研究成果の刊行に関する一覧表(3 / 4)

雑誌

発表者氏名	論文タイトル名	発表誌名	巻号	ページ	出版年
Nakai A, Miyachi T, Okada R, Tani I, Nakajima S, Onishi M, Fujita C, Tsujii M.	Evaluation of the Japanese version of the Developmental Coordination Disorder Questionnaire as a screening tool for clumsiness of Japanese children.	Research in Developmental Disabilities	32	1615-1622	2011
中井昭夫	「療育とは...」再考 —環境の中で身体が脳を創り,運動がこころを創る—	脳と発達	43	432	2011
田中康雄	発達障害−生活障害の視点から−	児童精神医学とその近接領域	52 巻	289-294	2011
田中康雄	子どもと家族を支える「ノットワーキング」づくり	保健師ジャーナル	64 巻	882-887	2011
Kuriyama K, Mishima K, Soshi T, Honma M, Kim Y	Effects of sex differences and regulation of the sleep-wake cycle on aversive memory encoding.	Neurosci Res	70	104-10	2011
Hida A, Kitamura S, Enomoto M, Nozaki K, Moriguchi Y, Echizenya M, Kusanagi H, Mishima K	Individual Traits and Environmental Factors Influencing Sleep Timing: A Study of 225 Japanese Couples.	Chronobiol Int	29	220-6	2012
三島和夫, 北村真吾	現代社会が子どもの脳に及ぼす影響概日リズム睡眠障害研究における課題	小児内科	43	819-23	2011
北村真吾	生物リズム障害の視点から見た不眠症	睡眠医療	5	62-7	2011
三島和夫, 北村真吾	不眠症治療の考え方と実践−リズム調節から考える	Life Style Medicine	5(1)	33-40	2011
三島和夫	睡眠のメカニズムとその障害	薬局	62(10)	13-9	2011

Ⅳ. 研究成果の刊行物・別刷

Research in Developmental Disabilities 32 (2011) 1615–1622

Contents lists available at ScienceDirect

Research in Developmental Disabilities

Evaluation of the Japanese version of the Developmental Coordination Disorder Questionnaire as a screening tool for clumsiness of Japanese children

Akio Nakai [a,*], Taishi Miyachi [b], Ryo Okada [c,d], Iori Tani [b], Shunji Nakajima [b], Masafumi Onishi [b], Chikako Fujita [b], Masatsugu Tsujii [d]

[a] Department of Pediatrics, Faculty of Medical Sciences, University of Fukui, Japan
[b] Research Center for Child Mental Development, Hamamatsu University School of Medicine, Japan
[c] Japanese Society for Rehabilitation of Persons with Disabilities, Japan
[d] School of Contemporary Sociology, Chukyo University, Japan

ARTICLE INFO

Article history:
Received 31 January 2011
Received in revised form 7 February 2011
Accepted 7 February 2011
Available online 5 March 2011

Keywords:
Developmental Coordination Disorder (DCD)
Screening
Questionnaire
Developmental Coordination Disorder Questionnaire (DCDQ)
Attention-deficit hyperactivity disorder (ADHD)
Intelligence quotient (IQ)

ABSTRACT

Developmental Coordination Disorder (DCD) is characterized by clumsiness and coordination difficulties. DCD interferes with academic performance and participation in physical activities and psychosocial functions, such as self-esteem, cognition, or emotion, from childhood through adolescence to adulthood. DCD is a common pediatric condition and its prevalence is estimated to be 6% worldwide. Although English questionnaires are available, there is no questionnaire to identify DCD in Japan, and therefore, no information on its prevalence is available. Recently, we developed the Japanese version of the Developmental Coordination Disorder Questionnaire (DCDQ-J). The purpose of this study was to describe the applicability of the DCDQ-J for use with a community-based population of children in Japan and to investigate the relationships between coordination and attention-deficit hyperactivity disorder (ADHD) tendencies or intelligence. The DCDQ-J was completed by 6330 parents or guardians of children and adolescents. We employed the ADHD-rating scale and determined the intelligence quotient (IQ) of the children. Two-way analysis of variance showed that the scores linearly increased as the children's grades advanced in 2 subscales, namely, control during movement and fine motor. In contrast, non-linear changes were found in the scores of the general coordination subscale. The total scores of the DCDQ-J and ADHD-RS were significantly correlated, but no relationship between DCDQ-J scores and IQ was found. The DCDQ-J is expected to be a useful screening tool to identify and assess motor coordination difficulties of children in Japan and enable cross-cultural comparisons.

1. Introduction

Daily living and school activities of children require various motor skills. Such motor skills depend on coordination of a wide range of movements of body parts, such as appropriate speed and strength, precise timing of movements, and control of posture and balance. The sum of the above-mentioned functions is called "coordination" and is one of the important brain functions that develops along with children's growth (Zwicker, Missiuna, & Boyd, 2009).

* Corresponding author at: Department of Pediatrics, Faculty of Medical Sciences, University of Fukui, 23 Matsuoka-Shimoaizuki, Eiheiji-cho, Fukui 910-1193, Japan. Tel.: +81 776 61 8359; fax: +81 776 61 8129.
E-mail address: anakai@u-fukui.ac.jp (A. Nakai).

0891-4222/$ – see front matter © 2011 Elsevier Ltd. All rights reserved.
doi:10.1016/j.ridd.2011.02.012

Insufficient coordination function is likely to induce delayed motor development, clumsiness, limited manual dexterity, and difficulty in posture. In addition, children with insufficient coordination tend to show retarded development of activities of daily living, including eating, toileting, dressing, and tool using, as well as school activities, including writing, drawing, playing musical instruments, gymnastics, and outdoor play. In fact, many clinical reports show that difficulty in coordination correlates with slow learning of basic daily living, studying, and various other activities (Missiuna, Moll, Law, King, & King, 2006; Polatajko & Cantin, 2005; Tseng, Howe, Chuang, & Hsieh, 2007).

However, the cause of such coordination problems is likely to be mistakenly considered as the lack of discipline by parents or poor motivation of children. If inappropriate measures against such problems are continuously taken, a feeling of self-denial and/or emotional difficulties may occur in children, which may result in self-distrust, exacerbate a repugnance to exercise and school activities, and may worsen the problems (Missiuna et al., 2006; Piek, Baynam, & Barrett, 2006; Polatajko & Cantin, 2005; Skinner & Piek, 2001; Tseng et al., 2007). Parents/guardians (Missiuna, Moll, King, King, & Law, 2007; Stephenson & Chesson, 2008) and teachers (Rivard, Missiuna, Hanna, & Wishart, 2007; Sugden & Chambers, 2003) may often lose patience with their developmental delay or feel disgusted with themselves, which may result in a bad relationship with the child (Cairney, Veldhuizen, & Szatmari, 2010). In addition, some studies have pointed out that coordination is deeply related to children's development of cognition and socialization because coordination increases children's ability to explore and manipulate their environment and encourages them to participate in social activities (Cairney et al., 2010; Missiuna et al., 2006; Piek et al., 2006).

The 4th edition of the diagnostic and statistical manual of mental disorders (DSM-IV) (American Psychiatric Association; Diagnostic and statistical manual of mental disorders: DSM-IV-TR, 2000) defines developmental coordination disorder (DCD) as "a marked impairment in the development of motor coordination, which interferes with daily living and studying." The incidence rate of DCD is 6%, and it is a relatively common pediatric condition (American Psychiatric Association; Diagnostic and statistical manual of mental disorders: DSM-IV-TR, 2000); however, there is no scale to facilitate the screening of DCD in Japan, which makes it difficult to evaluate the children's actual motor performance. The Developmental Coordination Disorder Questionnaire (DCDQ) is a parent rating scale for screening pediatric DCD (Wilson, Kaplan, Crawford, Campbell, & Dewey, 2000; Wilson et al., 2009). Recently, we developed a Japanese version of the DCDQ (DCDQ-J) (Nakai et al., 2009) for the Japanese children and conducted a preliminary investigation on both the reliability of our questionnaire and the psychometric properties.

This relatively large-scale school-based study aimed to study the applicability of the DCDQ-J as a screening tool for DCD in Japanese children. Furthermore, in order to evaluate the validity of the DCDQ-J, we investigated the relationships between coordination and ADHD tendencies or intelligence. DCD interferes with coordination in children whose intellectual level is within the normal range (American Psychiatric Association; Diagnostic and statistical manual of mental disorders: DSM-IV-TR, 2000); thus, the scores of the DCDQ-J should not be significantly related to intelligence. On the other hand, the scores of the DCDQ-J may be positively associated with ADHD tendencies, since DCD is frequently associated with ADHD (Fox & Lent, 1996; Kopp, Beckung, & Gillberg, 2010; Lingam et al., 2010).

2. Methods

2.1. Participants

Parents/guardians of all students in public nursery schools, elementary schools, and junior high schools in the participating city were invited to take part in this study. Nursery school students (middle class: 4- to 5-year-old students; senior class: 5- to 6-year-old students) and all elementary and junior high school students were included in this study. The questionnaire was sent to the parents/guardians via the teachers. The responses from the 6330 respondents were analyzed. Table 1 shows the details of the children, as reported by the respondents. The majority (94%) of the respondents were mothers. Approximately 5% of the respondents were fathers, and the rest were grandparents. Data from parents and guardians of children in special classrooms was excluded from the study. The number of data inputs varied at analysis because missing data was excluded.

2.2. Development of the DCDQ-J

DCDQ 2007 is a parent questionnaire consisting of 15 items and was designed to screen for coordination disorders in children aged 5–15 years (Wilson et al., 2000, 2009). There are 3 subscales, namely, "control during movement (6 subitems)", "fine motor (4 subitems)", and "general coordination (5 subitems)". The descriptions of each item are scored as follows by a 5-point scale based on the comparison between the child and other (children): "Not at all like your child (1 point)", "A bit like your child (2 points)", "Moderately like your child (3 points)", "Quite a bit like your child (4 points)", and "Extremely like your child (5 points)", with higher scores indicating better coordination. Recently, the DCDQ-J was developed and adapted to the Japanese culture (Nakai et al., 2009) in accordance with the International Guidelines (Beaton, Bombardier, Guillemin, & Feraz, 2000).

We employed the Japanese version of the ADHD-rating scale (Japanese version ADHD-RS) developed by DuPaul, Power, Anastopoulos, & Reid (1998), DuPaul, Power, Anastopoulos, & Reid (2008). Based on the ADHD criteria of DSM-IV (American Psychiatric Association; Diagnostic and statistical manual of mental disorders: DSM-IV-TR, 2000), this scale consists of 2

Table 1
Details of grade and sex of participants of this survey.

	Male	Female	Total
Nursery school			
Middle (4–5)	174	167	341
Senior (5–6)	154	176	330
Elementary school			
1 (6–7)	422	350	772
2 (7–8)	343	374	717
3 (8–9)	378	363	741
4 (9–10)	314	319	633
5 (10–11)	328	352	680
6 (11–12)	310	292	602
Lower-secondary school			
7 (12–13)	292	268	560
8 (13–14)	229	255	484
9 (14–15)	219	251	470
Total	3163	3167	6330

subscales to measure the 2 major characteristics of ADHD, namely, Inattentive (9 items) and Hyperactive-Impulsive (9 items). Both the school and home forms of the ADHD-RS have been confirmed to have sufficient reliability and validity (DuPaul, Power, Anastopoulos, & Reid, 1998; DuPaul, Power, McGoey, Ikeda, & Anastopoulos, 1998; DuPaul et al., 2008). As in prior surveys, parents or rearers rated each item on a 4-point Likert scale ranging from "Not at all or rarely (0)" to "Sometimes (1)," "Often (2)," or "Very often (3)." Therefore, the higher a child's score, the more the ADHD tendency.

Our survey employed the DCDQ-J and ADHD-RS and asked the parents or guardians to respond to all of the items for their children.

We measured the intelligence of elementary school children and lower-secondary schoolchildren by using the New Kyoken Support to Intelligence Tests for Each School Grade (Tatsuno, Ishida, & Hattori, 2002). This is a collective intelligence test conducted at the beginning of a school year to assess each child's intelligence quotient (IQ).

2.3. Procedure

This study was approved by the ethics committee of the Hamamatsu University School of Medicine. To request the cooperation of the target city, we provided the education committee of that city with an explanation of the purpose and method of our study, as well as an outline of our plan to protect the privacy of participants. We obtained consent from all the preschools and elementary and junior high schools in the participating city and performed the survey using the described questionnaires. We informed the parents and guardians before starting the study that participation was optional and that they would be notified of the results after the compilation of statistics.

2.4. Statistical analysis

SPSS version 16 (IBM Corporation, NY, USA) was used for statistical analysis.

3. Results

3.1. Scaling method of the DCDQ-J, confirmatory factor analysis, and reliability of DCDQ-J

A confirmatory-factor analysis of the DCDQ-J was performed by assuming the 3 factors reported by Wilson et al. (Schoemaker et al., 2006; Wilson et al., 2000, 2009). All factor loading values were $\geq$0.5, while indicators of good fit were slightly low, such as comparative fit index (CFI) = 0.86 and mean square error of approximation (RMSEA) = 0.13. Therefore, 4 error covariances were added according to the modification indices. As a result, the CFI increased to 0.94 and RMSEA decreased to 0.09, which were acceptable results. The α factors were calculated by subscale yielded values for control during movement, fine motor, and general coordination as 0.91, 0.91, and 0.81, respectively, which indicated that the subscales had high levels of internal consistencies. Accordingly, the study employed 3-factor analysis, and total scores per item were defined as subscale scores. The correlation coefficient between the subscales ranged from 0.59 to 0.73. The total scores of all items were defined as all scores of the DCDQ (α = 0.93).

3.2. Gender difference and school grade difference in the DCDQ-J

Two-way analysis of variance (ANOVA) with factors of age and school grade was performed to evaluate the subscale scores of the DCDQ-J (Table 2). The main effects of gender ($F(1, 6218) = 78.88$, $p < 0.001$) and school grade ($F(10, 6218) = 36.70$, $p < 0.001$) were significant, while the interaction effect ($F(10, 6218) = 0.54$) was not significant in the control

Table 2
Descriptive statistics of the Japanese version of Developmental Coordination Disorder Questionnaire.

Grade (age)	Control during movement				Fine motor				General coordination				DCDQ total			
	Male		Female		Male		Female		Male		Female		Male		Female	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Middle (4–5)	19.46	5.40	19.04	5.35	12.44	4.17	14.78	4.02	16.09	4.76	17.19	4.79	47.99	12.84	50.97	12.69
Senior (5–6)	21.31	5.46	19.99	5.26	13.63	4.20	15.59	3.76	17.23	4.27	17.73	4.59	52.51	12.11	53.38	12.50
1 (6–7)	21.22	5.48	20.38	5.32	14.53	3.72	16.12	3.63	16.75	4.57	17.99	4.59	52.55	12.24	54.56	12.03
2 (7–8)	21.51	5.22	20.45	5.12	13.82	3.63	15.70	3.39	16.27	4.39	17.66	4.34	51.73	11.58	53.81	11.31
3 (8–9)	22.29	5.38	20.76	5.01	14.17	3.56	15.60	3.50	16.98	4.26	17.53	4.16	53.44	11.71	53.94	11.00
4 (9–10)	22.94	5.43	21.27	5.38	14.91	3.51	16.02	3.44	17.76	4.33	17.77	4.20	55.79	11.67	55.18	11.51
5 (10–11)	23.29	5.21	21.86	5.64	14.98	3.74	16.58	3.47	17.83	4.46	18.41	4.44	56.10	11.96	56.99	12.00
6 (11–12)	23.39	5.77	22.09	5.21	14.88	4.00	16.71	3.35	17.72	4.75	18.30	4.15	55.99	13.29	57.12	11.34
7 (12–13)	23.64	5.26	22.39	5.41	14.88	3.93	16.45	3.53	17.78	4.50	18.35	4.40	56.39	12.33	57.16	12.01
8 (13–14)	24.62	5.10	23.03	5.52	15.97	3.77	17.05	3.26	19.07	4.46	18.62	4.55	59.72	12.19	58.59	12.08
9 (14–15)	25.11	4.92	23.73	5.55	16.00	3.70	17.39	3.44	19.04	4.61	18.96	4.64	60.36	12.00	60.04	12.22
Sex	78.88***				284.13***				21.44***				6.86**			
Grade	36.70***				25.35***				13.33***				29.67***			
Sex × grade	0.54				1.20				2.26*				1.30			

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

during movement subclass. In addition, the main effect of gender was higher in boys than in girls, and the main effect of school grade tended to increase as the grade level increased. The main effects of gender ($F(1, 6251) = 284.13$, $p < 0.001$) and school grade ($F(10, 6251) = 25.35$, $p < 0.001$) were significant in the fine motor subclass, while the interaction effect ($F(10, 6251) = 1.20$) was not significant. The main effect of gender was higher in girls than in boys, and the main effect of school grade tended to increase as the grade level increased. The main effects of gender ($F(1, 6231) = 21.44$, $p < 0.001$) and school grade ($F(10, 6231) = 13.33$, $p < 0.001$) and the interaction effect ($F(10, 6231) = 2.26$, $p < 0.001$) were significant in the general coordination subclass. The simple main effect by school grade was significant in the middle class students of the nursery school ($F(1, 6231) = 5.07$, $p < 0.001$), the elementary Year 1 schoolchildren ($F(1, 6231) = 14.60$, $p < 0.001$), and the Year 2 children ($F(1, 6231) = 17.14$, $p < 0.001$), and was higher in girls than in boys. The simple main effect of school grade was significant in both genders, boys ($F(10, 6231) = 11.86$, $p < 0.001$) and girls ($F(10, 6231) = 3.50$, $p < 0.001$), but the difference in school grade tended to be greater in boys than in girls. When the total scores of the DCDQ-J were analyzed using two-way ANOVA, the main effect of gender ($F(1, 6150) = 6.86$, $p < 0.01$) and that of school grade ($F(10, 6150) = 29.67$, $p < 0.001$) were significant, while the interaction effect ($F(10, 6150) = 1.30$) was not significant. The main effect of gender was greater in girls than in boys, and the main effect of school grade tended to increase as the grade level increased.

A main effect of school grade was observed at the subscale level and the total scores of the DCDQ-J; thus, the tendency of their developmental changes was evaluated using multiple regression analysis. The 1st to the 10th items were prepared by assigning a value of 1–11 to the middle class students of the nursery school through to Year 9 students. The influence of gender against each subscale and the total score were controlled at Step 1, and the items regarding their school grade from the 1st to the 10th were input by using a forward selection method at Step 2. The first item was significant in the control during movement subclass ($\beta = 0.23$, $p < 0.001$), and it tended to increase as the grade level increased. In the fine motor subclass, the first item was significant ($\beta = 0.17$, $p < 0.001$), and it tended to increase as the grade level increased. In the overall coordination subclass, an interaction of gender and school grade was observed, so that multiple regression analysis by gender was performed. The 2nd item was significant in boys ($\beta = 0.17$, $p < 0.001$), and in girls ($\beta = 0.09$, $p < 0.001$), and it increased as the grade level increased. In the total scores of DCDQ-J, the first item was significant ($\beta = 0.21$, $p < 0.001$), and it tended to increase as the grade level increased. Fig. 1 shows the plot of scores by school grade and the approximation curve.

3.3. Subgroups of coordination

Using the standard scores of the 3 subscales of the DCDQ-J, *k*-means clustering was performed to study the subgroups of coordination by changing the number of clusters from 2 to 4. In consideration of the interpretive potentiality, a 4-cluster analysis was used. Fig. 2 shows the subscale scores of the DCDQ-J by cluster. All of the subscale scores of Cluster 1 ($n = 1414$, 22.87%) were lower than the mean value; especially, the subscale score of the fine motor subclass was low. Therefore, Cluster 1 was defined as a "poor fine motor group." Cluster 2 ($n = 2307$, 37.31%) was characterized as having high subscale scores, and it was defined as an "excellent coordination group." The subscale score of fine motor alone in Cluster 3 ($n = 1377$, 22.27%) was greater than the mean value, and other 2 subscale scores were lower than the mean value, and it was defined as an "excellent fine motor group." All of the subscale scores of Cluster 4 ($n = 1086$, 17.56%) were far lower than the mean values, and it was defined as a "poor coordination group."

The frequency of cluster occurrence was studied when school grade and gender were different. The bias between the cluster and school grade was significant ($\chi^2(30) = 294.66$, $p < 0.001$). As the grade level increased, the number of participants

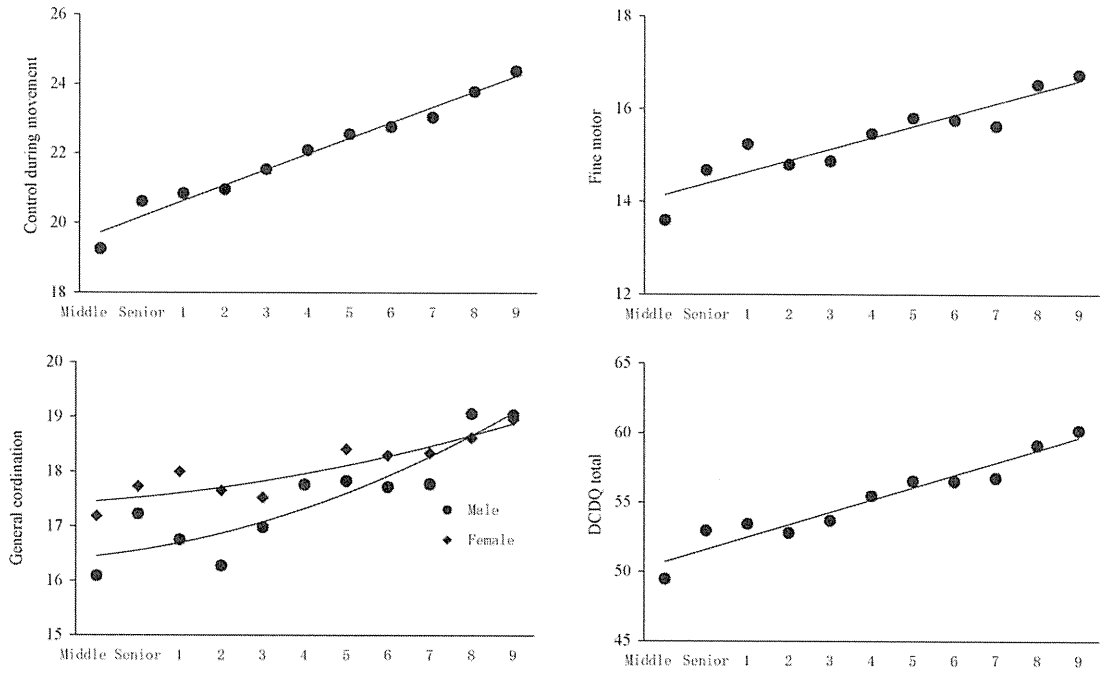

Fig. 1. The score of Japanese version of Developmental Coordination Disorder Questionnaire by grade.

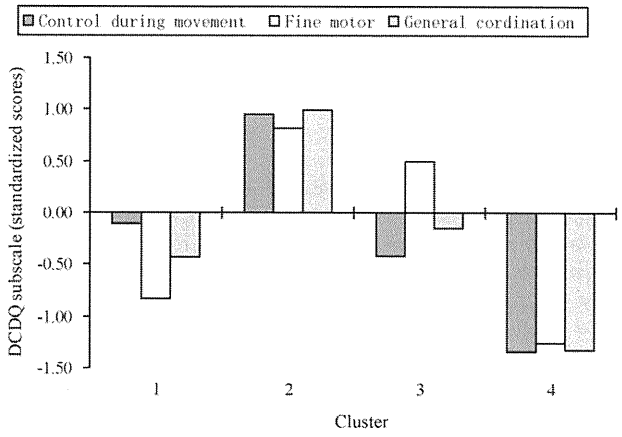

Fig. 2. The score of Japanese version of the Developmental Coordination Disorder Questionnaire subscales by cluster (standardized scores).

in the excellent coordination group increased, while those in the poor coordination group decreased (Fig. 3). The frequency of cluster occurrence of the other 2 groups was approximately 20% regardless of their school grade. In addition, there was a significant bias between the cluster and gender ($\chi^2(3) = 275.13$, $p < 0.001$), which indicated that the poor fine motor group had more boys than girls, while the excellent fine motor group had more girls (Fig. 4).

3.4. Relationship of the DCDQ-J with intelligence and ADHD-RS

In the Japanese version ADHD-RS, each subscale was averaged, and the resulting data was defined as inattentive ($\alpha = 0.90$) and hyperactive/impulsive ($\alpha = 0.86$); further, the total score of all items indicated ADHD tendencies ($\alpha = 0.93$). The correlation between the subscales was 0.75. The correlation coefficient between the DCDQ-J, the IQ, and the Japanese version ADHD-RS was calculated (Table 3). The 3 subscale scores and the total scores of the DCDQ-J were slightly positively associated with intelligence. Furthermore, a negative correlation of −0.2 to −0.5 was observed between the 3 subscale scores and the total scores of the DCDQ-J and the Japanese version ADHD-RS.

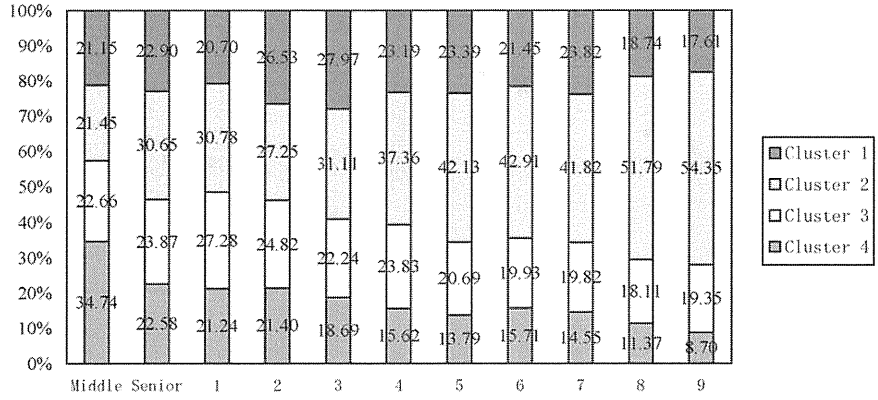

Fig. 3. The frequency ratio of each cluster by grade.

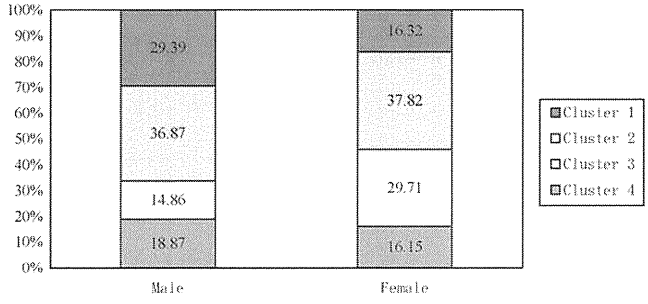

Fig. 4. The frequency ratio of each cluster by sex.

4. Discussion

This study was undertaken in a large sample of Japanese children by using DCDQ-J, ADHD-RS, and the New Kyoken Support to Intelligence Tests to establish relationships among coordination, ADHD tendencies, and intelligence. In this study, differences in development were evaluated, taking into consideration that motor skills increase with age and that the scores of control during movement and fine motor subclasses tend to increase linearly as the grade level increases. The general coordination changed non-linearly regardless of gender, and the scores tended to increase sharply as the grade level increased. The mean value and the development-related changes obtained in this study may be useful to study normal development of coordination and for screening of DCD in Japanese children.

When the subgroups of coordination were studied using the DCDQ-J, they were classified into 4 groups, including the poor fine motor group, the excellent coordination group, the excellent fine motor group, and the poor coordination group. Among these groups, the number of the participants in the excellent coordination group increased as the grade level increased, while those in the poor coordination group decreased. Furthermore, the poor fine motor group had more boys, while the excellent fine motor group had more girls. There were various patterns, for example, children with poor coordination were the weakest at fine motor or poor at all physical exercises, and the frequency of these patterns varied depending on their school grade and/or gender. Accordingly, special attention should be paid to children with clumsiness to determine the kind of movement that is their weak point, in consideration of their school grade and gender.

Table 3
Relationship between Developmental Coordination Disorder Questionnaire and intelligence quotient or attention-deficit hyperactivity disorder-rating scale.

	DCDQ			
	Control during movement	Fine motor	General coordination	DCDQ total
IQ	.12***	.14***	.11***	.14***
ADHD-RS				
Inattention	−.26***	−.46***	−.48***	−.43***
Hyperactive-Impulsive	−.19***	−.36***	−.35***	−.33***
ADHD total	−.24***	−.45***	−.45***	−.41***

*** $p < 0.001$.

The DCDQ-J was related to the ADHD tendencies in children. Previous studies have mention that DCD is associated with ADHD, and that children with ADHD present clumsiness (Fox & Lent, 1996; Kopp et al., 2010; Lingam et al., 2010). In this study as well, all subscales and total scores of the DCDQ-J were significantly associated with the Japanese version ADHD-RS, which suggested that children with poor coordination more frequently showed inattention and hyperactivity in some situations. On the other hand, there was almost no relationship between scores of the DCDQ-J and the IQ. The correlation between the subscales and the total score of the DCDQ-J and their IQ ranged from 0.1 and 0.2, and children with poorer coordination tended to have lower IQs, but the relationship was very weak. Considering that the IQ should be within the normal limit in the diagnosis criteria of DCD by DSM-IV (2000), this study indicates that the DCDQ-J has some degree of validity and may be a useful screening tool for DCD in Japan.

5. Limitation and perspectives

Only the questionnaire survey was done in this study, which was not intended to provide a medical diagnosis of DCD. In countries other than Japan, the cutoff value of the DCDQ is set in terms of the medical diagnosis as well as other batteries of tests (Schoemaker et al., 2006; Tseng, Fu, Wilson, & Hu, 2010; Wilson et al., 2000, 2009). Therefore, the predictive validity of the DCDQ-J should be studied in Japan in the future.

Conflict of interests

The authors have no conflict of interests to declare.

Acknowledgements

This study was supported, in part, by a Grant-in-Aid for Scientific Research from the Japan Society for the Promotion of Science (C20591219). The authors are grateful to children and parents who participated. The authors are also very thankful to Dr. Brenda N. Wilson (Alberta Health Services and University of Calgary, Canada) for the approval for use of the DCDQ. ADHD-RS Japanese version was used by the courtesy and with the permission of Prof. Yasuo Tanaka, Hokkaido University, Japan.

References

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV-TR* (4th ed.). Washington, DC: American Psychological Association.

Beaton, D., Bombardier, C., Guillemin, F., & Feraz, M. B. (2000). Guidelines for process of cross-cultural adaptation of self-report measures. *Spine, 25*, 3186–3191.

Cairney, J., Veldhuizen, S., & Szatmari, P. (2010). Motor coordination and emotional-behavioral problems in children. *Current Opinion in Psychiatry, 23*, 324–329.

DuPaul, G. J., Power, T. J., Anastopoulos, A., & Reid, R. (1998). *ADHD rating scale-IV: Checklists, norms and clinical interpretation*. New York: Guilford Press.

DuPaul, G. J., Power, T. J., McGoey, K. E., Ikeda, M. J., & Anastopoulos, A. D. (1998). Reliability and validity of parent and teacher ratings of attention-deficit/hyperactivity disorder symptoms. *Journal of Psychoeducational Assessment, 16*, 55–68.

DuPaul, G. J., Power, T. J., Anastopoulos, A., & Reid, R. (2008). *ADHD rating scale-IV: Checklists, norms and clinical interpretation (H. Ichikawa & Y. Tanaka, Trans.)*. Tokyo: Akashi-shoten. (Original work published 1998).

Fox, A. M., & Lent, B. (1996). Clumsy children primer on developmental coordination disorder. *Canadian Family Physician, 42*, 1965–1971.

Kopp, S., Beckung, E., & Gillberg, C. (2010). Developmental coordination disorder and other motor control problems in girls with autism spectrum disorder and/or attention deficit/hyperactivity disorder. *Research in Developmental Disabilities, 31*, 350–361.

Lingam, R., Golding, J., Jongmans, M. J., Hunt, L. P., Ellis, M., & Emond, A. (2010). The association between developmental coordination disorder and other developmental traits. *Pediatrics, 126*, e1109–e1118.

Missiuna, C., Moll, S., Law, M., King, S., & King, G. (2006). Mysteries and mazes: Parents' experiences of children with developmental coordination disorder. *Canadian Journal of Occupational Therapy, 73*, 7–17.

Missiuna, C., Moll, S., King, S., King, G., & Law, M. (2007). A trajectory of troubles: Parents' impressions of the impact of developmental coordination disorder. *Physical & Occupational Therapy in Pediatrics, 27*, 81–101.

Nakai, A., Yoshizawa, M., Kawatani, M., & Wilson, B. N. (2009). Cross-cultural adaptation of the Developmental Coordination Disorder Questionnaire 2007 (DCDQ'07) for Japanese children. *Paper presented at the DCD VIII: Developmental coordination disorder international conference*.

Piek, J. P., Baynam, G. B., & Barrett, N. C. (2006). The relationship between fine and gross motor ability, self-perceptions and self-worth in children and adolescents. *Human Movement Science, 25*, 65–75.

Polatajko, H. J., & Cantin, N. (2005). Developmental coordination disorder (dyspraxia): An overview of the state of the art. *Seminars in Pediatric Neurology, 12*, 250–258.

Rivard, L. M., Missiuna, C., Hanna, S., & Wishart, L. (2007). Understanding teachers' perceptions of the motor difficulties of children with developmental coordination disorder (DCD). *British Journal of Educational Psychology, 77*, 633–648.

Skinner, R. A., & Piek, J. P. (2001). Psychosocial implications of poor motor coordination in children and adolescents. *Human Movement Science, 20*, 73–94.

Stephenson, E. A., & Chesson, R. A. (2008). 'Always the guiding hand': Parents' accounts of the long-term implications of developmental co-ordination disorder for their children and families. *Child: Care, Health, and Development, 34*, 335–343.

Sugden, D. A., & Chambers, M. E. (2003). Intervention in children with Developmental Coordination Disorder: The role of parents and teachers. *British Journal of Educational Psychology, 73*, 545–561.

Schoemaker, M. M., Flapper, B., Verheij, N. P., Wilson, B. N., Reinders-Messelink, H. A., & de Kloet, A. (2006). Evaluation of the Developmental Coordination Disorder Questionnaire as a screening instrument. *Developmental Medicine & Child Neurology, 48*, 668–673.

Tatsuno, C., Ishida, T., & Hattori, T. (2002). *Teachers of Tsukuba University's Elementary and Junior High Schools, New Kyoken support to intelligence tests for each school grade*. Tokyo: Tosho Bunnka-sha. (in Japanese).

Tseng, M. H., Howe, T. H., Chuang, I. C., & Hsieh, C. L. (2007). Co-occurrence of problems in activity level, attention, psychosocial adjustment, reading and writing in children with developmental coordination disorder. *International Journal of Rehabilitation Research, 30*, 327–332.

Tseng, M. H., Fu, C. P., Wilson, B. N., & Hu, F. C. (2010). Psychometric properties of a Chinese version of the Developmental Coordination Disorder Questionnaire in community-based children. *Research in Developmental Disabilities, 31*, 33–45.

Wilson, B. N., Kaplan, B. J., Crawford, S. G., Campbell, A., & Dewey, D. (2000). Reliability and validity of a parent questionnaire on childhood motor skills. *American Journal of Occupational Therapy, 54*, 484–493.
Wilson, B. N., Crawford, S. G., Green, D., Roberts, G., Aylott, A., & Kaplan, B. J. (2009). Psychometric properties of the revised Developmental Coordination Disorder Questionnaire. *Physical & Occupational Therapy in Pediatrics, 29*, 182–202.
Zwicker, J. G., Missiuna, C., & Boyd, L. A. (2009). Neural correlates of developmental coordination disorder: A review of hypotheses. *Journal of Child Neurology, 24*, 1273–1281.

巻頭言

「療育とは…」再考

—環境の中で身体が脳を創り，運動がこころを創る—

中 井 昭 夫

福井県こども療育センター

現　福井大学大学院医学系研究科附属子どもの発達研究センター

療育とは単に「医療」「治療」と「養育」「保育・教育」を合わせたものではなく，療育の父と呼ばれる高木憲次先生の造語であるとされています．高木先生は「療育とは，現代の科学を総動員して不自由な肢体を出来るだけ克服し，それによって幸にも恢復したら『肢体の復活能力』そのものを（残存能力ではない）出来る丈有効に活用させ，以て自活の途の立つように育成することである．」（昭和 26 年「療育」第 1 巻第 1 号）と定義しています．

その後，高松鶴吉先生は，医療モデルに近いこの概念を社会モデルとしてさらに発展させ，「療育とは，現在のあらゆる科学と文明を駆使して，障害をもった子どもの自由度を拡大しようとするもので，それは優れた「子育て」でなければならない．」としています．学生さんの講義ではこれらをご紹介していたのですが，療育の現場に深く携わる機会を得ることができて，今改めてその意味を考えています．

福井県こども療育センターでも，AAC（augmentative and alternative communication）を含めた様々なアシスティブ・テクノロジー（支援技術）や取り組みが療育に取り入れられています．特に，自らでは移動できない程度の障害をもつ子でも様々な mobility instruments を用いて，motivation をもって移動するという経験が認知機能の発達を促進するという EBM に基づき，子ども達がセンター内を楽しそうに動き回っている様子は感動的です．今後，乳児用の電動車椅子，パワースーツなどロボット工学を含めた最新の「科学と文明」が療育に寄与していけるのではと感じています．さらに，今では当たり前になった Brain-Machine Interface（BMI）である人工内耳ですが，今後，人工眼など機能代償型 BMI や Deep Brain Stimulation に加え，脳内の情報を解読し，会話や書字などコミュニケーションとして出力する認知型 BMI により，障害をもった子ども達の社会参加が進むことが期待されます．

一方，周産期医療の進歩に伴い増え続けるいわゆる早産児の療育を行っていると，筋緊張の問題はもちろんですが，どこが自分の脇腹か？　自分の足がどこにあるのか？　など身体図式（Body Scheme）の形成が未成熟な子ども達，感覚の過敏や鈍麻など入力の問題を抱える子ども達がとても多いことに気づかされます．そして，これらのわずかな歪みに対する適切なポジショニングやハンドリングにより，認知発達がどんどん促進されていくことにも驚かされます．身体図式は発達の過程での様々な感覚の入力により形成され，ヒトの運動の基盤となり，その障害は認知能力に影響すると言われています．発達障害の発生メカニズムは未だ明らかではありませんが，遺伝的素因と環境との相互作用と考えられています．近年の認知発達ロボティクスの知見からも，例えば子宮と羊水という拘束された環境の中で胎児は自分自身の身体マッピングを含め経験・学習しており，その際には筋骨格系や感覚などの身体性が大きな役割を果たしていることが示唆されています．また，NICU graduates の学童期の高次脳機能の発達についての知見が蓄積されるにつれ，自閉症スペクトラム障害や AD/HD，学習障害などに似た発達の問題があることが数多く報告されるようになってきています．自閉症スペクトラム障害の乳児期早期には粗大運動や協調，感覚など身体機能の問題がむしろ大きいことも注目されています．このように考えていくと，従来，innate と思われていた新生児模倣や顔選好性，Penfield らの一次体性感覚野・運動野のホムンクルスなども胎児期からの子宮内での経験・学習の関与が大きいのではないか，それが十分でない時期に外界へでてきた子ども達には周産期医療の minimal handling の原則との中で，これらの経験・学習をいつ，どのように提供するのかという神経発達行動脳科学的アプローチによる新しい療育のあり方も今後重要な課題となるのではと感じています．これらの観点は是非 NICU で働くことを目指す，あるいは携わっている若い方々にも，療育との関わりをもつ機会を通じて考えていただき，また，NICU での医療へフィードバックしていただければと願っています．

これら，「あらゆる科学と文明」を駆使して子ども達の療育方法を開発していくには学際的・大型研究の推進が必要ですが，これら障害をもつ子ども達やその家族に最も身近に寄り添っている小児科医・日本小児神経学会がイニシアティブをとって進めていければと考えています．

ところで，私はこのような発達障害における身体性，特に協調運動の発達について取り組んでいますが，研究を進める中で，子ども達の不器用さ・発達性協調運動障害を評価・スクリーニングする国際的評価尺度が我が国にないことに気づき，まずそこから始めています．福井のような地方都市，また，療育センターのような研究施設でないところでも現在カナダ，オランダ，イスラエル，イギリスと 4 つの国際共同研究を行っています．環境問題でよく使われる “Think globally, Act locally” という言葉がありますが，私は「世界的な視野で考え，目の前の子ども・地域のために働く」ことはもちろん，逆に，“Think locally, Act globally”「目の前の子ども・地域のことを考えれば，世界的に行動せざるを得ない」の両方を信念に活動しています．

いろいろと妄想まがいのことを書き連ねてしまいましたが，最後に，高松鶴吉先生の「療育とは情念であり，思想であり，科学であり，システムである」という，私のもうひとつの大好きな言葉をご紹介して終わりたいと思います．

厚生労働科学研究費補助金（障害者対策総合研究事業）
就学前後の児童における発達障害の有病率とその発達的変化：
地域ベースの横断的および縦断的研究
平成 23 年度　総括・分担研究報告書

発　行　日　　平成 24（2012）年 3 月
発　行　者　　「就学前後の児童における発達障害の有病率とその発達的変化：
地域ベースの横断的および縦断的研究」
研究代表者　神尾　陽子
発　行　所　　（独）国立精神・神経医療研究センター精神保健研究所
〒187-8553　東京都小平市小川東町 4-1-1
TEL：042-341-2712（6237）　FAX：042-346-1979