Institution: BRUNEL UNIVERSITY (H0113)

Unit of Assessment: 4 – Psychology, Psychiatry and Neuroscience

Title of case study: Development of the first and only standardised test for diagnosing dyslexia for children in Japan

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

Having conducted novel research into developmental dyslexia amongst Japanese children, Professor Wydell led the development of the first Screening Test of Reading and Writing (STRAW-1), a systematic/comprehensive tool for diagnosing children with dyslexia across primary schools in Japan. The test also identifies areas of cognitive deficits enabling appropriate intervention programmes tailored for each dyslexic child's needs. As the first and only standardised test available, nearly 9,000 institutions in Japan use STRAW-1, including educational authorities, primary schools, schools for special needs education, local children's welfare centres, hospitals, clinics, and universities.

2. Underpinning research (indicative maximum 500 words)

In the English-speaking world, between 10-12% of individuals suffer from dyslexia, and there is a wide consensus that developmental dyslexia is a neurological disorder with a genetic origin. Further, in the UK, the Government has highlighted the significant economic and social costs of failing to deal with literacy deficits effectively, e.g., Ofsted (2010) reported that that 15% of girls and 25% of boys aged 11 failed to meet basic standards (Level 4) in reading and writing.

Professor Wydell at Brunel University has been conducting research on the universality and specificity of language/reading processes in alphabetic and non-alphabetic languages (Wydell & Butterworth, 1999; Wang et al., 2010). In contrast to English and other alphabetic languages, not much research had been conducted in Japanese. Thus in 2004, Prof Wydell led the research investigating Japanese children's language and literacy developmental trajectory and identifying dyslexia. The research was conducted in collaboration with Japanese researchers: Professors Akira Uno, University of Tsukuba; Noriko Haruhara, Mejiro University; and Masato Kaneko, Teikyo Heisei University; and it was funded by the Japan Society for the Promotion of Science (JSPS) from 2004 to 2006.

For the first time, Professor Wydell and her colleagues tested over 1,315 children from Grade 2 (8-YR) to Grade 6 (12-YR) on their cognitive reading and writing skills. The test was conducted individually rather than relying on questionnaires. The research concluded that in Japan, less than 1.5% of Japanese primary school children had reading problems with syllabic Kana, and 6.8% of them had reading problems with logographic Kanji. Thus, in contrast to the common belief, the research proved that Japanese children with reading/writing difficulties did exist, and yet, they were not identified as having dyslexia due to the lack of a systematic test. (Uno et al 2009a)

Based on the research findings, Professor Wydell and her colleagues developed the 1st edition of STRAW-I, a systematic and comprehensive assessment tool for identifying the attainment level of literacy skills as well as dyslexia among Japanese primary school children. STRAW-I was published by Interuna, Tokyo in 2006. Subsequently the 2nd edition was published in 2008 and since then it has been the only standard testing method for Japanese primary school children in Japan. The research, using the STRAW, demonstrated that Japanese children's reading and writing impairments were attributed to visual-visuospatial processing problems rather than phonological processing deficits, which are more prevalent in alphabetic languages (Sambai et al., 2012; Suzuki et al., 2010; Uno et al., 2009b).

The impact of STRAW-I was immense, with widespread uptake across Japan by educationalists, teachers, researchers, clinicians, and psychologists. Immediately after the publication of STRAW-I, there was a clear demand expressed for a test for older children. This has led to the development of STRAW-II, which encompasses STRAW-I and also includes junior-high school children (aged 7-12) to assess their literacy skills in Japanese and English as ESL (as they start to learn English). The project (2007-2011) was funded by the grants from the Japanese Ministry of Health.

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

Wydell, TN. & Butterworth, B. (1999). A case study of an English-Japanese bilingual with monolingual dyslexia. ***Cognition, 70,*** 273-305. http://dx.doi.org/10.1016/S0010-0277(99)00016-5

Uno*, A., **Wydell, T.N.***, Haruhara, N., Kaneko, M., & Shinya, N. (2009a). Relationship between reading/writing skills and cognitive abilities among Japanese primary-school children: normal readers versus poor readers (dyslexics). ***Interdisciplinary Journal of Reading & Writing*, 22**, 755-789. **** Joint First Authors. (REF 2)*** http://dx.doi.org/10.1007/s11145-008-9128-8

Uno, A., **Wydell, T.N.**, Kato, M., Itoh, K & Yoshino, F. (2009b) Cognitive Neuropsychology and regional cerebral blood flow study of a Japanese-English bilingual girl with specific language impairment (SLI). ***Cortex, 45,*** 154-163 with 4.058 (Impact factor). **** Joint First Authors.*** http://dx.doi.org/10.1016/j.cortex.2007.09.007

Sambai, A., Uno, A., Kurokawa, S., Haruhara, N., Kaneko, M., Awaya, N., Kozuka, J., Goto, T., & Tsutamori, E., Nakagawa, K., & **Wydell, T.N.** (2012). An investigation into Kana reading development in normal and dyslexic Japanese children using length and lexicality effects. ***Brain & Development 34,*** 520-528. http://dx.doi.org/10.1016/j.braindev.2011.09.005

Suzuki, K., Uno, A., Haruhara, N., Kaneko, M., **Wydell, T.N.**, Awaya, N., Kozuka, J., Gotoh, T. (2010). Characteristics of Hiragana and Katakana Writing in Children with Developmental Dyslexia evaluated by the Screening Test of Reading and Writing for Japanese Primary School Children (STRAW). ***Journal of Japan Society of Logopedics and Phoniatrics 51,*** 1-11. http://dx.doi.org/10.5112/jjlp.51.1

Wang, J-J., Bi, H-Y., Gao, L-Q., **Wydell, T.N.** (2010). The visual magnocellular pathway in Chinese-speaking children with developmental dyslexia. ***Neuropsychologia, 48***; 3627-3633. http://dx.doi.org/10.1016/j.neuropsychologia.2010.08.015

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

STRAW-I, developed by Prof Wydell, is the first and only systematic and comprehensive tool for diagnosing children (8-12 years old) with dyslexia across primary schools in Japan. The test also identifies areas of cognitive deficit (e.g., visuo-spatial processing deficits, short-time memory deficits, etc.), enabling appropriate intervention programmes tailored for each dyslexic child's need.

STRAW-I, supported by the research findings that 1.5% and 6.8% of Japanese primary school children had reading problems with syllabic Kana and logographic Kanji respectively, has informed the public, educational sector and health professionals of the existence of dyslexia among Japanese children who were otherwise labelled as 'lazy', and consequently became 'drop-outs'.

The influence on the education and health sectors are evident from its sales statistics. According to Interuna, the publisher of STRAW-I, over 4,700 copies of the 2nd edition of STRAW were purchased since its publication in 2008 in addition to 4,000 copies of the 1st edition in 2006-2007. Given that STRAW-I can be purchased by an organisation only, this confirms that over 8,700 organisations have been using STRAW-I as their standard test. Copies were sold to educational authorities, primary schools, schools for special needs education, local children's welfare centres, hospitals, clinics, and universities, indicating wide usage by educationalists, researchers, clinicians, and psychologists across Japan. It has been used in every city across Japan. In response to high demands, the publisher plans to produce 5,000 copies of STRAW-II (which incorporates STRAW-I

and an added test for elder children) by 2013.

As reflected by a wide range of institutions using STRAW-I, it is a fully comprehensive and versatile tool. A primary school teacher, who is also a member of the Educational Board and the Special Needs Education Committee in Yachiyo-shi (city) confirmed that STRAW-I has been standardised for Grades 2-6 (8-12 years old) in schools and that it has been 'extremely welcomed' by educational practitioners to identify areas of improvement once children are assessed with their reading, writing and cognitive development levels. [S3]

Another teacher from Kashiwa-shi Kashiwa Dai-san Primary School also noted STRAW's wide applicability [S4]:

'STRAW is useful to identify those children whose IQ (Intelligence quotient) scores are well within the normal range and yet who have reading/writing difficulties. It is also useful to identify the literacy attainment level of these children, as the data are standardised across the grades. Testing children with the STRAW is not taxing to them.'

STRAW-I has been used to understand the effectiveness of the intervention programme to improve children's reading and writing levels. A primary school teacher from Funabashi-shiritsu Misaki Primary School, who is also in charge of children with special needs, noted [S5]:

'Even when we knew through observations some children were struggling with reading/writing, until STRAW, there was no test to quantify statistically the levels of their difficulties…the test is also very useful to monitor how effective the remediation programmes are when offered for these children.'

Major dyslexia clinics such as Kanagawa Prefectural Children's Medical Center and Tottori Rehabilitation Centre for Children with Disabilities reported that referrals of children with suspected dyslexia by their schools increased significantly since the publication of STRAW-I. Previously children referred to these clinics tended to be diagnosed with other developmental disorders such as ADHD, autism, etc. However, STRAW-I has now made it possible to clearly identify those children specifically with developmental dyslexia.

A paediatrician at Goshikidai Hospital in Kagawa also noted that *STRAW-I is 'superior to other tests since Japanese children's literacy development/attainment can be objectively assessed based on large scale research data. The children's literacy attainment is measured by the accuracy of their test (STRAW) performance.'* [S6]

A paediatric neurologist, who works at 4 different hospitals, including a medical welfare centre, in Tottori, noted the effectiveness of STRAW:

'STRAW is the only standardised test in Japan which can evaluate children's writing attainment, and I use STRAW when assessing children with dysgraphia. STRAW can also evaluate children's attainment levels in reading/writing in Hiragana, Katakana and Kanji - it is easier to see where the children's problems arise.' [S7]

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

S1) Uno, A., Haruhara, N., Kaneko, M. & Wydell, T. N. (2006; 2008). Shougakusei no yomikaki Screening Kensa [STRAW: Standardized Screening Test of Reading and Writing for the Japanese Primary School Children (in Japanese)]. Tokyo: Interuna Publishing

S2) A supporting letter from Interuna Shuppan (Interuna Publishing Co.), Tokyo, Japan received confirming all sale information

Testimonies received from the users:

S3) A primary school teacher at Yachiyo-shiritsu Katsutadai Minami Primary School (5-9 Katsutadai, Yachiyo-shi, Chiba-Pref.); also a member of Yachiyo-shi (city) Educational Board and the Special Needs Education Committee

S4) A primary school teacher at Kashiwa-shi Kashiwa Dai-san Primary School, 4-54 Wakaba-cho, Kashiwa-shi (city), Chiba

S5) A primary school teacher at Funabashi-shiritsu Misaki Primary School, 5-39-1 Futawa-Higashi, Funabashi-shi (city), Chiba

S6) A paediatrician (MD) at Goshikidai Hospital, 963 Kamo-cho, Sakaide-city, Kagawa, Japan

S7) A paediatric neurologist (MD) at Tottori University Medical School Hospital; National Hospital Tottori Medical Center; Tottori Prefectural Rehabilitation Center for Children with Disabilities and Seibu Shimane Medical Welfare Center, Tottori, Japan