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Re-Introduction of Cognitive Screening for all School Children

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Abstract

This article argues for the reintroduction of cognitive assessment for all New South Wales (NSW) school children to ensure the early identification of those who are intellectually gifted. The article is based on a review of the literature, and includes discussion on the development of cognitive assessments, and historical and current practices in the administration of cognitive assessments in NSW. The benefits of introducing teacher administered group screening tests to all children starting school are outlined. In particular, such a strategy may (a) lead to better targeted educational provisions, (b) provide a baseline for comparison with the later learning gains of children, (c) allow for the observation of early signs of underachievement, and (d) allow for the identification of emerging signs of learning difficulties. Children with both high and low screening scores are recommended for referral to psychologists for a full cognitive test and other assessments.

Introduction

Some years ago this author worked for the NSW Department of Education as a casual school counsellor in the western suburbs of Sydney. The short-term role was chiefly to assess children with learning difficulties for disability funding eligibility. While in this role, the author found that cognitive tests were predominantly used to identify children with learning disabilities in line with the historic role of school counsellors (Faulkner, 2007).

It was also noted that cognitive tests (also referred to here as cognitive assessments and IQ tests) were not generally used for assessing giftedness, as they were time consuming and expensive, and—more importantly— as there would be no financial benefit to schools because there is no funding available for gifted children. Added to these obstacles has been the fact that there are relatively few school counsellors, with a mean Australia-wide ratio of one school counsellor to 1,635 students (Australian Guidance & Counselling Association, 2008). School counsellors, therefore, do not have much time to test individual students, which is why they often have to prioritise testing that is related to funding for children with special learning needs.

Special learning needs, as noted on the NSW Department of Education website (www.dec.nsw.gov.au), do not include giftedness. Instead, learning difficulties are listed in one or more areas of the curriculum, as well as behaviour disorders or disabilities such as intellectual or physical disability, vision or hearing impairment, language disorder, autism, and mental health conditions. The website also states that children's disabilities need to be assessed through the school counselling service. No such requirement exists on the NSW Department of Education website in relation to children who may be gifted, nor are these mentioned in NSW gifted policy documents that were last updated in 2004. Giftedness, it seems, is not a priority in a society based almost entirely on an egalitarian ethos on the one hand (Gross, 2003), and respect for individualism on the other (Renzulli, 2005).

Whereas some parents correctly identify their own children as gifted, ensure that they have a cognitive assessment by private psychologists, and use it to advocate for their children's educational needs at their schools, other parents remain unaware of their children's giftedness (Wellisch, Brown, & Knight, 2012). Where this is the case, appropriate identification is dependent on teachers' knowledge of giftedness. Unfortunately, research spanning several decades indicates that teachers are quite poor identifiers of gifted children (Dağlioğlu & Suveren, 2013; Fatouros, 1986; Speirs Neumeister, Adams, Pierce, Cassady, & Dixon, 2007). Difficulty in recognising gifted students—especially underachievers, gifted girls, and those with low motivation—has long been seen as a problem related to the lack of undergraduate teacher training in gifted children, even for experienced teachers (Endepohls-Ulpe & Ruf, 2005).

In addition to the lack of testing and funding, the high ratio of students to school counsellors, and the absence of teacher training in gifted education, there has also been a general

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reduction in the use of cognitive tests in schools over time to identify giftedness. Failure to replace these tests with evidence-based objective and reliable measures has further increased the likelihood of gifted children remaining unidentified, becoming underachievers, and dropping out of school (Ford, Grantham, & Whiting, 2008; Renzulli & Park, 2002; Wellisch & Brown, 2012).

In order to better understand the reduced use of cognitive tests for the purposes of identifying gifted students, a literature review was undertaken of cognitive testing in NSW.

Brief Background on Cognitive Tests

Cognitive testing involves the assessment of the thinking and reasoning abilities of individuals, and is administered by psychologists to children or adults. It is also possible to test groups of people using group tests that may be administered by a variety of professionals, including psychologists or teachers, depending on test requirements. Nevertheless, group testing is generally not considered as accurate as individual cognitive tests such as the Wechsler Intelligence Scale for Children or the Stanford-Binet Intelligence Scales (Rosenthal, 2008). These latter types of tests are, in fact, often referred to as 'gold standard' cognitive tests, as they are the most accurate instruments available to assess cognitive abilities.

A number of countries and eminent persons have been involved in the design and measurement of cognitive abilities (Stough, 2015). In the late 1800s, Francis Galton became one of the first people to study intelligence and pioneered psychometric and statistical methods. Frenchman Alfred Binet developed the first test resembling a modern intelligence test around the turn of last century, while the German psychologist William Stern introduced the idea of the intelligence quotient, or IQ, including a formula for mental age. Then Lewis Terman, an American cognitive psychology professor, incorporated IQ in his redeveloped Binet test for adult use. It was British psychologist Charles Spearman who discovered that people who did well on one mental test did well on others, regardless of their content, and posited that tests must draw on the same global capacity. He dubbed this capacity '*g*', for general intelligence.

IQ scores have been, and continue to be, used to address a great variety of research questions: the biological motion perception in Autism Spectrum Disorders (Rutherford & Troje, 2012), mercury exposure in children and IQ (Jacobson, Muckle, Ayotte, Dewailly, & Jacobson, 2015), and the effects of anaemia on child IQ (Ai, Zhao, Zhou, Ma, & Liu, 2012). Cognitive tests have even been compared to other methods of predicting scholastic and employment outcomes that argue for better measures than those of gold standard cognitive tests. The following are a selection of research findings about cognitive tests that demonstrate significant findings related to IQ scores:

- IQ at 4 is a good predictor of IQ at 18 (Cowley, 1994)
- A study by University of Minnesota psychologist Thomas Bouchard on twins reared apart found IQ correlations of .70, suggesting that genetic factors account for 70 percent of the variation in IQ (Bouchard, Lykken, McGue, Segal, & Tellegen, 1990)
- Studies dating back to the 1940s have consistently found that children with higher IQs complete more years of school than those with lower IQs—even when they grow up in the same households (Cowley, 1994)
- A study of childhood IQ and mortality has found that those with higher IQs live longer (Batty & Deary, 2004).

Do Cognitive Tests Assess Intelligence?

This question has been heatedly debated over a long period of time, especially with the adoption of much broader notions of ability and intelligence, which is one of the factors that have contributed to the reduced confidence in cognitive tests. Spearman's '*g*', mentioned earlier, is now embedded in the Cattell-Horn-Carroll (CHC) theory, the first consensus-based, comprehensive, empirically validated working taxonomy of cognitive elements that has formed the foundation for most contemporary cognitive tests. The model was arrived at by "synthesizing hundreds of factor analyses conducted over decades by independent researchers using many different collections of tests" (Daniel, 1997, pp. 1042-1043).

At the top of the model is *g*, or general intelligence, which has been described as the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn

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quickly, and learn from experience (Gottfredson, 1997). The model of general intelligence then branches out into 10 broad abilities with over 70 narrow abilities below it. This psychometric approach to the conceptualisation of intelligence has been the most influential, has generated the most systematic research and, more importantly, has facilitated the development of the latest reliable, valid, and practical intelligence test batteries.

However, not all developers of cognitive tests base their assessments on all 10 broad abilities. For example, Wechsler's Australian Standardised WPPSI-IV (for children 2.5 to 7.7 years) includes five of the broad areas, while the new WISC-V for older children includes six broad areas (Kaufman, Raiford, & Coalson, 2016). The Stanford-Binet 5 has also made use of five broad factors to guide test development, although not all are the same five as those in the WPPSI-IV. In addition to this, there is still debate about what intelligence entails (Stanovich, 2009; Sternberg, 2005). Nevertheless, and despite the continued debate and concerns about bias, cognitive tests remain the best predictors of children's academic achievements (Gottfredson, 1998; Plomin & Deary, 2014).

Historic Use of Cognitive Tests in NSW Schools

In NSW, a variety of group cognitive tests were used to help place children in ability grouping environments. Starting in the 1930s, the aim was to help guide students in selecting the most suitable post-primary courses. At the time, these consisted of academic secondary schools, or junior technical, commercial, or home science schools (Hughes, 2002). By 1939, a total of 40,000 children had been group tested.

Of note, selection for secondary education at this time was based on both IQ scores and class assessments. Nevertheless, as it was eventually found that relying on group IQ scores had prevented the selection of many students for secondary schooling who later achieved much better than their assessments had indicated, these tests were eventually abandoned. Thereafter, with the advent of the *Education Act 1961*, children were no longer selected for entry into secondary schooling. Instead, all children received comprehensive secondary schooling, even though they were still grouped in classes based on their mental ability. The last group cognitive test in NSW schools was administered in 1986 (Greg Rowe, personal information, 5/5/2016).

Current NSW Identification/Assessment Procedures

The NSW Education Department publication *Policy and implementation of strategies for the education of gifted and talented students* (Department of Education and Training, 2004) states that the process of identifying gifted students must include a number of strategies, including the use of "multiple criteria" and "input from the full range of stakeholders" (p. 8). The use of a multiple criteria approach is, in fact, widely supported by Australian experts in giftedness (Merrick & Targett, 2004), education department policies, and by the Australian Association for the Education of the Gifted and Talented (AAEGT).

A multiple criteria identification process may include standardised tests (e.g., IQ tests, aptitude tests, achievement tests, and non-verbal tests), dynamic assessments, observations of students (e.g., using Clark's criteria for giftedness; Clark, 2008), student portfolios, nominations (e.g., from peers, parents and gifted students themselves), and tests of creativity (Ambrose & Machek, 2015). Such an approach is seen as an improvement on the onetime almost exclusive use of IQ tests for identification (Merrick & Targett, 2004), although there is no guarantee that underachieving or twice/multiple exceptionally gifted children may more easily be identified without a cognitive test (Wellisch & Brown, 2012). It is therefore proposed that the identification process include evidence-based cognitive tests as part of the multiple criteria that are used.

Issues in the Use of Cognitive Tests

In the following, issues are outlined both in relation to the use of cognitive tests generally, as well as with respect to the identification of gifted students.

Reliability

A substantial increase in intelligence test scores in many parts of the world, from roughly 1930 to the present day, also known as the Flynn Effect, has caused concern about the reliability of cognitive tests amongst experts. Flynn believed that the increase may be due to environmental changes resulting from modernisation — more intellectually demanding work, greater use of technology, and smaller families — so that a much larger proportion of people have become accustomed to manipulating abstract concepts

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such as hypotheses and categories (Flynn, 2007). However, recent research suggests that the Flynn effect may have ended in at least a few developed nations (Holmes, 2014).

According to Cowley (1994), other criticisms of the reliability of IQ tests relate to the fact that some individuals who score poorly in one year may improve their performance in a subsequent year. Cognitive tests have also been denounced as unable to determine what an individual will actually achieve in life. Interestingly, these claims do not appear to be borne out by research.

Indeed, Gottfredson (1998) made the following comment about the trustworthiness of cognitive tests:

> The answer, based on decades of intelligence research, is an unequivocal yes. No matter their form or content, tests of mental skills invariably point to the existence of a global factor that permeates all aspects of cognition. And this factor seems to have considerable influence on a person's practical quality of life. Intelligence as measured by IQ tests is the single most effective predictor known of individual performance at school and on the job. It also predicts many other aspects of wellbeing, including a person's chances of divorcing, dropping out of high school, (and) being unemployed (p 24).

Test Bias

The perception of cultural bias appears to have resulted in a decreased use of cognitive tests worldwide. For example, in the United States, cognitive tests have long been criticised for favouring individuals of privileged backgrounds over others. Ford cites Sattler's (1992) reputed *Assessment of Children* handbook, which states that African American and Hispanic students score about one standard deviation below Caucasian students on standardized intelligence tests (Ford, 2003a, p. 511). This bias also appears to influence the identification of gifted children from minority backgrounds.

In technical terms, test bias may include construct bias that can affect the self-esteem and motivation of children from minority cultures. This may have an impact on test performance, along with content and item bias, arising from the assumption that children are familiar with the phrases or illustrations used in tests. The latter may be problematic for those who do not have English as a first language or who come from a disadvantaged background (Whiting & Ford, 2009). Other sources of bias may include the background of the test administrator, and the circumstances surrounding the administration of the test.

As gifted educational provision in the United States and Australia is more likely to be approved on the basis of high cognitive test results, there have been calls for more equitable identification of gifted children from diverse backgrounds (Ford, 2003b). Gagné (2011), a highly regarded Canadian expert in talent development, has expressed concern that the call for greater equity in gifted education will not be satisfied until all differences disappear. He has also noted and questioned the opposite effect of the over-representation of students from Asian backgrounds, with similar concerns raised in relation to selective high schools in Australia (Funnel, 2015). In response, Gagné (2011) has proposed that gifted educational provision should be based entirely on achievement, which has its own in-built biases, for example in the case of gifted underachievers.

Some argue that no test can be considered free of cultural bias (Benson, 2003; Whiting & Ford, 2009), including many traditional tests that have been known as culturally non-biased, and even gold standard cognitive tests have been scrutinised for cultural bias (Whiting & Ford, 2009). Despite this, cognitive tests are an important inclusion amongst the multiple criteria now used to identify gifted students. Lovett and Lewandowski (2006) have noted that:

> [A]t the present time, IQ tests and comparable batteries of cognitive abilities that yield general ability indices appear to be the most acceptable primary measures of giftedness, even though access to a gifted support program may be based on a comprehensive evaluation integrating multiple sources of information. (p. 524)

In part, the issue of bias in cognitive testing may be addressed through the use of a range of alternative tests and testing methods. For example, in the case of the culturally diverse, Ford, et al. (2008) suggested the use of nonverbal tests of intelligence that are less culturally loaded than traditional tests:

- Naglieri Nonverbal Ability Test (NNAT-2; Naglieri, 2008) is considered to be culturally neutral. It measures nonverbal abilities, including critical thinking and

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problem solving skills using nonverbal reasoning. Recent studies indicate that the NNAT-2 may yield small racial and ethnic group differences, and may be a good predictor of student achievement (NYC Department of Education, 2013). It may therefore lend itself to the assessment of giftedness (NYC Department of Education, 2013). It may either be administered individually (e.g. to Pre-schoolers and Kindergarten students), or to groups.

- Universal Nonverbal Intelligence Test (UNIT 2; Bracken & McCallum, 1998) aims to provide a fair assessment of intelligence for individuals who have speech, language, or hearing impairments; are from different cultural or language backgrounds; or are verbally uncommunicative. The assessment was updated in 2015.

- Raven's Progressive Matrices (Raven, Raven, & Court, 2003) measures both non-verbal and verbal aspects of general ability. A non-verbal version may be useful for group screening.

Cognitive Tests Only Assess Cognitive Capability

Historically, giftedness of school children related only to cognitive ability. During the 1930s, five broad categories were listed as part of general ability (see Table 1), with giftedness commencing at an IQ of 120.

Table 1.
Broad Categories of General Ability in the 1930s

Name	IQ
Gifted	120+
Above average	110-119
Average	90-109
Below average	80-89
Dull	79-

The current conceptualisations of giftedness differ between experts (starting at 120, Gagné, 2003; and 130, Lohman, 2008, as cited in Wellisch, 2015). Relatedly, the importance of cognitive tests appears generally to have decreased, not only due to the diversity and broadening of the conceptualisations of giftedness, but also due to issues of equity in identification, and the increasing importance of non-cognitive abilities in conceptualisations of giftedness (e.g., ability in the arts and sports). As a result, cognitive tests are now frequently replaced by what some experts describe as imprecise measures (Lovett & Lewandowski, 2006) including creativity tests and peer nominations.

Despite the criticism, cognitive tests remain among the most stable predictors of many non-cognitive outcomes including social status (Plomin & Deary, 2014). Therefore, the neglect of the assessment of the cognitive abilities of school children may be short sighted.

Re-Introduction of Cognitive Tests for all School Children

Article 29 of the *Convention on the Rights of the Child* (United Nations, 1989) commences with the statement that, "the education of the child shall be directed to the development of the child's…fullest potential". As Australia is a signatory to the Convention, it is reasonable to expect schools to use evidence-based screening to obtain information about the potential of children, and to provide appropriate educational interventions to allow them to reach their potential. Additionally, in an egalitarian society, *every* child should be able to expect access to fair and appropriate opportunities to have their specific educational needs met. Of note, Wellisch and Brown (2012) have stated that:

> A fair educational beginning for all children should ideally start with obtaining a breadth of information about their abilities as they first commence their schooling. However, rather than the ideal benchmarking procedure of an early assessment, identification usually takes place when problems arise (Eddles-Hirsch, Vialle, Rogers, & McCormick, 2010) or when a gifted program or class is being offered, necessitating expressions of interest and assessment of potential candidates. The provision of an appropriate education for children at either end of ability levels, therefore, continues to be on an ad hoc basis (p. 152).

The ad hoc procedures that are usually adopted to meet the educational needs of gifted students by teachers, who typically have minimal training in the area, are unfortunate. In contrast to the situation for special education, few universities in NSW provide a compulsory unit in gifted education within its initial teacher training

programs (Fraser-Seeto, Howard, & Woodcock, 2016). The absence of gifted education training in undergraduate studies may lead to a lack of teacher interest in later professional development courses about giftedness and gifted education (Commonwealth Government Publishing Service, 2001). Moreover, research currently in progress indicates that parents' suggestions about their children's gifted educational needs are rarely acted upon by teachers (Wellisch, 2017). Notwithstanding the above, it is usually teachers who refer potentially gifted children for assessments, which means that teachers are, in effect, the gatekeepers to gifted education provisions in schools.

Brown et al. (2005) highlight particular issues, in addition to their lack of training in gifted education, which may impact the abilities of teachers to identify gifted children:

- The influence of student interests on teachers may have a role in identification;
- Unexpected student interests that lead to unexpected behaviours may lead to identification by teachers;
- Teachers may be more likely to identify students whose behaviours do not match expected gender stereotypes;
- Teachers may have a fear of misidentifying students for placement into gifted and talented classes;
- The tendency of teachers to focus more on skills associated with academic performance and less on creativity, leadership, and motor skills; and
- The extremely bright, creative, curious, and questioning students, who may be stubborn, rule-breaking, egotistical, or otherwise high in nuisance value, may not be identified.

As the excessive reliance on teachers for the identification of gifted students may lead to substantial problems, it is proposed that cognitive screening be re-introduced for all school children. Perhaps, cognitive screening could be included as a component of developmental checks in the *Blue Book* (children's personal health record) as part of their developmental monitoring. For example, free cognitive screening could be provided upon school entry in the same way that free vision screening is encouraged for all 4 year old children through the State-wide Eyesight Preschool Screening (StEPS) Program. Such a strategy may not only improve the identification of gifted children but also address issues of equity. Indeed, it is noted that the introduction of non-verbal ability screening to second grade students resulted in a large increase in the numbers of disadvantaged and minority students who were identified as gifted in a U.S. school district (Card & Giuliano, 2015).

In contrast, the reduced use of cognitive tests and the failure to replace them with equally objective and reliable measures has been shown to increase the likelihood of gifted underachievers remaining unidentified, and of gifted children dropping out of school (Ford et al., 2008; Renzulli & Park, 2002). Cognitive screening at the school entry stage may well be the intervention needed to change the status quo and simultaneously establish a cognitive baseline. It would also help ensure evidence-based appropriate educational placements, provisions, and interventions.

Rationale for the Re-Introduction of Cognitive Tests for all School Children

The following outlines the rationale for the reintroduction of early cognitive testing of all school children:

- All children, including those who are gifted, should be allowed to reach their fullest potential (United Nations, 1989);
- Most teachers are not trained in giftedness and are therefore unable to reliably identify potentially gifted children, or refer them to psychologists for assessment (Commonwealth Government Publishing Service, 2001);
- Cognitive tests are the most commonly used of all test instruments to predict level of achievement (Gottfredson, 1998);
- The design of cognitive tests has improved greatly since they were last administered to all NSW school children, incorporating broader notions of intelligence (Daniel, 1997);
- Cognitive tests provide reliable information about a child's current cognitive functioning (Lovett &d Lewandowski, 2006) and may be used to

identify children's strengths and weaknesses (Wellisch & Brown, 2012);

- Mapping strengths and weaknesses may aid the identification of Specific Learning Difficulties, for example specific language impairment (Rice, 2016); and
- Screening records may be useful as a basis for comparison with later performance to alert teachers of underachievement.

Group Cognitive Tests

Group testing, if adopted, should be limited to an initial screening only, except in cases where children were unwell or unmotivated during their first assessment. This is because group screening tools are not considered as accurate as gold standard individual cognitive tests (Rosenthal, 2008), such as the Wechsler Intelligence Scales for Children or the Stanford-Binet Intelligence Scales. Additionally, using screening as a basis for educational placement instead of gold standard cognitive assessments have the potential to become a major liability issue for schools. For example, in 2014, a mother whose son's tested IQ was higher than his sister's, undertook legal action against the Department of Education when her son's Opportunity Class test (OC test) results were equal to his sister's, which caused him to fail to qualify for an Opportunity Class (Silmalis, 2014). The OC test used was not a gold standard test.

There are currently no gold standard (Ivnik et al., 1992) Australian standardised group cognitive tests. Instead, the Raven's Progressive Matrices (non-verbal version) may be used as a screening alternative. The Raven's Progressive Matrices is considered suitable for most children, including those (a) who cannot yet read, (b) do not have English as a first language, or (c) have a minority background. Furthermore, it may be administered as part of a dynamic assessment, if necessary (Chaffey, Bailey, & Vine, 2003; Doherty, 2004). Moreover, the test appears to be a feasible option for most schools, as it may be administered by teachers instead of psychologists.

Conclusion

This article has set out several arguments to support the introduction of group cognitive screening of all children at school entry. The cognitive abilities of children at this time may provide useful information that can add to the identification of students who are gifted, and provide alerts for any further assessments, as necessary. Furthermore, such a strategy may provide a useful cognitive baseline, evidence that can be used for the appropriate educational placements, provisions, and interventions of all children. It may also increase the likelihood of (a) gifted children being identified, (b) underachievement being addressed, (c) the specific needs of gifted children being met, and (d) a reduction in the number of gifted children dropping out of school. Essentially, cognitive screening of all children at school entry is likely to help improve overall student achievement while also reducing the waste of potential, which is a notable benefit both to society and gifted children.

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