Institution:
University of Leeds

Unit of Assessment:
UoA26 Sport and Exercise Sciences, Leisure and Tourism

Title of case study: The Leeds Consensus Statement: A universal standard to diagnose and assess Developmental Coordination Disorder

1. Summary of the impact (indicative maximum 100 words)

Research by **Utley** and colleagues at the University of Leeds, which examined ways of identifying, diagnosing and assessing Developmental Coordination Disorder (DCD) in children, led to an elaboration of the working definition of the condition - the Leeds Consensus Statement. Compared to other developmental disorders and impairments, DCD has been poorly understood with the previous diagnostic criteria causing confusion amongst clinicians and practitioners. The 2006 consensus statement provided a new universal standard in the diagnosis and assessment of DCD, together with clear principles to guide intervention. Its impact from 2008 onwards can be demonstrated through educational and health clinicians and practitioners across the world adopting the new standard and using it to diagnose DCD. Worldwide 4-6% of children born have DCD, since 2006 this is identified by the Leeds Consensus Statement.

2. Underpinning research (indicative maximum 500 words)

Utley (University of Leeds from 2000 - present, Sport and Exercise Sciences), together with Sugden (University of Leeds from 1977 – present, School of Education) and Chambers (University of Leeds from 1997 - present, School of Education), have made their careers' work the study of motor development and impairment, analysing the fundamental movement deficiencies in children with a range of disorders, developing both diagnostic and intervention/rehabilitation strategies.

Developmental Coordination Disorder (DCD) is evident where there is a marked impairment in the performance of motor skills, which has a significant, negative impact on children's ability to get on with everyday life activities independently. Features of DCD show high levels of overlap with other developmental disorders, including attention deficit hyperactivity disorder (ADHD), dyslexia and autism spectrum disorders, and confusion in assessment, diagnosis and consequently intervention causes barriers to progress and appropriate treatment. Following initial attempts in 1994 to develop a consensus statement (known as the London Consensus Statement), which highlighted the existence of DCD, there was a substantial increase in awareness of the disorder. This resulted in increasing demands for an updated version of the consensus to reflect current research and professional practice, to offer clinicians and practitioners a better understanding of DCD, to aid more accurate identification, diagnosis and assessment, and to inform more targeted intervention.

As a result of **Utley**'s detailed experimental work on children with movement difficulties, and because of **Utley**, Sugden and Chambers' theoretical, empirical and professional knowledge of movement analysis in children, the University of Leeds team secured an ESRC grant to develop an updated and revised consensus in 2005. The ESRC grant enabled **Utley**, Sugden and Chambers to bring together other leading professionals, from health, psychology, education and sports science, between 2004 – 2005, to gain agreement for a new consensus statement regarding the condition DCD. In the discussions raised by contributors, it was agreed to retain the term DCD and to propose new recommendations, guidelines for assessment and new general intervention principles, informed by research and the evidence based understanding of children with DCD **[1]**.

Research by **Utley**, which had positioned her as an expert in this field, contributed to the 2006 consensus agreement in two key ways. Firstly, **Utley**'s research helped determine exactly how children with DCD move during standardised tasks and the nature of their movement difficulties. Using detailed analytical methods, such as kinematic analysis, **Utley** led efforts to define the fundamental movement strategies of children with Cerebral Palsy (CP) or DCD **[2, 3]**, which proved to be of diagnostic value, for example the coupling of limbs to assist with control **[2, 4]**.

Secondly, **Utley**'s research has also addressed the issue of rehabilitation considering the role of the task, the environment, and the individual in the rehabilitation process. The fundamental movement analysis of children with DCD (and CP) identified critical features of the disorder(s) and successful interventions that were helpful in completing manual tasks such as reaching and

grasping and catching **[2 - 5]**. The performance of manual tasks, such as catching an object, requires the coordination of multiple, independent parts of the body (individual muscles, joints, limbs). Children with DCD perform many coordination tasks poorly and strategies that link some of these variables (e.g. joints), reduce the degrees of freedom in the system and simplify the task and improve its execution **[2, 5, 3]**. The research of **Utley** and colleagues demonstrated the importance of context on movement, namely the shape, size, weight and texture of an object **[4, 6, 2]**. Crucially, **Utley** and colleagues addressed the issue of movement in DCD from a different theoretical stance: a dynamical systems perspective which considered the process of movement production rather than the outcome **[5, 3]**. The importance of using different modes of information to influence movement was a pivotal finding which has been widely applied in rehabilitation. This approach is reflected in the strategies for intervention which are central to the Leeds Consensus Statement. The quality of this research resulted in publications in top journals such as *Motor Control* and *Developmental Medicine and Child Neurology*, which previously had not published research on DCD.

Thresholds were identified for each parameter to achieve discrimination between different movement disorders (separating DCD from CP, and ADHD for example), contributing to the clinical definition of DCD and the identification of several diagnostic traits and tests to diagnose the condition in patients. The research also evaluated intervention strategies and produced guidelines for successful intervention/rehabilitation.

Researchers:
Dr Andrea Utley, Co-Investigator, Reader in Motor Control and Learning, University of Leeds (2000-present)
Prof David Sugden, Co-Investigator, Professor Special Needs in Education, University of Leeds (1987-present)
Dr Mary Chambers, Co-Investigator, Lecturer, University of Leeds (2002-present)

3. References to the research (indicative maximum of six references)

[1] Sugden, D.A., Chambers, M. and **Utley, A**. (2006) ESRC Leeds University. UK-DCD Consensus Statement, Consensus Meeting Series 2004-2006. http://www.dcd-uk.org
[2] Utley, A., Steenbergen, B. and Astill, S.L. (2007) Ball catching in children with developmental coordination disorder: control of degrees of freedom. *Developmental Medicine and Child Neurology* **49**:34-8. DOI: 10.1017/S0012162207000096.x
Utley was principal investigator for this research which is published in one of the leading journals in the field.
[3] Astill, S. and **Utley, A**. (2008) Coupling of the reach and grasp phase during catching in children with developmental coordination disorder. *Journal of Motor Behaviour* **40:**4**,**315-323 DOI: 10.3200/JMBR.40.4.315-324 Utley was lead author, collaborating with Astill (University of Leeds, 2008 – present)
[4] Utley, A. and Sugden, D.A. (1998) Interlimb coupling in Children with Hemiplegic Cerebral Palsy at Speed. *Developmental Medicine and Child Neurology* **40**:396-404. DOI:10.1111/j.1469-8749.1998.tb08215.x Utley was principal investigator for this research which is published in one of the leading journals in the field.
[5] Utley, A. and Astill, S.L. (2007) Developmental sequences of two-handed catching: How do children with and without developmental coordination disorder differ? *Physiotherapy Theory and Practice* **23**:65 – 82 DOI: 10.1080/09593980701211838
[6] Utley, A. and Steenbergen, B. (2006) Discrete bimanual co-ordination in children and young adolescents with hemiparetic cerebral palsy: Recent findings, implications and future research directions. *Paediatric Rehabilitation* **9**:127-136. DOI: 10.1080/13638490500155573 Utley and Steenbergen (University of Nijmegen) were co-authors for this research.

Grants:
2004-2005 ESRC Seminar Series Grant Utley (CI) £17,000 Developmental Coordination Disorder

4. Details of the impact (indicative maximum 750 words)

From 2006 and continuing throughout the impact period from 2008 onwards, the Leeds Consensus Statement has been recognised as a universal standard in the assessment of Developmental Co-ordination Disorder (DCD). It has been important in providing a common language and an agreed

framework for the understanding of DCD, enabling more confident and accurate diagnosis of the condition and subsequently more appropriate interventions based on this understanding.

"The Leeds Consensus Statement (2006) provided much needed clarification on matters relating to the diagnosis and assessment of the condition, together with clear principles to help guide intervention planning."
Reader in Psychology, Social Work & Public Health, Oxford Brookes University **[A]**

Impact on practitioners and professional services
Utley's research findings and contribution to the Leeds Consensus Statement have directly enhanced professional practice, by helping provide robust and accurate diagnostic understanding for the identification of DCD, applied by educational and health clinicians and practitioners across the world.

The Leeds Consensus Statement's influence on professional services and standards can be evidenced by the sale of over 2000 copies of the statement (890 of these were after 2008) **[B]**, indicating its adoption by large numbers of practitioners to guide their work. It has also been adopted as the official diagnostic criterion for DCD by national and international bodies, with its recommendations applied in the UK (Royal College of Paediatrics and Child Health, College of Occupational Therapists, National Association of Special Educational Needs and The Dyspraxia Foundation), Netherlands **[C]**, Canada (CanChild Centre for Childhood Disability, McMaster University), and USA. These bodies include the European Academy for Childhood Disability **[D]**, which is an association of professionals working with children with disability throughout Europe, and the Dyscovery Centre, a centre of excellence in the UK for children and adults with specific learning difficulties. Initially set up to co-ordinate services for children across the UK, the Dyscovery Centre now sees children and adults from as far afield as Ecuador, Hong Kong and the UAE, successfully treating thousands of children and training over 10,000 health and educational professionals.

"The DCD Consensus Statement has been used since its publication as the official diagnostic criterion by healthcare professionals, it is used to define best practice and has been integral to the delivery of healthcare and educational services to children affected by this disorder" **[E]**
Pediatrician and Director, The Dyscovery Centre, University of Wales.

The establishment of the Leeds Consensus Statement as an internationally reliable working definition of the condition allowed researchers and professionals to not only agree on perceptions of children's movement difficulties, but also more accurately evaluate intervention, providing a reliable assessment standard to document improvements in the motor performance of thousands of children. For example, the consensus statement was used by a team in Germany, who then conducted the largest survey of diagnosis, assessment and intervention methods for children with DCD based on the criteria identified in the Leeds Consensus Statement. Their findings were then published as the Swiss–German guidelines in 2011 **[F]**.

Beyond its initial impact in establishing a new working definition and a new universal standard in the diagnosis and assessment of DCD, the research also continues to inform debate. Together with the improved professional practices as a result of the Leeds Consensus Statement, the research findings are captured again in an updated version of the Consensus in 2012 **[E]**, led by the European Academy for Childhood Disability **[D]**. These guidelines will continue to help ensure consistency in the way that DCD is diagnosed, as well as informing future intervention strategies. This has been recognised by a number of agencies as demonstrated by the quote below.
"There is detailed guidance and discussion about assessment and diagnosis which has been very useful in supporting clinicians working out in the field in DCD clinics **[G]**
Occupational Therapist, The Children's Trust, UK.

Impact on health and welfare
DCD is a common disorder affecting motor coordination in 4 – 6 % of children in the UK, and has a significant, negative impact on activities associated with daily living, such as dressing, eating,

riding a bicycle, academic achievements, and thus limits the social and economic opportunities available to children with this disorder.

Research about DCD is not nearly as comprehensive as other developmental disorders, such as dyslexia, ADHD and autism spectrum disorders. Detailed assessment of co-ordination problems, early in the life of a child with DCD, enables children to be given support and appropriate intervention. Prior to international agreement over the condition, some children who were identified as DCD often had other conditions and this clouded the intervention process. Therefore, by providing a better understanding of DCD, the Leeds Consensus Statement has not only prompted more accurate diagnosis but improved the alignment of diagnosis and intervention.

"the DCD Consensus Statement has been referred to widely in the UK and elsewhere as an official diagnostic criterion by healthcare professionals, is used to define best practice, and has greatly informed the delivery of healthcare and educational services to children affected by this disorder." **[H]**
Head of Psychology, Australian Catholic University, Melbourne, Australia

The research has encouraged more functional approaches to intervention, based on evidence drawn from the motor learning literature **[2, 5, 3]** and **Utley** has been central to this work and approach. Guidelines for assessment and intervention found in the Leeds Consensus Statement have formed the foundation of numerous intervention plans nationally and internationally **[A]**, so by providing knowledge of the nature of the underlying deficit, and subsequently facilitating better rehabilitation, clinicians and practitioners across the world have been able to help thousands of children with movement difficulties improve participation in activities as part of daily living.

5. Sources to corroborate the impact (indicative maximum of 10 references)

[A] Letter (dated 12/12/2012) from Reader in Psychology, Department of Psychology, Social Work & Public Health, Oxford Brookes University. (Letter corroborating the role of the Leeds consensus statement in clarification of the diagnosis and assessment of the DCD, available if requested).
[B] University of Wales, Newport – School of Education: Developmental Co-ordination Disorder (DCD) http://www.mscdevelopmentaldisorders.org/wp-content/uploads/What-is-DCD.pdf [accessed 3/10/2013].
[C] Consensus development around DCD, Centre for Human Movement Sciences, Groningen, The Netherlands (19/05/2008), including details of the decision to accept three of the four criteria as identified in the Leeds Consensus Statement (p.45).
http://www.ergoterapiforbarn.no/pdf/Marina_consensus.pdf [accessed 3/10/2013].
[D] Blank R, Smits-Engelsman B, Polatajko H, Wilson P (2012) European Academy for Childhood Disability (EACD): recommendations on the definition, diagnosis and intervention of developmental coordination disorder (long version). *Developmental Medicine and Child Neurology* **54**(1), 54-93. http://onlinelibrary.wiley.com/doi/10.1111/j.1469-8749.2011.04171.x/pdf [accessed 3/10/2013].
[E] Letter (dated 17/06/2013) from Pediatrician and Director of The Dyscovery Centre, University of Wales, Newport (Letter corroborating the impact of the Leeds consensus statement by healthcare professionals for both diagnosis and intervention. In addition the letter authenticates the claims made in the case study, available if requested).
[F] 2011 Swiss German European Guidelines. Child Centre Maulbronn & University of Heidelburg, Germany. Published in *Developmental Medicine and Child Neurology*, (2011) **53**, 1 (Available if requested).
[G] Letter (dated 23/09/2013) from Occupational Therapist and head of research, The Children's Trust. (Available if requested).
[H] Leader of research team, Australian Catholic University. (Letter (dated 17/09/2013) corroborating the impact of the Leeds Consensus statement and the importance of diagnosis and targeted intervention, available if requested).