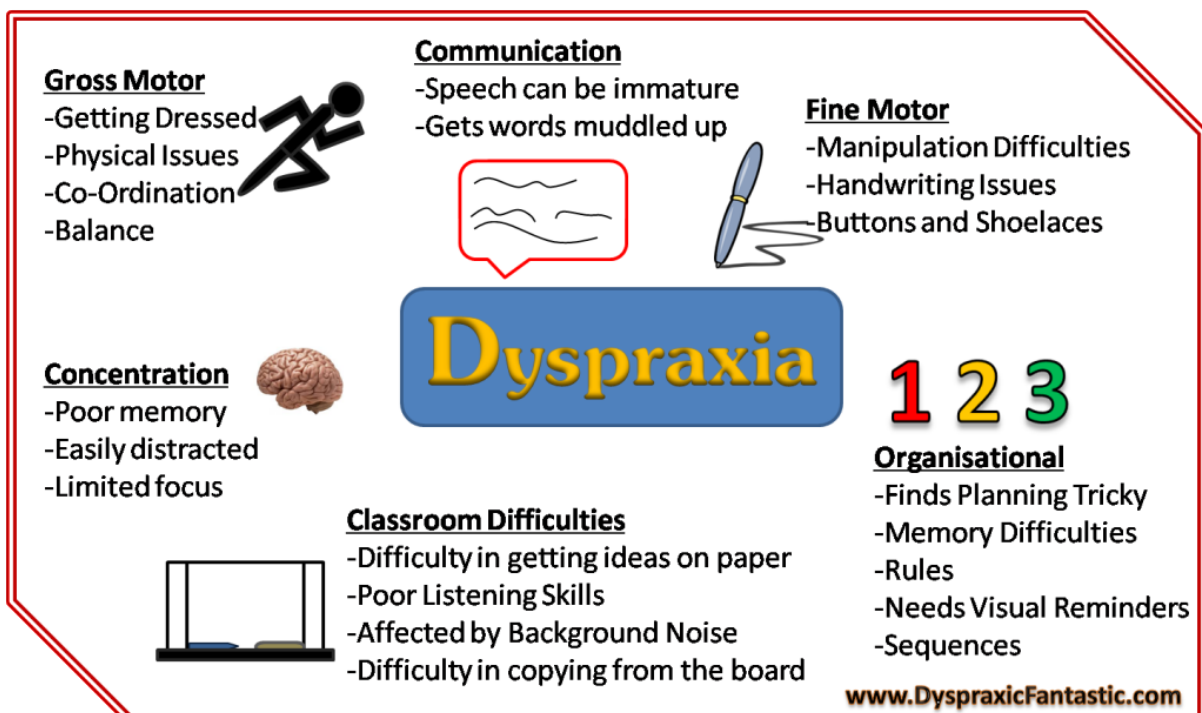
The thesis will asset parents and students, giving an indication to special needs students how Taekwondo can help them living a more fulfilled life.



Purpose of this thesis

The purpose of this document is twofold

- to empower the Taekwondo instructor to:
 - Understand dyspraxia and related disabilities.
 - Have the knowledge to train students who have these disabilities and the benefits to himself and the student.
- To empower parents and students to:
 - Understand the benefits of using Taekwondo as a tool to improve the skills the student requires to experience a better life
 - Improve their:
 - Self-esteem by heightening the physical and mental powers.
 - Self-confidence by encouraging to succeed and to take control of life.
 - Level of discipline by thoroughly training the body and mind in the tenets and techniques of Taekwondo.
 - Self-defence mechanisms by training to recognize situations in which physical self-defence may be necessary by controlling the situation.
 - The mind and body by strengthen the mind and body through increased physical coordination and mental discipline.



Understanding Dyspraxia

Dyspraxia refers to the trouble of movement in the human body and includes difficulty in four key skills

- Fine motor skills
 - Fine motor skills are the ability to make movements using the small muscles in our hands and wrists.
 - Kids use fine motor skills to do many school-related tasks.
 - There are things you can do at home to help improve your child's fine motor skills.
- Gross motor skill
 - Gross motor skills involve movements of the large muscles of the arms, legs and torso.
 - Kids rely on gross motor skills for everyday activities at school, at home and in the community.
 - Kids who struggle with gross motor skills have trouble doing whole-body movements like climbing and jumping jacks.
- Motor planning
 - Motor planning is a skill that allows us to remember and perform steps to make a movement happen.
 - We use motor planning for all physical activities, including everyday tasks like brushing teeth or washing hands.
 - Kids who struggle with motor planning may take a long time to learn and complete physical tasks, like tying shoes.
- Coordination - It sometimes looks that their movements and actions are out of sync

These challenges usually do not exist on their own. Kids with motor skills difficulties often have other challenges, too. These include:

- ADHD
- Transcription and handwriting difficulties, like dysgraphia
- Sensory processing issues
- Mental health issues, like anxiety
- Slow processing speed
- Autism

<https://www.understood.org/en/learning-thinking-differences/child-learning-disabilities/dyspraxia/understanding-dyspraxia>

Common Symptoms of Dyspraxia

The condition affects every person differently, while some experience mild symptoms and others more severe. The signs seen may also differ as the person ages.

However, in most cases, the symptoms are seen early in life, with babies being extremely irritable and having problems feeding. They may have a hard time meeting developmental milestones, including sitting up, rolling over and walking.

The signs change as a child becomes older.

- For toddlers, some of the signs of the condition include:
 - Prefers to eat with fingers, not utensils and is an overall messy eater
 - Is delayed when toilet training
 - Cannot play ball or ride a tricycle
 - Does not play with puzzles or construction toys
 - Unable to talk well with kids their age and may not say single words until the age of 3
- For preschool children, the common symptoms include:
 - Bumping into things and people
 - Issues learning to skip and jump
 - Difficulty working zippers, snaps, and buttons
 - Unable to speak at the right pitch, volume, or speed
- For primary school aged children, the signs include:
 - Desire to avoid gym class
 - Issue writing
 - Moving objects
 - Trouble following directions
 - Weak muscle tone
- Symptoms in secondary school children include:
 - Issues with sports
 - Falls, trips and bumps into things often
 - Repeats things and talks constantly
 - Loses and forgets things
 - Cannot pick up on nonverbal signals

It will be a good idea if the child displays any of the above to speak with a professional about how to best address dyspraxia

Reference : <https://info.brainbalancecenters.com/contact-us>

Taekwondo and special needs students

The benefits of Taekwondo for any student is

- Enhances Fitness
- Builds Confidence
- Creates Flexibility
- Improve Discipline
- Self-defence Skills
- Strengthen Co-ordination
- Develops social skills
- Self-acceptance
- Etc.

The same applies to the student who suffers from dyspraxia the approach and methods of teaching may however be different from student to student and requires patience There are for the person suffering from dyspraxia many more benefits that would be life changing but this will differ from person to person.

It is fairly normal for most children to be a bit clumsy and fall over a lot, but for a child with dyspraxia it takes longer to do basic things like tying shoelaces.

A child diagnosed with dyspraxia could be told that they may not have much spatial awareness, co-ordination, sense of timing or balance which affect things like cycling, tying shoelaces etc. This affects any attempt to join most team sports. They feel guilty when tripping over the ball, fumbling the ball or missing passes and end up leaving the sport with a feeling of guilt because they let the team down and leaves the child frustrated

TaeKwon-Do on the other hand concentrated on the individual performance rather than the class performance which gives a big boost to the child's sense of confidence. The dyspraxia child will most certainly struggle more than other children doing the class. However, with the right motivation as well as training hard inside and outside the classroom will their be most certainly an improvement.

Co-ordination difficulties can even affect adults at work with things like time management, planning and personal organization. Dyspraxia refers to people with difficulties like planning, organising, and carrying out movement in the right order. These skills are developed in TaeKwon-Do by using patterns and sparring such as the Tul pattern and Matsogi sparring.

TaeKwon-Do Patterns

Patterns are particularly good training for a person with dyspraxia.

People with dyspraxia are normally very logical, methodical, extremely determined and have a good long-term memory. Unfortunately, dyspraxia often co exists with ADHD, dyslexia, language disorders and behavioural problems. Because of co-ordination problems dyspraxic children normally avoid team sports. A child with dyspraxia often has underdeveloped motor neurons. The neurons often don't communicate with other parts of the brain; hence the brain takes too long to process the data. The neural pathways between the motor cortex (rear portion of the frontal lobe), which is responsible for allowing us to carry out voluntary movements and the other parts of the brain is weaker. However, these weaker neural pathways can be developed.

Every time you learn something neural circuits are altered in your brain, and through repetition of a particular skill, the relevant pathways develop, just like developing a muscle.

Each neural circuit consists of neurons, which communicate with each other through synapses. Its these synapses that can be strengthened. Through the repetition of learning and training Patterns we not only perfect and master the pattern, but we strengthen the neural pathways. The less an action is performed the neural pathway remains weak. The repetition of movement required in martial arts strengthens the neural pathway, hence compensating for the weaker connections to the brain. Through practice a dyspraxic student can go from being told he would not be able to do sport to riding a bike, and even competing in TaeKwon-Do tournaments.

TaeKwon-Do patterns is beneficial to strengthen the neural pathways that relate to balance, special awareness, coordination, and timing because of the complex movements executing a pattern. Patterns correctly executed requires special attention to do the techniques in the correct order, with balance, timing, and co-ordination. This targets areas in the brain that causes the problems and encourages the inclination for methodical thinking.

Instructors can help dyspraxic students get the most out of their training by starting with some private lessons to determine the needs of the student and at the same time build the students confidence before introducing the student into a class environment. The instructor needs to take cognisance of a few factors

- Assisting the student in areas they battle
- Learn to have patience with the student

- Encourage them to train every day.

Just like regular students not all dyspraxic students can or have the desire to try martial arts but should be encouraged as the training benefits to them are unique. There is no doubt that students with dyspraxia it could take longer than other students to achieve success in the martial arts, but a dyspraxic student is just as able as anyone else to achieve the high standard but may take more dedication and sacrifice from the student, instructors and parents.

Refer to annexure B for a detailed testimony of a martial arts student with dyspraxia

A Suggested Approach

Suggestions how to introduce Taekwondo to a student with Dyspraxia and/or special needs. These suggestions will be different from student to student and need to be adjusted every time

- Meeting the parents and student for the first time should take place not before or after a normal class but rather at a quiet place without the distractions.
- Introduce yourself and give a clear understanding of Taekwondo and its benefits
- Allow them to explain the need they have allowing you to get a clear understanding of the student as well as their needs
- Explain to them how you see Taekwondo can help their child
- Find out what the child likes and what they keep themselves busy with. Many special needs children have what is known as a “rip roaring obsession”. This will assist you to be able to relate to the child as well as creating a program for the child for example Dinosaurs or Tsunamis etc. You can create the dinosaur kick or in patterns say we are blocking the T-REX and now we are punching the T-Rex etc.
- The first session alone with the student should be around 20 min to assess for yourself if you are able to communicate and work with the child. Not every special need child will click with you, and if that is the case you should be honest and refer the child to another club or coach.
- A training session should include:
 - Warm up
 - Stretch
 - 1 Kick
 - 1 Block

- 1 Stance
- 1 Pattern (Repeat as many times as the child can do it)
- Game
- Stretch
- Distractions.
 - Special Needs students are very easily distracted. We need to deal with each student separately according to the need e.g. If a child is demanding to stop training because he wants his toy, video game, etc (Normally a rip roaring obsession item) You take the Item and gently but firmly say: “We need to complete the training before you can have the toy”
 - Remember all children do like boundaries but it is the way the instructor enforces these boundaries for the students to buy into these boundaries
- In your training program make provision for the following
 - Find a Taekwondo role model
 - Make Life adjustments
 - Give them an outlet
 - Allow them to fidget
 - Seek out the help of other professionals
 - Work with an occupational therapist
 - Encourage physically active learning
 - Use simple assistive technology to assist students
 - Continue to assess
 - Allow slight alterations to your rules
 - Encourage taking steps towards a goal
- This is just an indication of how to put a plan together but please keep in mind that training special needs children is a journey and does not work for every instructor. Patience is key to success.
- Please refer to the case study below for more information on training a student with special needs

Case Study

Saoirse Mullaney

This reflects my own experience with one of my students diagnosed with Dyspraxia

The information supplied below is with permission of her parents

A summary of her diagnoses

- October 2014
 - Psycho-educational Assessment Aine Smyth
 - Saoirse got diagnosed with Dyslexia, Auditory processing disorder and characteristics of Dyspraxia.
- February 2015
 - Occupational Therapy Assessment Nicola Young, Sunflower Clinic Kilkenny
 - Saoirse diagnoses of Dyspraxia and significant sensory processing disorder.
- February 2016
 - Occupational therapy, Aurora Clinic Enniscorthy Wexford
 - Handwriting Assessment
 - Awarded a laptop for Saoirse
- October 2016
- Irlen Diagnostician, Aislinn Ryan
 - Diagnosis with Irlen syndrome
- Saoirse has Juvenile Idiopathic Arthritis under Dr Orla Killeen, Crumlin Children's hospital.



In the summer of 2015 Saoirse Mullaney came to me at the age of 7 years old she was suffering from dyspraxia and childhood arthritis. When her mom Kelly brought Saoirse to me her concerns were enormous, everything was a problem Saoirse

- Saoirse would not make eye contact
- She had low confidence and self-esteem
- She was sad about her body shape
- She was bullied due to her Irlen lenses
- Saoirse could not read facial expressions and body language
- She had poor core stability.
- The biggest thing was that Saoirse was sad and depressed.

Her parents took her from specialist to specialists, spending thousands of euros on Occupational Therapists, Play Therapy etc. they followed sensory diets and everything the experts told them to do.

Their Occupational Therapist advised them to try TaeKwon-Do.

My own experience with special needs was very limited let alone with students who have dyspraxia. I had trained a young man in South Africa that was blind to black belt and competing tournaments (sparring and patterns) Training Mark was a huge challenge, coming up with unique ways for him to do patterns as well as techniques to enable him to defend himself and to spar. Dyspraxia was at that point new to me, however I was motivated by the challenge and felt a real desire to help Saoirse to overcome some of her difficulties in life.

Saoirse joined the mainstream classes the gym in Waterford, in 2015 at the age of 7 and was a joy to have in my classes. Saoirse was very friendly and fitted right in with the other kids, making many friends, but battled to get the movements right as fast as the other kids, although she struggled for a long time, she never wanted to quit, a sign of her determination, which I really admired. After green belt (around 2 years of training) I received the sad news from her Mom that she wanted to stop training due to arthritis pain. This made me feel very sad as she was a very special young girl that had a lot of challenges like travelling from Waterford almost once a month to Dublin Temple Street children's hospital (a two hour drive) to have her childhood arthritis treated because she was in such pain. She was sometimes bullied by some kids on the school bus due to her shaded Irlen glasses she had to wear. She had to wear these special glasses at school to cope with the stress bright light caused her.

After couple of months I received the good news that they had found the right medication for Saoirse and was coming back to training. She loved it. After a few weeks it became apparent that she hated the sound in class groups because overwhelmed her, I spoke to her mom for Saoirse doing private lessons instead. Saoirse in my mind would become better than most of the other kids in the long run, although she took longer to get things right, for example a side kick most kids get right the first time they are shown, Saoirse might need to be shown 10 different ways. In the end she would know 10 ways to teach each a side kick to another student where the other kids would only know the one way to do it.

One private lesson a week would enable her to get ahead and catch up, developing her talent to the full. Saoirse agreed to give it another go! The private lessons were a turning point for Saoirse. We started in October 2017 and she went from a frustrated and demotivated young TaeKwon-Do student to become the Open British Champion in 2019 two years later!

From being desponded to British Open Champion

Saoirse would meet me once a week for 30 min, we would talk first about how her week went and how she was feeling that day, this would give me an indication of her mind set for the session. If she were in pain from arthritis, I gave her more stretching and patterns. If she were in a good high energy state, we concentrated on sparring training.

To find the right sparring style to Saoirse we looked at some of the top female fighters in the world using YouTube footage and decided that Katya Solovey was the style that was most suited to her. This is an important first stage of training a person with dyspraxia. They need to identify themselves with someone that inspires them and can relate to be like. We watched many of her fights and took techniques from Katya and copied them. Being dyspraxic a student must redo a technique many more times than other students. However, once they understand the purpose and **method** of a technique, they have far more determination than your average student to train and perfect it

The same process was followed with the Patterns by studying the competitors competing in World Championships, she loved watching them and soon became inspired, once inspiration sets in you are halfway there. I would let her perform the moves and film her, then we would watch the video of her together enabling her to understand where she was going wrong by seeing herself doing it. Once we identified the right technique, we would train it over and over until it was perfect. Kicks we would focus on wall bar work this (I believe is essential to perfect kicking technique. For stance and hand technique we did countless static and dynamic repetitions on the floor.

Using our imagination, Saoirse and I came up with many new and better ways to improve her skills both in Patterns and Sparring.

Repeating sequences over and over again movement was perfected, as explained in the testimony of Mr. Bellasie and I Quote "Through the repetition of learning and training patterns we not only perfect and master the pattern but we strengthen the neural pathways. The less an action is performed the neural pathway remains weak. The repetition of movement required in martial arts strengthens the neural pathway."

Saoirse has won medals in local, national, and international tournaments, including the British Open Championships which is a major International event.

I am proud to have her as my student. She inspired me to do this thesis for my 8th degree on the benefits of Taekwon-Do for Dyspraxia students.



Saoirse with Coach Master Franks

Kelly Mullaney (Saoirse's Mother) Testimony

Kelly's shares her experience with Taekwon-Do and the difference it has made in Saoirse's life

We honestly have not looked back. Saoirse was attending OT on a weekly basis. She started Taekwondo with Neil Franks. Our life changed for the better. Not only for Saoirse but our family life.

Neil taught Saoirse inner strength and with her determination her skill soared.



Kelly with Saoirse after winning gold at the British Open for sparring

Yes Saoirse finds things harder but with Neil's backing and dedication she can do whatever everyone else can do and sometimes better. That is a big thing in any child's life. Saoirse is 12 and is not below average in the Taekwondo world. She has all these diagnoses, but we did not want her to go into any category only mainstream

Neil has pushed her to her limit. Neil can read Saoirse and he knows when to push her and when to hold back. Saoirse could never hold her anger and had continuous

meltdowns. Neil has taught her the Taekwondo way. When she feels like she will blow she will do several sidekicks, Burpees etc. to manage her anger.

Saoirse has improved in every single thing and that's big thanks to Neil. He likes perfection which has rubbed off on Saoirse.

She has dealt with bullies thanks to Taekwondo which gave her the confidence to do so.

Saoirse's core is so much better she loves her body now. Always in front of a mirror now which is a big thing as we had to take it out of her room as she hated her body so much. Aiming for a six-pack good luck with that Neil

Neil has helped us by giving Saoirse scenarios of mean people and how to deal with them. Where now Saoirse tries to read people because with the dyspraxia (she's a bit more innocent) she would never see the bad in anyone.

What has Neil Franks and Taekwondo done for Saoirse?

Neil gave us hope from the first moment we met him. He took Saoirse under his wing. He noticed every mood in her. Saoirse went through a phase which looking back now she was depressed did not want to go to TaeKwon-Do.

Neil met her and told her she was too good to give up and said things are hard in life you need ways to deal with it not run away from it. Something triggered in Saoirse after that chat. She was determined to prove Neil was right.

She saw Neil / Master Franks Taekwondo fitness centre as a family never did I think she would look up to a stranger like she does to Neil. She adores him. Neil Franks gave our daughter what we could not achieve. He gave her confidence, self-esteem, and the love of Taekwondo. Saoirse dream is to make the Irish team and represent Master Franks and Ireland

Master Franks Taekwondo Centre is a family. She has made so many friends. The little Pandas (4 to 7 yrs.) look up to Saoirse. Giving her high 5's wherever they might see her. Saoirse is buzzing when she comes home from TaeKwon-Do. It's a fantastic club and we delighted to be part of it!

We can't thank Neil for introducing the love of Taekwondo to our little girl.

We are very lucky to have Neil looking after our little girl and now our son Cormac has joined and wants to be as good as his sister.



Saoirse with her teammates at the British Open Championships Nov 2019.



Conclusion

It is a proven fact that martial arts and more specific Taekwondo can be very beneficial to students with special needs

This thesis can be read as a guide and will be very beneficial to instructor and student alike.

Please remember this is only a guide and reflects my personal experience

A final word to both instructor and student

Patience Is Key

Annexure A - Resume – Neil David Franks

- I grew up and lived in South Africa and moved to Ireland in July 2011, teaching Taekwon-Do as part of the ITA in the Waterford region.
- My professional career in Taekwondo started early in the late 1980's
- While in South Africa I trained more than 45 black belts from 1st to 4th degree many of whom are still involved in the sport.
- I have a Sports Science diploma

Involvement in Taekwondo

- Since 2000 have been to more than 14 international and world championships, taking anything from 8 to 25 participants to these tournaments with a very high medal count
- Attended and completed 5 IICs under General Choi, in 1991 North Korea, 1992 Moscow, 1994 South Africa, 1997 Prague and 1999 Trinity College Dublin.
- Attended the IIC under Grand Master Choi Jung Hwa in Dublin in 2013.
- Completed 8 IICs with GTF from 2004 to 2011.
- Completed at least one IIC every year since in Ireland

Personal achievements

- 1985 Awarded best Student in Taekwondo South Africa
- 1987 Black Belt 1st Degree under the International Taekwondo Federation (ITF)
- 1989 2nd Degree Taekwondo Black Belt, under the ITF,
- 1991 3rd Degree Taekwondo Black Belt under the ITF Cert No SA -3-3
- 1991 Selected as Springbok to Represent South Africa at the World Taekwon-Do Championships in Pyong Yang, North Korea
- 1993 Selected at Protea to Represent South Africa at the World Taekwon-Do Championships in Kuala Lumpur Malaysia
- 1995 Won the Australasian Championships for Sparring and Patterns in Melbourne
- 1995 Graded to 4th Degree Taekwondo Belt Belt in Italy Cert. No SA-4-2
- 1999 Graded to 5th Degree Taekwondo with ITF in Dublin Ireland Cert No SA - 5 - 1
- 2004 Founded the Global Taekwondo Federation of South Africa and opened the Headquarters in Rivonia, Johannesburg



- 2005 Graded To 6th Degree with GTF Cert No SA-6-1
- 2005 Brought Master Xuan Ha, 8th Degree Master and Technical Director of GTF to South Africa for a Technical International Seminar in Johannesburg
- 2006 Six of my Black Belt students became World Champions at the GTF Taekwon-Do World Championships in Italy
- 2009 Eight of my Black Belt students became World Champions at the GTF Taekwon-Do World Championships in Malaysia
- 2010 Selected as one of three Instructors across the World to head up the Technical committee of the Global Taekwondo Federation By Technical Chairman Master Ha, 8th Degree Black Belt
- 2011 Graded to Master 7th Degree under GTF 2011 Cert No SA-7-1.

Umpiring & Coaching Experience

- Global TaeKwon-Do International Referee, 2004, 2005, 2006, 2007, 2008, 2009, 2011.
- Selected to coach Irish Team for Patterns in World Championships 2014.
- Selected to referee for ITF at World Championships.

Annexure B - Testimony -Thomas Bellasie

“An ancient art, for a modern world”

Overcoming dyspraxia through the martial arts. By Thomas Bellasie. BA

This is the testimony of Thomas Bellasie, who has battled with Dyspraxia all his life. He explains how Martial Arts has helped his life. In this case he has done it through Goju Ryu Karate, but the principles are the same as in ITF TaeKwon-Do. The repetition of Patterns increases the strength of the neural pathways and the connection to the brain strengthens with this repetition. In his story you will find extensive proof of the positive and life changing effect Martial Arts has on Dyspraxia.

His Testimony:

As a young child, of around 6 to 7 years old, I was diagnosed with Dyspraxia/ DCD (Developmental Coordination Disorder), and Dyslexia. The preferred medical term for Dyspraxia is DCD; hence I shall refer to the condition by this term. My difficulty in reading, as well as in tasks such as cycling, tying shoe laces and general clumsiness were early signs. The headmaster at my first school had very archaic attitudes to learning difficulties, which in hindsight is perhaps understandable. In the 1990's, learning difficulties, such as Dyspraxia, Dyslexia, and ADHD were just starting to be more widely accepted. The headmaster was close to retiring, and wasn't about to alter his methods of teaching. To him Dyslexia was "*stupid boy syndrome*", Dyspraxia – "*clumsy boy syndrome*". This was a fairly common attitude. Fortunately, with incredible support from family, many of whom later became teachers; my first non-picture book was 1984, by George Orwell. I vividly remember the week when I became able to read.

The first educational psychologist who I saw told me that I would never be able to cycle, would probably not do my SATs, and may never wear shoes with laces. At secondary school, the educational psychologist told me that despite my intelligence, she confirmed similar things. Despite gaining good grades at college, I was not "*university material*". This all seems rather dismal, doesn't it? I am now 31 have earned a BA in philosophy and psychology, a black belt in karate; I enjoy wakeboarding, and ride a motorbike. It may be thought that learning difficulties are less stigmatised now, and that there is a greater understanding. It is certainly true that there is more specialist support available, and most teachers vaguely know of these conditions. However, there is still a huge lack of understanding within the general population, despite DCD affecting roughly 8-10% of the U.K. This is a significant minority. The vast majority of literature on DCD focuses on the

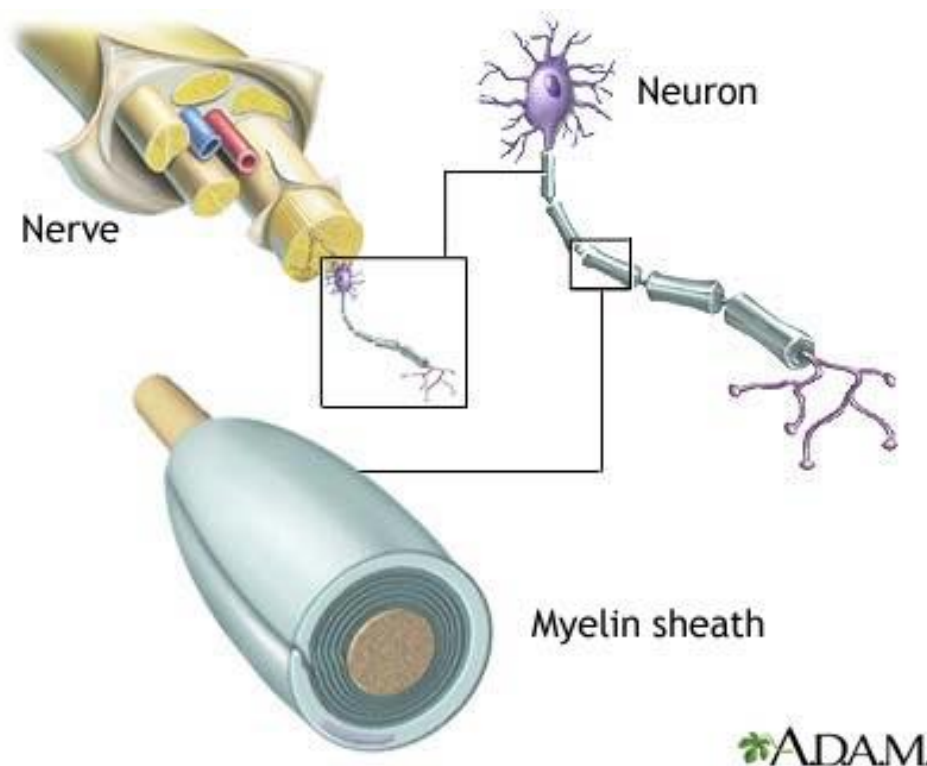
early stages in childhood, but does little to address the continual development, and coping strategies as an adult. Through this article, I aim to address this issue. I shall explain what DCD and Dyslexia are, with the primary focus being on Dyspraxia, and the neurological, and neuromuscular mechanisms behind it. I feel that most literature on the condition fails to fully explain the condition, despite the importance of understanding the condition in supporting someone with this condition. Traditional martial arts, specifically Goju Ryu Karate (under the tutelage of Paul Coleman, 7th Dan) has started to remap my brain.

My love of martial arts started when I was around 7 to 8 years old. My brother showed me a Bruce Lee film. Nobody could predict how much this would inspire me. I started to ask around, and do some research. Firing up the noisy dial-up internet, and asking around, I found a Judo club. After months of nagging Mum, and family discussions, I went to my first lesson. Understandably, she was concerned that I was setting myself up to fail. I got slammed to the mat hard, but found my tenacious nature which was to become my greatest asset in helping me. I immediately started running, swimming, and body weight exercises, by the age of 10, I was reading about the history of Judo, Asian philosophy, and Feudal Japan. I was hooked. Through gaining better core strength, and understanding balance better, my practice started to help my everyday life. When I was 10, Mum made huge sacrifices to get me into a private, specialist school. It was amazing; they understood how to help me. My academia started to improve, and so did my balance. I will explain some of the methods which were used later in this essay, before explaining how my instructor, and friend, Kyoshi (teacher of teachers), Paul Coleman saw my enthusiasm, and would support me in achieving far beyond my expectations. This was only the start of a long journey, which I am still on.

DCD is a common disorder, which affects fine, and gross motor co-ordination, and can also affect speech. I undertook speech therapy as a child, and I still think about slowing down my speech, and annunciating my words. This is still a problem when I'm tired, but an awareness of it helps. DCD has been described as, an *“impairment, or difficulties with, organisation, planning and execution of a physical movement, with a developmental rather than acquired origin”* (J. Appleton, J. Appleton, R. Gibbs, 2007). Interestingly, as with many learning difficulties, it predominantly affects males, and has a high rate of co-morbidity (rate of co- occurrence) with Dyslexia, ADHD, and autism spectrum disorders. According to Dr M. Portwood, this may be as high as 40-45% (M. Portwood, 2000). This makes it extremely hard to diagnose, as ADHD and dyslexia may also cause poor coordination. The essential feature of Dyspraxia is the impairment in the development of motor co-ordination, which is caused by problems in the communication in the neurological and neuromuscular connection.

In order to give a more concise explanation of DCD, we must take a slight detour in explaining some basic neuroscience, regarding proprioception, neural pathways, and DCD. I will then explain how martial arts help with this. The brain comprises of around 10 billion neurones, which are the bricks in the foundation of the structure of the brain. Neurones make and break connections with other neurones. A single neurone can have 10,000 links, or as few as 1-2 in other neural networks. To make this appear less esoteric, imagine a spider web, as another strand of silk is added, the connections in the web increase, and the overall complexity of the web increases with it. Forming neural networks gives the brain its incredible learning capacity. Intellectual ability isn't the number of neurons, but the amount of connections.

One of the major features of the neurone is the axon, leading from the cell, covered in an insulating layer of myelin (consisting of proteins, and fatty substances).



<https://medlineplus.gov/ency/imagepages/9682.htm>

This axon carries the electrical pulse, and at the end of the axon is a gap (synapse), which is the point in which the electrical signal is transferred between cells. The axon releases a neurotransmitter, which causes electrical activity in the receiving neurone, causing electrical discharges/nerve signals to occur in the membranes of the neurones. The synaptic junction is where the signal transfer takes place and the neurone fires when it is stimulated to a certain level. The pattern in which the

neurones fire is important. Much like a 4 stroke engine, if the correct sequence of events doesn't occur, the engine won't work. The intake has to happen before the compression, the neurones have to fire in the right pattern, creating neural pathways. One of the problems in DCD is in the pattern of firing in some neurones, as well as the connections between them, signals are lost in the synaptic gap. If the connections are weak, the neural pathways will also be weak. *"The neurones form increasingly complex neural networks which are the basis of the nervous system"* (M. Portwood, 2000). The brain stem and limbic system understand the signals within the body. They respond to emotions, and hunger within the body, as well as to the endocrine, and autonomous nervous system. These regulate the heartbeat, respiration and digestion.

The Thalamo – cortical system consists of the Thalamus and the cortex, which work in conjunction to receive signals from outside of the body. The cortex is adapted to receive signals from the sensors, responding to our senses (sight, touch, taste, smell and hearing). Most germane to our purposes, it responds to proprioception (our body's awareness of its position in space). If I were to ask you where your left hand is during a game of twister, your knowledge of where it is, despite being in a contorted position is a great way to show proprioception! DCD is primarily a proprioceptive disorder. The Thalamo-cortical system makes up about ¼ of the brain's volume, and a huge 75% of its 10 billion neurones.

The function of these neurones transmits from one part of the CNS to another.

The neural connections are affected by the messages which the brain receives from external stimulation, within our environment. To borrow an analogy from Kyoshi Paul Coleman, imagine a lawn with a path around the outside, people continuously cut across it, eventually wearing down a path in the lawn. If they stop doing this, the path will disappear. As they start the habit again, the pathway comes back. As the complexity of the connections increase, the pathways become easier to trigger. The more synapses which a pathway has, the faster the network becomes. A mature connection requires fewer electrical pulses. As the pathway increases in complexity, the processing speed increases with it. As a young child, we have an excess of connections, but by the age of 3, as the brain develops, the lesser used ones are "pruned". Unnecessary connections die. Where the brain hasn't reinforced the correct pathways, messages travel along longer routes, resulting in slower processing, and an increased chance of the signal not being processed. *"This persistent neurological inactivity is the basis for youngsters with Dyspraxia"* (M. Portwood, "Understanding developmental Dyspraxia", 2000). The difficulty in motor control and proprioception in those with DCD is a result of under-developed motor neurones, resulting in a longer processing time.

Efficient brain function is heavily reliant upon the transfer of information between the limbic and cortical systems. The cortex consists of the left and right hemispheres which have different properties. There are 4 cortical lobes, consisting of:

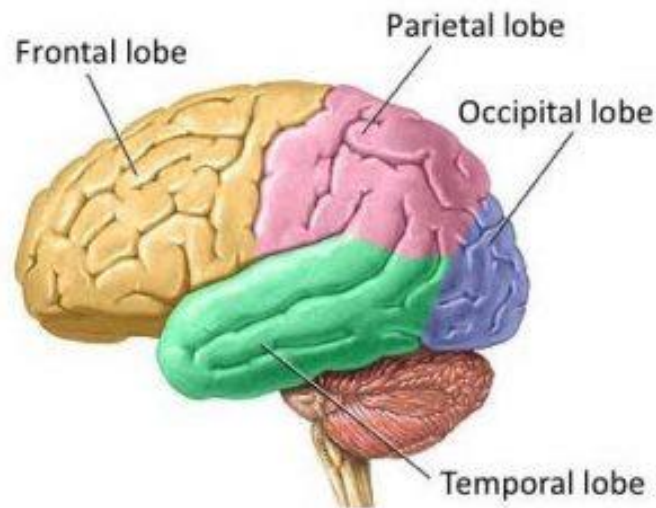
- Frontal lobe- involved in organisation, voluntary movement, planning, purposeful activity, and production of speech.
- Parietal- Processes the responses to pain, touch, and coordinates joint/muscle positions.
- Occipital lobe- analyses messages from the retina, before transferring to parietal.
- Temporal-interprets sound.

The cortex is split into right and left hemispheres, which are connected nerves (Corpus Callosum). The left receives sensory information about the right side of the body. The left hemisphere processes sequentially, and works with analytical information. It interprets information then fits the pieces together like a jigsaw. This helps with linguistic reasoning and skills. The right hemisphere combines the parts, and doesn't organise in a linear way, but simultaneously. It helps with:

- Depth perception, and pattern recognition
- Visual and spatial processing
- Sensitivity to melody and rhythm (dancing, music etc.)
- Non verbal stimuli

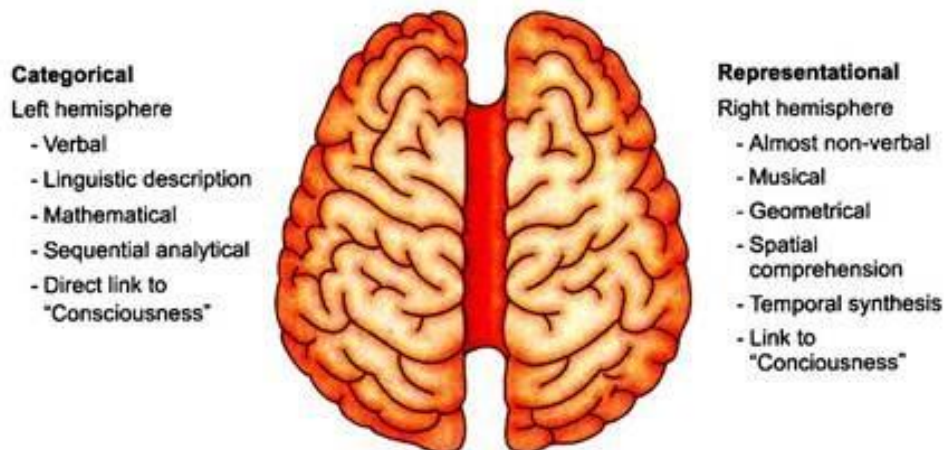
The right hemisphere processes information quicker than the left. Each hemisphere does its job then sends the information to the opposite hemisphere if needed. It is heavily accepted that learning a skill such as music, or languages results in an overall improvement in cognitive ability. This is also true of physical skills, such as martial arts. This is because encouraging the development of one hemisphere, often results in improved cognitive function in the other hemisphere.

Arguably, one of the reasons that males are more prone to learning difficulties, such as Dyslexia, and DCD, is that males appear to have evolved specialised functions in the hemispheres (left-language, right-spatial/visual). This means that if one hemisphere experiences processing challenges, they are unlikely to ask their neighbour for help. In contrast, if a female has processing challenges on one side, they are more likely to utilise the systems of the neighbouring hemisphere. Men are less adaptable in our cognitive make up, than our female peers.



<http://www.biologydiscussion.com/nervous-system/4-main-lobes-of-cerebral-cortex-with-diagram/62812>

Both Dyslexia and, DCD are more prevalent in males. *“Males are four times more likely to be affected than females”* (<https://www.mentalhealth.org.uk>). DCD results from difficulties in processing information in the right hemisphere. Dyslexia is caused by an issue in processing in the left hemisphere. It is not fully understood why there is such a high co-morbidity rate of the two conditions, but issues in communication between the two hemispheres may be one explanation.



http://www.internetdict.com/wp-content/uploads/related_images/2016/01/14/what-are-the-four-lobes-of-the-brain_1.jpg

This may all seem rather dismal for those with DCD, but claiming that a child “*will never be able to cycle*”, as I was told as a child leaves out one important mechanism of our brain. Our brains are extremely adaptable. Through a process of neuroplasticity, we can reorganise our brain, changing its structure. Neuroplasticity is the process of reorganising and forming new neural connections throughout life. This allows the neurones to compensate for conditions or injury. Undamaged axons can grow new nerve endings, hence forming new neural pathways to help accomplish a function. With the right training, we can overcome huge challenges through this process.

When I started Judo, and a regular fitness regime, I had started this process. A well managed exercise program, with a focus on core strength and stability creates a great foundation for finding a good path of overcoming these difficulties. There is a general acceptance that children with DCD, often have below average strength, which contributes to poor balance and motor function. Personally, this wasn't ever a big problem, because I was raised to be an extremely active child. As a teenager, I started researching nutrition, and trying different exercise programs, getting increasingly interested in martial arts. I was constantly working on my weaknesses, and strengthening the neural pathways, gradually reshaping my brain. It is this same process which has helped my dyslexia, and allows me to write this and develop into a fairly prolific reader.

When I was about 9 to 10, Mum managed to get me into a specialist school for those with DCD, and dyslexia. She volunteered as an administrator, and dinner supervisor. In return, I was given a place at the school. PE lessons consisted of working with balance beams, trying to walk down straight lines, and numerous balance related exercises. Although I was stronger than a lot of my peers to begin with, walking on a straight line was a huge challenge, but the neural pathways were gradually strengthened. With regards to my dyslexia, they tried putting coloured film over the pages of my books, as often the contrast of the black text on the white background creates difficulties in focusing. My problem (and still is when I'm very tired) is that my eyes weren't tracking the text across the line properly. I would start reading a line then my vision would drift to the line below it, resulting in fairly amusing sounding sentences! I used to read with a ruler underneath the line. Eventually, I didn't need this. As soon as reading wasn't such hard work, I started to really enjoy it. This is working with the same process of neural plasticity which allowed me to increase my proprioception enough to compete in Judo, and start learning Jujitsu.

Martial arts depend on co-ordinated actions, balance and a force output. The skilful actions are an expression of co-ordinated movement. Complex movements usually originate in the lower/mid brain. The motor neurones receive signals from the, cortex, brain stem, and spinal cord and directly from sensory neurones in the CNS. Literature on DCD regularly describes the neurological issues, which I have already covered, but rarely discusses the role of the receptors in the muscles, which are a vital part of the CNS. My progress through physical training is, in part due to creating new neurological pathways, but the neuromuscular affects of training must also be considered. The brain interprets information from receptors around our body for all of our senses, this includes proprioception. Receptors are specialised cells, which alter their properties in response to stimuli. Different receptor systems allow the body to differentiate the type of energy being absorbed, hence helping information to be shared with other neurones within the CNS. We have 3 main types of receptors:

- Interoceptors- Convert information from within the body
- Exteroceptors- Transmit information from within the environment
- Proprioceptors- Convert information about the relative location, and movement in space of the body parts, telling us where each part of our body is at one time.

As already discussed, DCD is a proprioceptive disorder. It is both a neurological and neuromuscular condition. Proprioceptors are the most important to mechanical movement. These pass on information about muscular changes in the limbs and torso. The most important types of proprioceptors are: Muscle spindles, Golgi tendon organs, and the Gamma system.

Muscle spindles run parallel to muscle fibres, and provide sensory feedback about length changes, and rate of changes in the muscle fibres. If a length change happens suddenly, it can induce a stretch reflex to protect the muscle. The Golgi only recognise, and react to force. Force sensors recognise changes in the tension of the muscle, thus protecting the muscle from excessive force. They only react to force in associated fibres to their area. This can be altered over time. The suppression of Golgi training is a premise of plyometric training, which is essential for martial arts. The aim of plyometric training is to exert maximum force, in a short time, hence increasing power. The Gamma system takes information from proprioceptors, and bypasses consciousness, creating unconscious reflexes. They also inform the CNS where the limbs are in relation to the body, and create our 'internal map', which is used to carry out movement.

Signals from proprioceptors travel along sensory nerve fibres, along the spine. The primary sensory nerve fibres make direct contact with the spinal motor neurones. Some sensory (afferent) nerve fibres travel directly to the brain, helping limb positioning, movement planning and body perception. From my experience, it is evident that through a well designed exercise regime, and regular martial arts training, I have increased the strength of the muscles, and created more active nerve fibres in these systems.

By the time I was in my twenties, I was able to start wakeboarding, and was training in Karate. I started Goju Ryu Karate when I was about 25 to 26. By this time, my DCD was only obvious during my training, but not obvious in my daily life. I had accepted that this would always be the case. Through experience, and research, I suggest that strength training is extremely useful for those with DCD, but isn't as effective as fitness training, combined with the technical training of traditional martial arts. It seems to be the combination of mental and physical training which is most effective in combating the symptoms of DCD.

Through training with some local instructors, I managed to get to a certain level. However, knowing that I wanted to take my training further, I contacted Kyoshi (teacher of teachers) Paul Coleman, as I knew that his academy (Oxford Karate Academy) had an incredible reputation. He has gained a 7th Dan in The All Japan Karate-Do Seiwakai and 7th Dan Japan Karate Federation Goju Kai, and is an international examiner. We immediately got along well, but he noticed that I had some very odd habits. Due to my unwillingness to be treated differently, I have developed a habit of not telling people about my condition. During my University study, I didn't take extra time for exams, which is probably ill advised! During a conversation in the pub with Kyoshi Paul Coleman, where I explained how much training had helped me, I explained DCD, and Dyslexia. My training changed from that moment. He started working with me to figure out how to adjust my training, utilising his diverse teaching methodology. I gained my 1st Dan/level Black Belt through him, and I'm currently working towards my 2nd Dan/level Black Belt). Kyoshi Coleman started boxing, and Judo when he was 11, then decided to focus on Judo until he was 21. Kyoshi started another style for 6 months, before discovering Goju Ryu when he was 18, whilst he was still training in Judo. His passion and dedication to the art is contagious. He left school at 15, acquiring qualifications in various jobs, before leaving the building trade. At that time he taught karate part-time. He decided to teach Karate full-time in 1992. He has immersed and dedicated himself to training, competing and teaching. He has worked harder with me, over the past year and a half, than any of my teachers throughout all of my formal education. Together, we have started to understand my condition more, which has inspired enough progress to research this article,

and share my experiences. I have started to realise that traditional martial arts have something to offer that few other activities can. For those with DCD, I would strongly suggest finding an instructor, who understands your condition, and will work with you and push you to achieve your potential. This may take time.

A karate lesson will generally consist of practising basic techniques (kihon), fighting drills/ partner practice (kumite), and practising kata (forms). Kata and kihon can be practised by oneself, with very little space. Kata are detailed, choreographed sequences of martial arts movements, which were developed to help the practitioner to improve their skills through daily practice. They don't require any equipment, and are a form of solo practice, which can be done anywhere. In order to do something reactively in a fight, the response has to be hard wired in the CNS. The neural pathways required for the movements are built through practising the movements thousands of times, hence reinforcing the pathways associated with such techniques. This includes increasing the efficiency of the receptors in the muscles. The kihon are practised to improve individual techniques, stances and combinations of movements and the techniques are also practised in pre arranged sequences in the kata. These are then applied/tested with a partner during partner drills or kumite. Hence, in a single lesson a single technique is practised in a variety of ways, and with different variables. It is precisely this constant repetition which is vital for someone with DCD. I am constantly working on proprioception, distance perception, and balance.

Although any activity which relies on co-ordination, and balance will be beneficial to someone with DCD, this constant neurological and neuromuscular reinforcement is key to improving. Fighting arts like boxing, MMA, Kick-boxing may be useful, but the structure of an art which includes kata (included in most Asian martial arts) seems to create an environment in which we are constantly reinforcing the neural pathways, and practising the areas in which someone with DCD struggles. Dancing and music follow a similar structure. A pianist will practice the basics, learning relatively simple pieces then build on that to create more complicated scores. They will play a piece, then isolate one part which they are struggling with, then practice that part constantly, before reintegrating it into the piece. This constant reinforcement requires certain character traits. The individual must have a persistent, tenacious nature, they must accept that they will have to work exponentially harder than their peers who don't have DCD, but hard work often overcomes talent. Someone who works incredibly hard at something, and sees the benefits will continue to improve, whereas an exceptionally talented person often quits as they rise up to higher grades. Of course, the best dancers, musicians and martial artists in the world, are those with an incredible work ethic,

and natural talent. But to achieve a high level of skill, hard work, and a great support network is essential. Hard work is king!

Purely through experience, and through having a curious and perceptive mind, Kyoshi Coleman intuitively knew how to work with me to reinforce the neural pathways in a way which works for me. He pushes me hard, because I respond well to it, and I care about what I do. I have always pushed myself hard, but he helps me to push myself harder. Together we have come to appreciate something which is severely overlooked in literature about DCD. Where the eyes are focusing massively affects proprioception. My wakeboard instructor also regularly tells me, *“you look down, you go down”*. If I look down when I jump a wake, the nose of the board normally hits the surface of the water first, requiring quick reactions and skill to correct posture and balance, hence you normally *“wipe out”* (crash into the water), it's often dramatic and amusing, but it hurts! The line of sight is extremely important. In order to demonstrate this, try standing on one leg, looking straight ahead, then look up or down, you will notice it affect your balance. When I'm training, Kyoshi often stands where I should be looking, instructing *“look at me”*, or picking marks on the wall, doors or windows as points of focus. Training in front of my reflection is also highly beneficial. Seeing my mistakes, my body corrects it, often without conscious thought. For most of us vision describes how clearly we see an object, but vision affects us in more profound ways than we usually conceive. *“To maintain balance and navigate space in the physical world, we must organise, and integrate information from the eyes, proprioceptive [...] and vestibular (inner ears sensing motion, equilibrium and spatial awareness) systems”*. (Dr N. Davis OD 2016). When a person loses sight, or hearing, they often have difficulty maintaining balance, and require help to *“relearn”* certain skills, which were previously taken for granted, such as walking.

The relationship between the vestibular and visual systems begins at birth. As young children, movement guides vision, but as we develop, vision starts to guide movement. Around half, to two thirds of the brain is used for visual processing. Unless our eyes are closed, two thirds of the electrical activity of the brain is devoted to vision. Any disruption to the vestibular and visual systems, through injury, or ocular condition, often results in a disruption of balance. Kyoshi Coleman has an intuitive understanding of this, and realised how much visual training could help me.

Throughout this essay, I have explained what DCD is, and how martial arts have helped me. Being told as a child, that *“you will never...”*, is potentially damaging to a child. It encourages them to not try. This, in my opinion, is a huge mistake. We should be telling those diagnosed with DCD about the struggles which they will

face. However, with a great support network, a positive mindset, and an iron-clad tenacity, there is no reason that someone with DCD can't achieve their goals. Finding an activity, which constantly builds the neural pathways, and working on visual training are essential to cause the process of neuroplasticity to take place. Traditional martial arts are a great way to do this, but dancing, or music will help build the neural pathways. It is the constant drilling of a movement which is important, combining this with an exercise program which strengthens the core, constantly working on improving balance, and co-ordinated movements that will bring huge benefits. Parents, and teachers should work with the individual to help them find the activities, which they enjoy, and work on these highlighted areas. I feel that learning support departments in schools should work closely with PE departments to facilitate the students with DCD. Personally, I think that the physical, and cognitive challenges in traditional martial arts, make it uniquely placed to help those suffering with DCD. The very nature of the art means that we are constantly working on the areas affected with DCD. If you are able to find an instructor who is willing to dedicate the time, and patience to help you, then the benefits will be huge. I am lucky enough to train with a world class instructor, and be supported by some incredible instructors at Oxford Karate Academy. They all understand my challenges, but work with me, which has led to some incredible experiences.

Last year 17 of us travelled to Japan to train. We spent a week training 5 to 6 hours per day. The training focused on constantly drilling certain movements. The precision of technique via high level instruction, and intense, focused training was incredible. It is exactly this type of immersive training, which is highly beneficial for anyone who wants to use the art to understand the more profound aspects of the art. *"Perfection of character is through perfection of technique"* (Kyoshi Coleman).

I am extremely lucky to have an incredible family, and have a support structure around me, but ultimately, the individual's attitude will determine success. If I was able to get rid of my condition, to the cost of the lessons that overcoming my condition has taught me, then I certainly wouldn't make that sacrifice. Having to adapt, and overcome from a young age, has given me the focus, drive and tenacity which I have today. To those with DCD, I conclude by saying that DCD gives you challenges, and you may not be able to take a straight path to your goals, but with the right support, understanding your condition, and the right mindset, you can achieve more than you think you can. Karate continues to help me improve, and I believe that the methodology of traditional martial arts is highly beneficial to those with DCD. However music, art, or dance, combined with strength training may provide similar results for those not inclined towards martial arts. My condition will always be a part of me, but as I progress, it affects me in less conspicuous ways,

thus becoming less of a hindrance. In order to help those with DCD, learning support departments could collaborate more closely with art, music and sport departments to provide individualised plans for the student. Ultimately, the progress is dependent upon the attitude, and drive of the individual. A great support network is important, and I simply can't overstate how much my family, friends, Kyoshi Coleman, and the fantastic instructors and fellow students have helped me. Improvement is the result of dedication, and hard work. Hard work is king!

Reference taken from Thomas Belassie and his experience as a martial artist with dyspraxia, article sourced from Leighton Barrett's Martial Education's blog on Dyspraxia. (<https://martialeducation.wordpress.com/2017/06/19/how-martial-arts-can-be-beneficial-to-hope-cope-with-dyspraxia/>)

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Useful Links

- www.dyspraxia.ie
- www.dyslexia.ie
- https://www.brainbalancecenters.com/?_ga=2.69149586.2008387883.1599062088-2022372090.1599062088
- <https://edp256dyspraxia.weebly.com/>

