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### Literature search results

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**Database search terms:** dyslexi*, dyspraxi*, (“developmental co-ordination disorder” OR “developmental coordination disorder” OR DCD), exp DYSLEXIA, exp DEVELOPMENTAL COORDINATION DISORDER/, exp DYSPRAXIA/

**Evidence search string(s):** dyslexia AND (dyspraxia OR “developmental coordination disorder”)

**Google search string(s):** dyslexia AND (dyspraxia OR “developmental coordination disorder”)

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3. An examination of the relationship between movement problems and four common developmental disorders

**Author(s)** Martin N.C., Piek J., Baynam G., Levy F., Hay D.

**Citation:** Human Movement Science, October 2010, vol./is. 29/5(799-808), 0167-9457 (October 2010)

**Publication Date:** October 2010

**Abstract:** It has been well recognized since the days of "minimal brain dysfunction" (Clements, 1966) that various developmental disorders have a shared aetiology. Poor motor coordination has been implicated as one of the factors in these relationships. This study examines the different patterns in symptomatology of five developmental disorders, namely developmental coordination disorder (DCD), attention-deficit/hyperactivity disorder (ADHD), reading disorder (RD), oppositional defiant disorder (ODD), and conduct disorder (CD) in order to build on the genetic work from Martin, Levy, Piek, and Hay (2006) and Martin, Piek, and Hay (2006) examining the overlap of these disorders. Latent class analysis was used on questionnaire data from 1304 families from the Australian twin ADHD project (ATAP) to examine the patterns of comorbidity of the five disorders. We confirmed and added detail to the shared symptoms between DCD, ADHD, RD, and ODD, but found no links between CD symptoms and any other disorders. Despite the close link previously identified with ODD and CD, this finding suggests a different aetiology for CD. 2009 Elsevier B.V.

**Source:** EMBASE

4. Significance of long-chain polyunsaturated fatty acids (PUFAs) for the development and behaviour of children.

**Author(s)** Schuchardt JP, Huss M, Stauss-Grabo M, Hahn A

**Citation:** European Journal of Pediatrics, February 2010, vol./is. 169/2(149-64), 0340-6199;1432-1076 (2010 Feb)

**Publication Date:** February 2010

**Abstract:** Omega-6 and omega-3 polyunsaturated fatty acids (PUFAs) play a central role in the normal development and functioning of the brain and central nervous system. Long-chain PUFAs (LC-PUFAs) such as eicosapentaenoic acid (EPA, C20:5omega-3), docosahexaenoic acid (DHA, C22:6omega-3) and arachidonic acid (AA, C20:4omega-6), in particular, are involved in numerous neuronal processes, ranging from effects on membrane fluidity to gene expression regulation. Deficiencies and imbalances of these nutrients, not only during the developmental phase but throughout the whole life span, have significant effects on brain function. Numerous observational studies have shown a link between childhood developmental disorders and omega-6:omega-3 fatty acid imbalances. For instance, neurocognitive disorders such as attention-deficit hyperactivity disorder (ADHD), dyslexia, dyspraxia and autism spectrum disorders are often associated with a relative lack of omega-3 fatty acids. In addition to a high omega-6 fatty acid intake and, in many cases, an insufficient supply of omega-3 fatty acids among the population, evidence is increasing to suggest that PUFA metabolism can be impaired in individuals with ADHD. In this context, PUFA imbalances are being discussed as potential risk factors for neurodevelopmental disorders. Another focus is whether the nutritive PUFA requirements—especially long-chain omega-3 fatty acid requirements—are higher among some individuals. Meanwhile, several controlled studies investigated the clinical benefits of LC-PUFA supplementation in affected children and adolescents, with occasionally conflicting results.

**Source:** Medline

5. Genetics research suggests links between common disorders.

**Author(s)** Quinn C

**Citation:** Learning Disability Practice, 01 November 2009, vol./is. 12/9(36-37), 14658712

**Publication Date:** 01 November 2009

**Abstract:** Dyslexia, dyspraxia, attention deficit hyperactivity disorder (ADHD), Asperger syndrome and autism have traditionally been defined and treated separately. New genetic research suggests there may be significant overlaps in these conditions. The findings are providing a fresh understanding of these disorders and could lead to new avenues for their treatment.

**Source:** CINAHLL
7. Co-occurring disorders: A possible key to visual perceptual deficits in children with developmental coordination disorder?

**Author(s)** Crawford S.G., Dewey D.

**Citation:** Human Movement Science, February 2008, vol./is. 27/1(154-169), 0167-9457 (February 2008)

**Publication Date:** February 2008

**Abstract:** A study was conducted to examine how visual perceptual functioning in children with DCD may be influenced by co-occurring learning problems such as reading disabilities (RD) and/or attention deficit hyperactivity disorder (ADHD). Participants included seven groups of children: 27 children with DCD only, 11 with ADHD only, 14 with RD only, 63 with DCD and at least one other disorder (i.e., DCD + ADHD, DCD + RD, DCD + ADHD + RD), and 73 typically developing controls. Visual perceptual skills were assessed using the Test of Visual Perceptual Skills (TVPS) and the Rey Osterreith Complex Figure (ROCF; copy and delayed recall). Children with DCD and at least one other disorder were found to have impairments on the TVPS compared to children with DCD only, ADHD only, and typically developing controls, particularly on subtests assessing visual memory. On the ROCF, children with DCD and at least one other disorder scored significantly lower than children with ADHD only or RD only. Children with DCD plus one other disorder were then subdivided into three groups: DCD + ADHD, DCD + RD, and DCD + ADHD + RD and compared to children with DCD only, ADHD only, and RD only. Results indicated that children with DCD + ADHD + RD had significant impairments on the TVPS compared to children with DCD only and children with ADHD only. On the ROCF, children with DCD + ADHD + RD scored significantly lower than all of the groups, except the DCD + RD group. These findings suggest that DCD on its own is not associated with visual perceptual problems; rather, it is the presence of co-occurring disorders that is a possible key to visual perceptual deficits in children with DCD. The number of co-occurring disorders present with DCD is associated with the severity of the visual perceptual dysfunction. Deficits in visual memory skills appear to be a specific area of difficulty for children with DCD and co-occurring RD and/or ADHD. 2007 Elsevier B.V. All rights reserved.

**Source:** EMBASE

8. Cooccurrence of problems in activity level, attention, psychosocial adjustment, reading and writing in children with developmental coordination disorder.

**Author(s)** Tseng MH, Howe TH, Chuang IC, Hsieh CL

**Citation:** International Journal of Rehabilitation Research, 01 December 2007, vol./is. 30/4(327-332), 03425282

**Publication Date:** 01 December 2007

**Abstract:** The purpose of this paper was to investigate the cooccurrence of problems in activity level, attention, reading, writing and psychosocial adjustment of children with developmental coordination disorder (DCD). A parent-report questionnaire, the Developmental Coordination Disorder Questionnaire - Chinese version (DCDQ-C), was used to screen first to third graders from 13 mainstream schools in Taipei. Two standardized motor tests were then administered to those who scored below 10% on the DCDQ-C. Tests of activity level, attention, reading, writing and psychosocial adjustment were then administered to this sample. Thirty-eight children identified as DCD, 32 as suspect for DCD and 82 as normal comparison were included in the final sample. Multivariate analysis of variance comparing the three groups (DCD, suspect DCD, and comparison) revealed that both children with DCD and suspect for DCD obtained significantly poorer scores on measures of attention and reading, and were more hyperactive than comparison children. Children with DCD and suspect for DCD were also reported to have more internalizing and social problems than children without motor problems. No significant differences, however, were noted between children with different degree of motor coordination problems (categorized as DCD and suspect for DCD) on any measure. Furthermore, a high percentage of children in both the DCD and suspect groups fell in the clinical range of attention, activity level and psychosocial adjustment problems. The results revealed a high risk for these problems in nonreferred children with motor coordination problems. The high percentage of clinical range behavioral problems warrants attention of clinicians who work with children with motor coordination difficulties to the need...
to promote early identification and referral.

Source: CINAHL


Author(s): Caylak E

Citation: American Journal of Medical Genetics. Part B, Neurpsychiatric Genetics: the Official Publication of the International Society of Psychiatric Genetics, October 2007, vol./is. 144B/7(923-43), 1552-4841;1552-4841 (2007 Oct 5)

Publication Date: October 2007

Abstract: Learning disorders (LD) commonly comprise of a heterogeneous group of disorders manifested by unexpected problems in some children's experiences in the academic performance arena. These problems especially comprise of a variety of disorders which may be subclassified to attention-deficit hyperactivity disorder (ADHD), reading disability (RD), specific language impairment (SLI), speech-sound disorder (SSD), and dyspraxia. The aim of this review is to summarize the current molecular studies and some of the most exciting recent developments in molecular genetic research on LD. The findings for the association and linkage of LD with candidate genes will help to set the research agendas for future studies to follow. (c) 2007 Wiley-Liss, Inc.

Source: Medline

13. Comorbidity of dyslexia, dyspraxia, attention deficit disorder (ADD), attention deficit hyperactive disorder (ADHD), obsessive compulsive disorder (OCD) and Tourette's syndrome in children: a prospective epidemiological study.

Author(s): Pauc R

Citation: Clinical Chiropractic, 01 December 2005, vol./is. 8/4(189-198), 14792354

Publication Date: 01 December 2005

Abstract: Background context

Source: CINAHL

14. Identification of FOXP2 truncation as a novel cause of developmental speech and language deficits


Citation: American Journal of Human Genetics, June 2005, vol./is. 76/6(1074-1080), 0002-9297 (June 2005)

Publication Date: June 2005

Abstract: FOXP2, the first gene to have been implicated in a developmental communication disorder, offers a unique entry point into neuromolecular mechanisms influencing human speech and language acquisition. In multiple members of the well-studied KE family, a heterozygous missense mutation in FOXP2 causes problems in sequencing muscle movements required for articulating speech (developmental verbal dyspraxia), accompanied by wider deficits in linguistic and grammatical processing. Chromosomal rearrangements involving this locus have also been identified. Analyses of FOXP2 coding sequence in typical forms of specific language impairment (SLI), autism, and dyslexia have not uncovered any etiological variants. However, no previous study has performed mutation screening of children with a primary diagnosis of verbal dyspraxia, the most overt feature of the disorder in affected members of the KE family. Here, we report investigations of the entire coding region of FOXP2, including alternatively spliced exons, in 49 probands affected with verbal dyspraxia. We detected variants that alter FOXP2 protein sequence in three probands. One such variant is a heterozygous nonsense mutation that yields a dramatically truncated protein product and cosegregates with speech and language difficulties in the proband, his affected sibling, and their mother. Our discovery of the first nonsense mutation in FOXP2 now opens the door for detailed investigations of neurodevelopment in people carrying different etiological variants of the gene. This endeavor will be crucial for gaining insight into the role of FOXP2 in human cognition. 2005 by The American Society of Human Genetics. All rights reserved.

Source: EMBASE

Available in fulltext from American Journal of Human Genetics at National Library of
16. Long-chain polyunsaturated fatty acids in childhood developmental and psychiatric disorders.

Author(s): Richardson AJ
Citation: Lipids, December 2004, vol./is. 39/12(1215-22), 0024-4201;0024-4201 (2004 Dec)
Publication Date: December 2004
Abstract: Both omega-3 and omega-6 long-chain PUFA (LC-PUFA) are crucial to brain development and function, but omega-3 LC-PUFA in particular are often lacking in modern diets in developed countries. Increasing evidence, reviewed here, indicates that LC-PUFA deficiencies or imbalances are associated with childhood developmental and psychiatric disorders including ADHD, dyslexia, dyspraxia, and autistic spectrum disorders. These conditions show a high clinical overlap and run in the same families, as well as showing associations with various adult psychiatric disorders in which FA abnormalities are already implicated, such as depression, other mood disorders, and schizophrenia. Preliminary evidence from controlled trials also suggests that dietary supplementation with LC-PUFA might help in the management of these kinds of childhood behavioral and learning difficulties. Treatment with omega-3 FA appears most promising, but the few small studies published to date have involved different populations, study designs, treatments, and outcome measures. Large-scale studies are now needed to confirm the benefits reported. Further research is also required to assess the durability of such treatment effects, to determine optimal treatment compositions and dosages, and to develop reliable ways of identifying those individuals most likely to benefit from this kind of treatment. Childhood developmental and psychiatric disorders clearly reflect multifactorial influences, but the study of LC-PUFA and their metabolism could offer important new approaches to their early identification and management. Heterogeneity and comorbidity are such, however, that a focus on specific traits or symptoms may prove more fruitful than an exclusive reliance on current diagnostic categories.
Source: Medline


Author(s): Visser J
Citation: Human Movement Science, November 2003, vol./is. 22/4-5(479-93), 0167-9457:0167-9457 (2003 Nov)
Publication Date: November 2003
Abstract: The interest in Developmental Coordination Disorder (DCD) has grown considerably over the last decade. Nevertheless, its etiology and prognosis are still poorly understood. The idea is growing that DCD may not be a uniform disorder. This review summarizes research on DCD, with a particular focus on subtype and comorbidity studies. The main message of the paper is that, in order to understand the etiology and prognosis of DCD, we need to have a better understanding of its nature. This requires an awareness of the existence of subtypes and comorbidities. Current theories on comorbidity phenomena are discussed in terms of their possible merit for the development of the field. Particular attention is given to the Automatization Deficit Hypothesis, a theory based on research on dyslexia.
Source: Medline


Author(s): Ramus F, Pidgeon E, Frith U
Citation: Journal of Child Psychology & Psychiatry & Allied Disciplines, July 2003, vol./is. 44/5(712-22), 0021-9630;0021-9630 (2003 Jul)
Publication Date: July 2003
Abstract: BACKGROUND: The goal of this study was to investigate the automacticity/cerebellar theory of dyslexia. We tested phonological skills and cerebellar function in a group of dyslexic 8-12-year-old children and their matched controls. Tests administered included the Phonological Assessment Battery, postural stability, bead threading, finger to thumb and time estimation.RESULTS: Dyslexic children were found to...
be significantly poorer than the controls at all tasks but time estimation. About 77% of dyslexics were more than one standard deviation below controls in phonological ability, and 59% were similarly impaired in motor skills. However, at least part of the discrepancy in motor skills was due to dyslexic individuals who had additional disorders (ADHD and/or DCD). The absence of evidence for a time estimation deficit also casts doubt on the cerebellar origin of the motor deficiency. About half the dyslexic children didn’t have any motor problem, and there was no evidence for a causal relationship between motor skills on the one hand and phonological and reading skills on the other.

CONCLUSION: This study provides partial support for the presence of motor problems in dyslexic children, but does not support the hypothesis that a cerebellar dysfunction is the cause of their phonological and reading impairment.

Source: Medline
Available in fulltext from Journal of Child Psychology & Psychiatry at EBSCOhost

23. The importance of omega-3 fatty acids for behaviour, cognition and mood
Author(s) Richardson A.J.
Citation: Scandinavian Journal of Nutrition/Naringsforskning, 2003, vol./is. 47/2(92-98), 1102-6480 (2003)
Publication Date: 2003
Abstract: There is mounting evidence that functional deficiencies or imbalances in certain highly unsaturated fatty acids (HUFA) of the omega-3 and omega-6 series may contribute to a wide range of developmental and psychiatric conditions, including dyslexia, dyspraxia, attention deficit hyperactivity disorder (ADHD), autism, depression, bipolar disorder and the schizophrenia spectrum. These nutrients are essential to the development and function of the brain, but the omega-3 HUFA in particular (eicosapentaenoic and docosahexaenoic acids) are often lacking from modern diets. The evidence implicating omega-3 fatty acids in these conditions is summarized here, with a focus on the results from randomized controlled treatment trials. These indicate that treatment with eicosapentaenoic acid can reduce symptoms in adults with mood disorders, schizophrenia and possibly Huntington’s disease. In children, preliminary evidence suggests that omega-3 HUFA could also reduce some of the behavioural and learning difficulties associated with ADHD, dyslexia and related conditions. The key features of most of these conditions can be found in milder form as part of normal individual differences in mood, behaviour and cognition. The evidence presented here therefore has implications for the general population, and indicates that an adequate dietary intake of omega-3 fatty acids in particular may be crucial for optimal mental health and functioning.
Source: EMBASE

24. The association of abnormal cerebellar function in children with developmental coordination disorder and reading difficulties.
Author(s) O’Hare A, Khalid S
Publication Date: October 2002
Abstract: Children with developmental coordination disorder/dyspraxia (DCD) are at high risk of reading and writing delay. The difficulties with motor skills are heterogeneous and many children have features of poor cerebellar function, reflected in problems with posture, balance and fast accurate control of movement. This study confirmed a high level of parental reporting of reading and writing delay in a clinical group of 23 children with DCD, defined on the basis of both clinical examination and standardized testing of motor function. Direct measurement of reading delay, identified still further children in the group. Those children with reading delay had associated findings typical of phonological awareness difficulties. The children also underwent a standardized test of neurological function and although they all had difficulties with cerebellar function, no distinctive pattern emerged for those whose presentation was complicated by delayed reading and writing. Both the children with DCD and 136 typically developing children, completed the pilot parental questionnaire on gross motor skills. The three skills of catching a ball, jumping on a moving playground roundabout and handwriting, distinguished the children with DCD. This study therefore confirms that children with DCD should be assessed for difficulties in phonological awareness. Additionally, children aged between 7 and 12 years are on the whole, highly
competent in a range of gross motor skills and further study might determine whether a simple parental questionnaire might detect children who would benefit from further assessment. The study also suggests that all the children with DCD have cerebellar dysfunction and further work with a larger group might determine particular patterns associated with reading delay.

Source: Medline
Available in fulltext from Dyslexia (10769242) at EBSCOhost

25. Dyspraxia, dyslexia and attention deficit hyperactivity disorder (ADHD)
Author(s)
Citation: Pharmaceutical Journal, May 2002, vol./is. 268/7199(714), 0031-6873 (25 May 2002)
Publication Date: May 2002
Source: EMBASE

29. Dyslexia and dyspraxia: commentary.
Author(s) Nicolson R
Citation: Dyslexia: the Journal of the British Dyslexia Association, July 2000, vol./is. 6/3(203-4), 1076-9242;1076-9242 (2000 Jul-Sep)
Publication Date: July 2000
Source: Medline
Available in fulltext from Dyslexia (10769242) at EBSCOhost

30. Fatty acid metabolism in neurodevelopmental disorder: a new perspective on associations between attention-deficit/hyperactivity disorder, dyslexia, dyspraxia and the autistic spectrum.
Author(s) Richardson AJ, Ross MA
Citation: Prostaglandins Leukotrienes & Essential Fatty Acids, July 2000, vol./is. 63/1-2(1-9), 0952-3278;0952-3278 (2000 Jul-Aug)
Publication Date: July 2000
Abstract: There is increasing evidence that abnormalities of fatty acid and membrane phospholipid metabolism play a part in a wide range of neurodevelopmental and psychiatric disorders. This proposal is discussed here in relation to attention-deficit/hyperactivity disorder (ADHD), dyslexia, developmental coordination disorder (dyspraxia) and the autistic spectrum. These are among the most common neurodevelopmental disorders of childhood, with significant implications for society as well as for those directly affected. However, controversy still surrounds both the identification and management of these conditions, and while their aetiology is recognized as being complex and multifactorial, little progress has yet been made in elucidating predisposing factors at the biological level. An overview is provided here of the contents of this Special Issue, which contains a selection of reports from a unique multidisciplinary workshop involving both researchers and clinicians. Its purpose was to explore the possibility that ADHD, dyslexia, dyspraxia and autism fall within a phospholipid spectrum of disorders. This proposal could explain the high degree of comorbidity between these conditions, their aggregation within families and relation to other psychiatric disorders, and a range of associated features that are already well known at a clinical level. The existing evidence for fatty acid abnormalities in these disorders is summarized, and new approaches are outlined that have the potential to improve both the identification and the management of these and related neurodevelopmental and psychiatric conditions. Copyright 2000 Harcourt Publishers Ltd.
Source: Medline

31. Dark adaptation, motor skills, docosahexaenoic acid, and dyslexia.
Author(s) Stordy BJ
Citation: American Journal of Clinical Nutrition, January 2000, vol./is. 71/1 Suppl(323S-6S), 0002-9165;0002-9165 (2000 Jan)
Publication Date: January 2000
Abstract: Dyslexia is a widespread condition characterized by difficulty with learning and
movement skills. It is frequently comorbid with dyspraxia (developmental coordination disorder), the chief characteristic of which is impaired movement skills, indicating that there may be some common biological basis to the conditions. Visual and central processing deficits have been found. The long-chain polyunsaturated fatty acids (LCPUFAs) are important components of retinal and brain membranes. In the preliminary studies reported here, dark adaptation was shown to be impaired in 10 dyslexic young adults when compared with a similar control group (P < 0.05, repeated-measures analysis of variance); dark adaptation improved in 5 dyslexic patients after supplementation with a docosahexaenoic acid (DHA)-rich fish oil for 1 mo (P < 0.05, paired t test on final rod threshold); and movement skills in a group of 15 dyspraxic children improved after 4 mo of supplementation with a mixture of high-DHA fish oil, evening primrose oil, and thyme oil (P < 0.007 for manual dexterity, P < 0.02 for ball skills, and P < 0.03 for static and dynamic balance; paired t tests). The studies were small and had designs that did not allow firm conclusions to be made. However, when considered with other evidence from another closely related condition, attention-deficit hyperactivity disorder, for which reduced ability to elongate and desaturate the essential fatty acids linoleic acid and alpha-linolenic acid to arachidonic acid and DHA, respectively, has been proposed, the studies suggest that more research, including double-blind, placebo-controlled studies, would be useful to clarify the benefits of LCPUFAs in dyslexia and other closely related conditions.

Source: Medline

32. Fatty acid metabolism in neurodevelopmental disorder: A new perspective on associations between attention-deficit/hyperactivity disorder, dyslexia, dyspraxia and the autistic spectrum
Author(s) Richardson A.J., Ross M.A.
Citation: Prostaglandins Leukotrienes and Essential Fatty Acids, 2000, vol./is. 63/1-2(1-9), 0952-3278 (2000)
Publication Date: 2000
Abstract: There is increasing evidence that abnormalities of fatty acid and membrane phospholipid metabolism play a part in a wide range of neurodevelopmental and psychiatric disorders. This proposal is discussed here in relation to attention-deficit/hyperactivity disorder (ADHD), dyslexia, developmental coordination disorder (dyspraxia) and the autistic spectrum. These are among the most common neurodevelopmental disorders of childhood, with significant implications for society as well as for those directly affected. However, controversy still surrounds both the identification and management of these conditions, and while their aetiology is recognized as being complex and multifactorial, little progress has yet been made in elucidating predisposing factors at the biological level. An overview is provided here of the contents of this Special Issue, which contains a selection of reports from a unique multi-disciplinary workshop involving both researchers and clinicians. Its purpose was to explore the possibility that ADHD, dyslexia, dyspraxia and autism fall within a phospholipid spectrum of disorders. This proposal could explain the high degree of comorbidity between these conditions, their aggregation within families and relation to other psychiatric disorders, and a range of associated features that are already well known at a clinical level. The existing evidence for fatty acid abnormalities in these disorders is summarized, and new approaches are outlined that have the potential to improve both the identification and the management of these and related neurodevelopmental and psychiatric conditions. (C) 2000 Harcourt Publishers Ltd.
Source: EMBASE

33. Dysmetric dyslexia and dyspraxia. Hypothesis and study.
Author(s) Frank J, Levinson H
Citation: Journal of the American Academy of Child Psychiatry, October 1973, vol./is. 12/4(690-701), 0002-7138;0002-7138 (1973 Oct)
Publication Date: October 1973
Source: Medline

Published Research - Google Scholar
Developmental coordination disorder: associated problems in attention, learning, and psychosocial adjustment


... Diagnostic and statistical manual of mental disorders. (4th ed.)Author, Washington, DC (1994). ... Comorbidity of developmental coordination disorder with ADHD and reading disability. ... Speed of processing, motor skill, automaticity and dyslexia. ...
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Consequences of comorbidity of developmental coordination disorders and learning disabilities for severity and pattern of perceptual—motor dysfunction

MJ Jongmans, BCM Smits-Engelsman… - Journal of learning ..., 2003 - ldx.sagepub.com ... for Children (Smits-Engelsman, 1998); LD = learning disabilities; DCD = developmental coordination ... for Children (Smits-Engelsman (1998); DCD = developmental coordination disorder; LD = learning ... children with dyslexia, the general type of performance difficulty these chil ...

The association between developmental coordination disorder and other developmental traits

R Lingam, J Golding, MJ Jongmans, LP Hunt… - Pediatrics, 2010 - Am Acad Pediatrics ... Developmental coordination disorder (DCD) is defined according to the Diagnostic and Statistical Manual of ... by a severe impairment in the development of motor coordination, which significantly ... language impairment (SLI), autism spectrum disorder (ASD), and dyslexia in clinic ...