Research in Developmental Disabilities 32 (2011) 995–1003

Contents lists available at ScienceDirect

Research in Developmental Disabilities

Development of a multi-dimensional scale for PDD and ADHD

Yasuko Funabiki *, Hisaya Kawagishi, Teruhisa Uwatoko [1], Sayaka Yoshimura, Toshiya Murai

Department of Psychiatry, Graduate School of Medicine, Kyoto University, 54 Kawaharacho, Shogoin, Sakyo-ku, Kyoto 606-8507, Japan

ARTICLE INFO

Article history:
Received 24 January 2011
Received in revised form 27 January 2011
Accepted 27 January 2011

Keywords:
Pervasive developmental disorder
ADHD
Autism
Assessment
Chart

ABSTRACT

A novel assessment scale, the multi-dimensional scale for pervasive developmental disorder (PDD) and attention-deficit/hyperactivity disorder (ADHD) (MSPA), is reported. Existing assessment scales are intended to establish each diagnosis. However, the diagnosis by itself does not always capture individual characteristics or indicate the level of support required, since inter-individual differences are substantial and co-morbidity is common. The MSPA consists of 14 domains and each domain is rated by a nine-point quantitative scale. The clinical and behavioral features are projected onto a radar-chart, which facilitates understanding of the disorders both by the patients themselves and by those in their surroundings. We assessed 179 patients and analyzed features by six diagnostic subgroups, which showed relationships between features and diagnoses. The inter-rater reliability was satisfactory.

1. Introduction

Pervasive developmental disorder (PDD) and attention-deficit/hyperactivity disorder (ADHD) belong to the class of neurodevelopmental disorders. The former is characterized by severe and pervasive impairment in several areas of development, which may include reciprocal social interaction skills, communication skills, and the presence of stereotyped behavior, interests, and activities, according to the Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition-Text Revision (DSM-IV-TR) (American Psychiatric Association, 2000). The latter is characterized by hyperactivity, inattention and impulsivity. However, PDD patients often have symptoms of ADHD (Frazier & Youngstrom, 2006; Jensen, Larrieu, & Mack, 1997; Lee & Ousley, 2006; Sinzig, Walter, & Doepfner, 2009; Yoshida & Uchiyama, 2004) and vice versa (Nijmeijer et al., 2009; Kochhar et al., 2011), although diagnostic criteria do not overlap (Ghanizadeh, 2010). Also, genetic linkages between these disorders have been reported (Bakker et al., 2003; Lichtenstein, Carlström, Råstam, Gillberg, & Anckarsäter, 2010; Ogdie et al., 2003; Smalley et al., 2002; Yamagata et al., 2002). In clinical practice, the differential diagnosis between ADHD and a milder subtype of PDD, PDD not otherwise specified (PDDNOS), is sometimes difficult, because the criteria have not been so formulated as to be useful in this aspect of differential diagnosis, and because it is often the case that a patient has symptoms of PDD as well as ADHD (Nijmeijer et al., 2008).

In addition, these patients often demonstrate clumsiness (Dewey, Cantell, & Crawford, 2007; Pan, Tsai, & Chu, 2009; Pitcher, Piek, & Hay, 2003; Staples & Reid, 2010; Strum, Fernell, & Gillberg, 2004). Gillberg & Gillberg, 1988 proposed the concept of DAMP (deficits in attention, motor control, and perception), which is an overlapping condition of ADHD and developmental coordination disorder (DCD). Moreover, PDD and ADHD patients often suffer from several other symptoms, such as sleep problems (Richdale & Schreck, 2009), sensory abnormality (Baron-Cohen, Ashwin, Ashwin, Tavassoli, &

* Corresponding author. Tel.: +81 75 751 3373; fax: +81 75 751 4212.
E-mail address: funaysk@kuhp.kyoto-u.ac.jp (Y. Funabiki).
[1] Teruhisa Uwatoko is now at the Division of Preventive Services, School of Public Health, Kyoto University.

0891-4222/$ – see front matter © 2011 Elsevier Ltd. All rights reserved.
doi:10.1016/j.ridd.2011.01.052

Chakrabarti, 2009; Harrison & Hare, 2004; Lane, Young, Baker, & Angley, 2010; Leekam, Nieto, Libby, Wing, & Gould, 2007) and learning or executive dysfunction (Nijmeijer et al., 2008).

Thus, many of the characteristics of PDD, ADHD and DCD are not specific to one diagnosis (Matson & Nebel-Schwalm, 2007). The combination of these clinical characteristics has a wide inter-individual variation. Furthermore, the degree of dysfunction in each domain also varies from person to person. Therefore, the diagnosis alone may neither represent the entire profile of characteristics nor indicate the support that an individual patient may need in life. In addition, the diagnosis itself is very time-consuming because of the amount of information that must be gathered. Consequently, only a fraction of the patients who need special care obtain specialized assessment (Russell, Ford, Steer, & Golding, 2010). Furthermore, not only before but also after diagnosis, these patients and their families face numerous struggles to receive appropriate support for all areas of disability and deficit (Whitman, 2004).

Therefore, assessment scales across core features of each diagnosis are needed. Recently, several rating scales have been reported for this purpose. Child Symptom Inventory-4 includes comorbid items and differentiates children with autism spectrum disorder (ASD) from those with ADHD (DeVincent & Gadow, 2009). Autism Spectrum Disorder-Comorbid for Children (ASD-CC) is a rating scale designed for capturing comorbid psychopathology in ASD population (Matson, LoVullo, Rivet, & Boisjoli, 2009). For infants and toddlers, the Baby and Infant Screen for Children with aUtIsm Traits-Part 2 (BISCUIT-Part 2) was invented (Matson, Boisjoli, Hess, & Wilkins, 2011). These scales are designed for infants or children and are scored by caregivers.

We developed a multi-dimensional scale for PDD and ADHD (MSPA) to describe their symptom profiles comprehensively and guide them to the specific support needed directly. It consists of 14 domains of clinical and behavioral features including five core features of PDD, three of ADHD, two of DCD, and the four problem areas of sensory, sleep, learning, and language development.

2. Materials and methods

Ethical approval for the study was obtained from the Ethics Committee at Kyoto University Hospital. We conducted the study according to the Ethical Guideline for Epidemiological Research by the Japanese Ministry of Health, Labour and Welfare.

2.1. Participants

179 patients with PDD or ADHD were evaluated by psychiatrists who are experienced in examining these disorders. They visited psychiatrists for a diagnosis and a professional assessment between September 2006 and July 2010. The diagnosis was based on the criteria of DSM-IV-TR. We measured IQ (intellectual quotient) by Wechsler Adult Intelligence Scale Third Edition (Wechsler, 1997) for patients above 17 years old or by Wechsler Intelligence Scale for Children Third Edition (Wechsler, 1991) for patients from 6 to 17 years old, or DQ (developmental quotient) by Kyoto Scale of Psychological Development for patients under 6 years old (Ikuzawa et al., 2001). We divided them into six diagnostic groups: autistic disorder with mental retardation (Autism with MR) (IQ or DQ < 70), autistic disorder without mental retardation (Autism without MR), Asperger's disorder, PDDNOS, combined-type ADHD, and inattentive-type ADHD. We excluded cases above 50 years old because of the difficulty in obtaining information from infancy, and also excluded cases with complications such as deafness. Consequently, the age of the subjects was 14 ± 10 (mean $\pm$ standard deviation) years old, and the range was 3–49 years old. The profiles of the participants are presented in Table 1. Differences among groups were not seen in gender or age by one-way ANOVA. Autism with MR had significantly lower scores than each of the other groups in FIQ, VIQ and PIQ, as expected from the diagnostic definitions. No significant differences were seen between other pairs.

2.2. Measures

We extracted 14 domains of clinical and behavioral features in PDD and ADHD patients: five from PDD features (communication, sociality, emotion, restricted interests/behaviors, stereotyped/repetitive motion), two from DCD (gross motor, fine motor), three from ADHD (hyperactivity, inattention, impulsivity), and four other symptom areas where these patients often suffer (sensory, sleep cycle, learning, language development). We also formulated the criteria of a nine-rank

Table 1
Group characteristics.

	Autism with MR	Autism without MR	Asperger	PDDNOS	ADHD combined	ADHD inattentive
Number	21	18	40	74	12	14
Male:female	16:5	15:3	29:11	59:15	9:3	9:5
Age	12.3 ± 8.0	14.1 ± 12.5	14.2 ± 8.6	14.7 ± 11.5	13.3 ± 6.9	14.7 ± 8.5
FIQ	51.6 ± 14.3[a]	87.3 ± 13.0	91.8 ± 20.3	94.8 ± 17.7	96.3 ± 8.3	95.5 ± 17.6
VIQ	47.1 ± 18.8[a]	90.2 ± 16.6	93.8 ± 21.9	96.2 ± 19.3	96.8 ± 11.0	98.5 ± 22.3
PIQ	53.2 ± 16.7[a]	85.7 ± 14.6	91.0 ± 20.2	94.3 ± 16.9	96.2 ± 9.4	91.6 ± 13.4

[a]Significantly different from other groups.