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THE IMPACT OF DEVELOPMENTAL
COORDINATION DISORDER

by

IRISSA LE

Presented to the Faculty of the Honors College of
The University of Texas at Arlington in Partial Fulfillment
of the Requirements
for the Degree of

HONORS BACHELOR OF SCIENCE IN BIOLOGY

THE UNIVERSITY OF TEXAS AT ARLINGTON

December 2021

ACKNOWLEDGMENTS

First, I would like to thank Dr. Tamplain for starting this research study. The work on this research has opened my eyes to the needs of kids with DCD. I would also like to thank Dr. Dawson for her work in organizing the UGRAP program back in the fall of 2020; otherwise, this experience would have never happened for me. Additionally, I also would like to thank Miss Brown and the rest of the Honors College staff for their day-to-day support in aiding senior research projects like this. I want to thank my friends as well for their support and encouragement. Lastly, I would like to thank my family: my Dad, my Mom, my Brother, and my Grandmother for always being there for me in my time of need. I thank God that He put you all in my life. I am a very fortunate person.

November 14, 2021

ABSTRACT

THE IMPACT OF DEVELOPMENTAL COORDINATION DISORDER

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The University of Texas at Arlington, 2021

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Development Coordination Disorder (DCD) is a neurodevelopmental disorder that affects the performance of common, everyday tasks in children due to a delay in the development of motor skills. Oftentimes, parents of these children express concern about the limited number of resources available. To further understand what kind of support children with DCD may need, questionnaire responses of parents with DCD children in the US were documented. A survey was prepared through a survey software program called QuestionPro for the parents participating in Impact for DCD – USA. In total, there were 217 surveys completed. It was found that most children with DCD were also diagnosed with co-occurring conditions, including verbal dyspraxia, ADHD, and anxiety. Additionally, the majority of the children were not attending therapy for their movement

difficulties. More awareness and funding are needed to advance the development and performance of children with DCD, physically and emotionally.

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CHAPTER 1

INTRODUCTION

1.1 What is Developmental Coordination Disorder?

It is of no doubt that education is an essential part of a child's upbringing. The formative years of their lives influence the projection of progress they will attain later on into adulthood. However, for those with a disability or a disorder, these beginning stages can be especially troublesome. Some disorders are very obvious and easy to see, like Down syndrome or cerebral palsy. There are other disorders that are "invisible" and are not so obvious. One of them includes Developmental Coordination Disorder. Developmental Coordination Disorder (DCD), also known as developmental dyspraxia, is a neurodevelopmental condition that makes motor learning difficult, causing common everyday tasks to be difficult at best. It falls under the heading of Neurodevelopmental Disorders in the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013). It is unknown what the exact cause of DCD may be. However, children may be at risk of developing DCD if they are small for their gestational age, born premature, born with a low birth weight, or if there is a history of DCD in the family. Statistically, DCD occurs more often in males than it does in females (Understood Team, 2021). There are only a few treatment methods, but they have been demonstrated to be more effective than no treatment at all (Blank et al., 2012). There is no effective pharmacological treatment for coordination or developmental issues (Drake, [date unknown]).

1.1.1 Symptoms

The criteria for a DCD diagnosis includes (a) the acquisition and execution of coordinated motor abilities is significantly lower than expected considering the individual's chronological age and opportunities for skill learning and usage, (b) criterion a's motor skills deficit severely and persistently interferes with daily activities suitable to chronological age, including academic/school productivity, prevocational and vocational activities, leisure, and play, (c) the onset of symptoms occurs during the early stages of development, (d) the motor skills deficiencies are not explained by intellectual disability (intellectual developmental disorder) or a visual impairment, and they are not caused by a movement-related neurological disorder (American Psychiatric Association, 2013). Multiple impairments of gross and fine motor control have been identified as symptoms (Missiuna et al., 2008). Poor timing and balance are common gross motor symptoms, causing patients to stumble over their own feet. Proprioception and spatial awareness may be linked to difficulty combining motions into a series or recalling movements in a sequence (Geuze, 2005). Difficulty executing coordinated motor actions, as well as fine and gross motor difficulties, result in clumsiness, slowness, and imprecise motor performance in people with DCD. As a result, people with DCD may struggle with postural control (hypotonia or hypertonia, immature distal control, poor static and dynamic balance, etc.), sensorimotor coordination, and motor learning (motor planning, learning new movements, adaptation to change, etc.) (Biotteau et al., 2019).

1.1.2 Treatments

There are several methods of therapy and treatments that focus on developing the motor skills of those with DCD. Cognitive motor therapy aims to teach movement patterns

to children who are having trouble with those tasks, as well as instill abilities that are crucial in coordinated movements, such as planning a motor action, carrying it out, and assessing the outcome. Sensory integration therapy aims to teach children who are overly sensitive to stimuli how to cope with this while performing motor activities by modifying the environment to provide an acceptable level of sensory stimulation; those who are insensitive to stimuli are gradually exposed to more stimulation. Better sensory integration is thought to lead to better-regulated motor responses over time (Drake). The most common treatment of choice for DCD is occupational therapy. It aids with the development of motor skills and the learning of basic tasks that are necessary for school and daily life. Writing, typing, tying shoes, using stairs, and getting dressed are examples of these tasks (Understood Team, 2021).

1.2 Research Study

To further understand what kind of support children with DCD may need, the parents and families of children with DCD in the US were documented and recorded about their experiences in the school system and their communities. This research study aims to emulate a similar study that was conducted in Australia. The rationale here is that there is more to motor skills than just time and effort. If we could gain some insight as to what makes living with DCD especially troublesome, we can make a better effort in organizing the right kind of help that these children and parents need. Because of this lack of awareness, there is a lack of resources available for the children and parents with this disorder.

CHAPTER 2

METHODOLOGY

This research study was conducted through a survey software program called QuestionPro and involved parents and primary caregivers who had children ages 2-18 with DCD and motor development difficulties associated with DCD. A model was formulated that mirrors a program in Australia called Impact for DCD. In total, there were 101 multiple-choice and free-response questions in the study. We targeted the parents of minors in the US with DCD. The questions were organized into eight sections: family and diagnostic, movement difficulties, activity, schooling, therapy/intervention, social & emotional impact, demographic information, and final questions. Those parents were asked a series of questions about their children and their experience. Appropriate question logic was applied where it was needed, i.e., branching, skipping, and hide/show. If they met certain key question criteria, then they would be redirected for further follow-up questions. Each survey required about 30 minutes for each participant. The survey was distributed through Facebook and/or Twitter over the course of approximately five months.

CHAPTER 3

RESULTS

Over the course of about five months, 217 completed surveys were collected with responses correlating to 210 families. A great majority (90.95%) in the survey had one child affected with DCD, with 8.10% having two children, whereas only 0.95% with three children in their family. Before their child's diagnosis, 74.30% of the parents had not heard of DCD. In our study, we found that 64.49% of the children were males, and 35.52% were females (Table 1). Interestingly enough, DCD tends to show up in relatively higher numbers in boys than girls. This trend can be seen consistently across different age groups. With regards to birth order, over a third of the time, DCD showed up in firstborns (36.41%). Slightly less than a third of the time it appeared in the youngest child (32.26%). In families with only one child, it appeared 19.35%. Last but not least, it showed up in middle children 11.98% of the time. Additionally, based on the socio-economic background data of the participants, higher social classes seemed to be more impacted by DCD than lower social classes.

Slightly more than one-fourth (26.05%) of the participants had a history of movement-related difficulties in their family. Approximately one-third (33.18%) of the participants had a history with other medical conditions affecting movement/learning in their family. A family history of ADHD (attention deficit hyperactivity disorder) was reported by one-third (33.33%) of families, learning difficulties by 19.50% of families,

dyslexia by 15.72% of families, and ASD (autism spectrum disorder) by 12.58% of families. A large number of the children were diagnosed by their pediatrician (26.27%) or by their occupational therapist (21.51%). A summary of the professional diagnoses can be found in Figure 3.2.

Table 3.1: Sample characteristics of children (n=217)

	N	%
Sex		
Male	138	64.49%
Female	76	35.51%
Current age		
<5 years	5	2.34%
5-6 years	42	19.63%
7-8 years	32	14.95%
9-10 years	38	17.76%
11-12 years	32	14.95%
13+ years	65	30.37%
Position in family		
Eldest	79	36.41%
Middle	26	11.98%
Youngest	70	32.26%
Only child	42	19.35%

Moreover, increased numbers of DCD are documented in the regions of high population as these are the areas where schools are better established (Figure 3.1). This is evident with the most cases reported in Texas, New York, and California. Conversely, the lowest numbers in the United States also happen to be in states with smaller populations. Therefore, DCD cases are more commonly reported in higher socio-economic regions as well as heavily populated areas.

Nearly all of the families (90.32%) have accessed therapy at any one point in time in order to receive help for their child's motor difficulties. However, 64.52% said that they were not currently attending any therapy services to assist their child with their movement difficulties. Approximately 62.09% of the parents felt that their child had not received

sufficient therapy to assist their movement difficulties. About 83.10% of the children did not receive any funding to support their therapy costs. Around 60.68% of the parents in the US felt comfortable maintaining their own DCD regiment at home. However, only 16.90% of the DCD children in the US received funding to support their therapy costs.

The majority of the parents (94.47%) were concerned about the impact their child’s movement difficulties have on their social and emotional health. About 65.90% had concerns about their child’s movement difficulties affecting their ability to gain employment in the future. Almost all of the parents (97.24%) answered that it takes longer for their child to accomplish movement tasks than other children. Around 94.44% said that their child becomes easily fatigued when performing movement tasks they find difficult. About 73.73% said that in comparison to other children, their child is more tired at the end of the day, while 61.75% of the parents said that their child does not enjoy participating in organized sport and physical activity. As a result, 37.96% of DCD children are only able to get roughly about 60 minutes of moderate to vigorous physical activity per day.

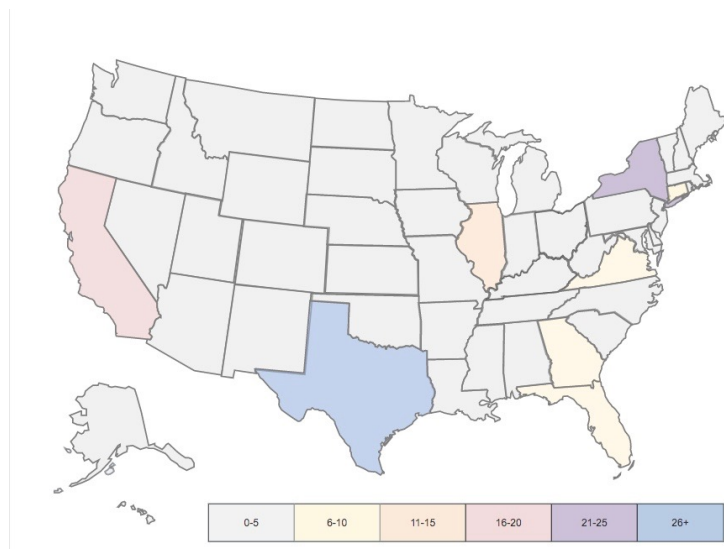


Figure 3.1: Survey distribution of the ‘Impact for DCD’ survey within the US

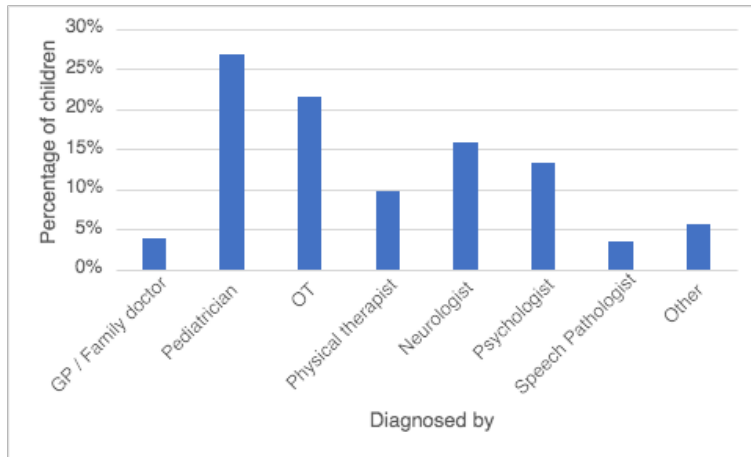


Figure 3.2: Professional diagnoses of motor difficulty condition

With respect to the classroom, 79.44% answered that they have concerns about how their child’s movement difficulties impacted their ability to successfully complete their schooling. Although 72.17% of the parents answered that their child enjoyed attending school, 59.04% said that their child had difficulty making friends at school. Around 77.0% of the parents answered that they thought their child’s movement difficulties were negatively impacting their ability to reach their potential at school. However, 86.36% responded that their child’s school did allow for provisions/spaces to support their child’s learning. Additionally, 78.57% of the classroom teachers were aware of the child’s movement difficulties, and 73.36% answered that their child had at some point received support from a teacher/education aid to assist tasks impacted by their movement difficulties (e.g., handwriting). Lastly, 73.21% answered that their physical education teacher had not communicated with them or the classroom teacher about supporting their child.

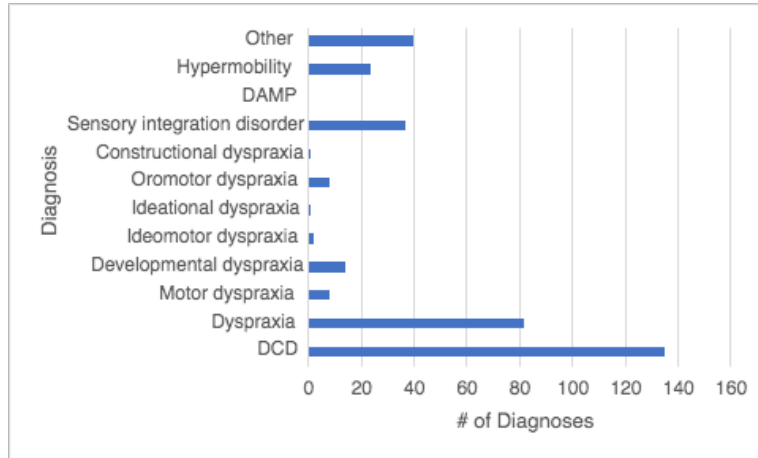


Figure 3.3: Count of motor conditions diagnosed to children in the survey

With regards to specific types of motor disorders in children, DCD was accounted for 38.36%, followed by dyspraxia (23.08%), sensory integration disorder (10.54%), and hypermobility (6.84%) (Figure 3.3). In addition to motor difficulties, the children also had anxiety (20.09%), attention deficit hyperactivity disorder (ADHD) (19.63%), childhood apraxia of speech/verbal dyspraxia/specific language impairment/speech difficulties (CAS) (19.39%), dysgraphia (10.75%), dyslexia (6.78%), depression (5.37%), autism spectrum disorder (ASD) (4.91%) (Figure 3.4).

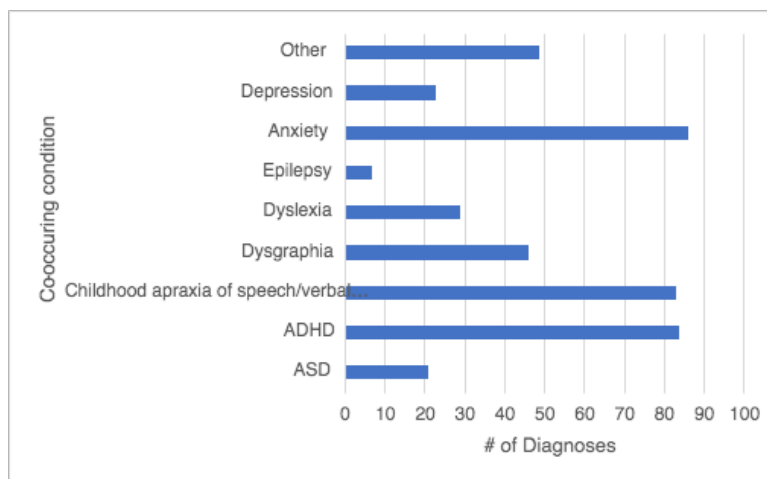


Figure 3.4: Count of co-occurring conditions diagnosed to children in the survey

CHAPTER 4

DISCUSSION

On average, DCD affects 5-6% of school-aged children, which is approximately 3.8 – 4.6 million children in the United States (Blank et al., 2012). It is more common than Down syndrome, which affects only 1% of the population. Its commonality is closer to that of dyslexia, which affects at least 1 in 10 people (Hollander, 2021). Yet, most people are not familiar with this disorder. From our study, 74.30% of the parents had not heard of DCD before their child's diagnosis. Now, with this new knowledge of their child's diagnosis, these parents are "assigned" to search for answers and possible treatments. From the data collected, it was found that children with Developmental Coordination Disorder indeed have a more difficult time performing basic physical tasks in comparison to their peers. Approximately 97.24% of the parents answered that it takes longer for their child to accomplish movement tasks than other children. About 94.44% said that their child becomes easily fatigued when performing movement tasks they find difficult. This fatigue is due to all the energy and concentration exerted in order to over-focus on a particularly difficult physical task. Approximately 73.73% said that, in comparison to other children, their child is more tired at the end of the day, while 61.75% of the parents said that their child does not enjoy participating in organized sport and physical activity. This is most likely because the children felt discouraged when they were not able to keep up with the other children. It is an isolating feeling to watch their peers play and carry out basic tasks with relative ease. Sadly, DCD is a lifelong condition that these children will have to deal

with throughout their lives. DCD is not a condition that can be cured. It is one which they have to pay extra attention to every action they take. For example, a basic everyday function such as sitting down and getting up can be a chore for DCD children. For them to successfully do this task, they need to methodically get up from a chair slowly and have a constant awareness of their foot placement so that they will not fall. Even eating and chewing have to be thought out with laser focus to ensure that food does not become a choking hazard. These are the difficulties that people with DCD must face on a daily basis. As children, they have not mastered them yet. For them, it takes extra time and even assistance in order to complete these basic tasks. They have to work hard to do tasks that come easily to most neurotypical people. By developing good techniques, tasks that are otherwise difficult become more routine. The norm is for society to label these students as “lazy.” However, the truth is they have a condition. They have DCD.

From our sample, 78.57% of the classroom teachers were aware of the child’s movement difficulties, 62.09% of the parents felt that their child had not received sufficient therapy to assist their movement difficulties, and 83.10% of the children did not receive any funding to support their therapy costs. This means that more awareness is needed in order to bring about the necessary programs to assist families in our communities that need it. Although a considerable number of children and families affected by DCD had some form of support, these percentages could potentially be much higher. Further support is needed from schools and local community programs to help these children be physically stronger, and more feel confident in their abilities. This can be brought about by getting the proper training that teachers and coaches need in order to implement specific learning plans that cater to DCD students. By contacting the child’s physical therapist or other

health professional and communicating their needs back and forth between professionals would more effectively benefit these children. Although the majority of schoolteachers in the study had knowledge of DCD conditions, most physical education instructors did not. As a result, they did not reach out to parents about the child's physical condition. By working with the healthcare professionals and other resource providers within the community, children with DCD will be better served. Improved programs with Early Childhood Intervention (ECI) can be developed for children with DCD as well. Hopefully, this research will bring more awareness that would spur on more attention, encouraging others to pick up further research and build upon this study as we are only scratching the tip of the iceberg in the area of DCD.

Before any remedy can be proposed, a diagnosis needs to first be established. Of the various people that a child is exposed to in the formative years, it seems that the occupations with the highest specializations are the ones who are most likely to pick up on the subtle cues and symptoms of DCD. Probably due to the fine niche that their work involves, specialists, according to the data, are the key figures in initially diagnosing that “something” is amidst. Occupations like family doctors are too preoccupied with a whole host of symptoms and conditions to be able to zero in on this particular diagnosis we now know as DCD (Figure 3.2).

Making matters worse, DCD often leads to other conditions like anxiety, depression, and other nervous disorders (Figure 3.4). This can, at times, further complicate diagnosis and follow-up treatments for psychiatrists and therapists. It is crucial that these specialists be able to distinguish early signs and symptoms of DCD in order to recommend

the correct therapy and treatment for those afflicted. A misdiagnosis would otherwise prevent these children from integrating properly into society and leading productive lives.

The problems associated with DCD do not just end there with the child. Additionally, it also spills over to the rest of the family as well. Parents of children with DCD are over-burdened with worries, guilt, and concern as they feel helpless when they cannot make their children's condition disappear. A child with DCD is not just an issue for himself or herself. The diagnosis is an issue that involves the whole family.

As any concerned parent would, most families with DCD students try to seek out treatment but often to no avail. With DCD being relatively new in the realm of neurological disorders, there are just not enough resources out there for them to access. That leaves affected families frustrated and isolated. More needs to be done to assist and alleviate their stresses and strains as they are already overwhelmed as it is.

As most parents naturally would, parents of DCD children, especially, are worried about their children's possible future careers. Whereas most parents of normally functioning children generally have high aspirations for their offspring, DCD parents just want their children to fit in - to lead as normal lives as possible.

Self-esteem issues are another concern for DCD parents. What parent does not want their child to have normal interactions with friends? It is generally accepted that schoolchildren can be cruel to one another in those early developmental years. If they sense anything different or peculiar with a classmate, they will all zero in and gang up to pick on that particular student with that difference. Growing up in the independent school system is hard enough as an average student, let alone one with DCD. Anxiety, depression, and low self-esteem are understood if not expected to occur in DCD cases. As a matter of

fact, DCD children have been shown to have a higher chance of experiencing anxiety and depression (Draghi et al., 2020).

Comorbidity, in general, makes living with DCD more difficult. On top of motor deficiencies, having another diagnosed condition creates even more stress in these children, further negatively affecting their performance in school. For researchers, this makes it even more difficult to distinguish between DCD and the additional comorbidity. Without the ability to isolate these conditions from one another, a DCD diagnosis can often be missed.

Throughout the study, there were many correlations with the Australian counterpart study. As stated earlier, DCD findings translate the same across the board, no matter the country or continent. One of the similarities was that 60.68% of the parents in the US felt comfortable to maintain their own DCD regiment at home in comparison to the 68.5% in the “Impact for DCD” Australian study (Licari et al., 2021). Additionally, 62.09% of American parents felt that their child had received sufficient therapy to assist their movement difficulties, whereas the survey found this in 67.6% of the Australian parents. On the contrary, when it comes to finances, only 16.90% of the DCD children in the US received funding to support their therapy costs, compared to 42.2% of children in Australia (Licari et al., 2021).

Though the volume of the study and the resulting data slightly vary, they are in many ways similar in terms of socio-economic strata, gender, or even birth order. DCD traits are very similar regardless of geographical location so long as the researchers know where and what to look for. If done correctly and thoroughly, the study will reveal consistently and predictably all the marks and characteristics of DCD children they come

across. Given a greater sample and long-range longitudinal studies, the level of understanding in the area of DCD will only increase, with the results produced proving immeasurable in the lives of DCD children.

CHAPTER 5

CONCLUSION

Based on the findings in the course of this study, it appears that educators are often overlooking a quite common but much lesser understood learning disorder that is among children all around them. As the surveys revealed, there is one in every twenty students in the United States who are affected by this condition. By addressing DCD, perhaps the word would spread to shed more light on this condition. In doing, this would generate more interest that would lead to more funding. This, in turn, would generate more research teams that could explore the many facets of DCD that have yet to be discovered. It is with the hope that maybe one day, DCD will be as widely known as Autism or Down syndrome. It is only then that educators will be better equipped with the tools to understand and subsequently help children with this condition known as DCD. Though this study has brought some new understanding to the condition, it is just barely beginning to scratch the surface of what needs to be done. Perhaps this study will spark curiosity in young minds who will someday build on what has already been found here and develop it further, taking it to another level of understanding.

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BIOGRAPHICAL INFORMATION

During Irissa's time at the University of Texas at Arlington, she was a member of the Goolsby Early Leadership Program, Women in Leadership, Circle K International, and the University's Deans list. She was also an ambassador for the Lockheed Martin Career Development Center as a MavNavigator. She was also a Biology Teaching Assistant under Dr. Paul Chippindale. She is currently working as an undergraduate researcher under Dr. Priscila Tamplain in the Department of Kinesiology. After graduation, she aspires to enter graduate school.