



The relationship of reading ability to creativity: Positive, not negative associations[☆]



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ABSTRACT

It has been argued that reading disability may be accompanied by compensatory enhancements in creativity. Here, we assessed reading, spelling and nonword repetition in a large, representative sample of adolescents and young adults, and examined associations with creativity, indexed by trait Openness to Experience and a creative writing task. Creativity and reading ability were significantly associated in a series of regression models controlling for IQ, age, and sex, but the effect was in the opposite direction to that predicted by compensation hypotheses: Higher reading scores were associated with higher scores on creativity measures. We discuss possible explanations for this finding, suggesting a 'facilitation' hypothesis by which reading ability might facilitate creative thinking.

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1. Introduction

Research indicates that dyslexia – defined here as reading ability in the lower tail of the normal distribution (Bates et al., 2011; Shaywitz, Escobar, Shaywitz, Fletcher, & Makuch, 1992) – is not incompatible with high levels of intelligence or creativity (e.g. Shaywitz, 2003; Wolf, 2007) and that it is distinguishable from general cognitive ability at both the psychological and biological levels (Gabel, Gibson, Gruen, & LoTurco, 2010; Luciano et al., 2007; Marlow et al., 2003). However, beyond this, it has been suggested that reading disability may involve a compensatory cognitive *benefit* in the form of enhanced creativity (e.g. Chakravarty, 2009; Davis & Braun, 1997; Eide & Eide, 2011; LaFrance, 1997; Rack, 1981; Tafti, Hameedy, & Baghal, 2009; West, 1997). Here, we examine this compensatory cognitive benefit hypothesis in a large sample with measures of reading and a trait measure linked to creative ability and a creative writing measure.

Support for the compensation hypothesis has come from a relatively small number of studies, generally with small sample sizes and varying conceptions of reading disorder. Nevertheless, their results are consistently in favor of a link between reading disorder and creativity. For instance, in four studies of 14–37 formally-diagnosed dyslexic participants and similar numbers of controls, dyslexic adults showed a small

advantage over non-dyslexic adults in both laboratory-based creativity tasks and self-report measures of creativity (Everatt, Steffert, & Smythe, 1999). This effect was not found in dyslexic children aged around 7 years, and on this basis, Everatt et al. (1999) suggested that creative ability might develop over time as a coping mechanism for low literacy. This developmental model is supported by reports of higher creativity scores in older dyslexic children compared to their non-dyslexic peers (Everatt, Weeks, & Brooks, 2008; Tafti et al., 2009).

Validity is particularly important in assessing creativity research, and researchers have noted that laboratory-based tasks measuring creativity have only modest predictive or criterion validity (e.g. Dietrich, 2007; Dietrich & Kanson, 2010), prompting the use of additional creativity measures. Two such methods have gained particular prominence: Measuring real-world creative output, such as occupational type, and using comprehensive personality inventories. The former method was used in the context of reading and creativity by Wolff and Lundberg (2002), who reported a significant deficit in phonological processing – measured via word and nonword recognition tests, and not formal diagnoses of dyslexia – in art and photography students compared to students in the economics department of the same university. Such associations may, however, result from active course-selection effects by students based on their skills in reading. Logan (2009) posited a self-selection theory to account for her finding of increased prevalence of dyslexia among 'entrepreneurs' – businesspeople requiring creativity and adaptability – compared to 'corporate managers' – those used to conventional organizational structures and rules. Thus, reading disability may not involve innate compensatory enhancements, but instead may lead some individuals to learn compensatory skills.

The second criterion-valid creativity measurement derives from personality theory, in which creativity is associated with the trait of

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Openness to Experience. This personality trait is moderately heritable, while some 50–60% of its variation is explained by environmental influences (Bouchard, 2004). High Openness has been reliably linked to enhanced performance on both laboratory tasks such as the alternative uses test (McCrae, 1987), and to higher objective creative achievements, gauged by metrics such as patents, professional esteem, and peer-rankings of creativity (McCrae, 1994, 2007). Further validating Openness as a marker of creativity, higher scores are associated with involvement in creative professions (Barrick, Mount, & Gupta, 2003; King, Walker, & Broyles, 1996; Larson, Rottinghaus, & Borgen, 2002), and with rated adaptability (LePine, Colquitt, & Erez, 2000).

Here we utilized Openness as a broad-spectrum index of creativity, supplemented by a creative writing test. We tested the hypothesis that creativity is a compensatory response to poor reading in a large, unselected, representative sample of adolescents and young adults, who had been assessed on a battery of reading and language measures.

1.1. Hypotheses

If theories positing compensatory benefits of reading disability are correct, reading should be negatively associated with creativity (hypothesis 1a). If the linkage is restricted to more severe cases of reading disability or extreme cases of creativity, the relationship will hold only when comparing individuals with particularly low reading scores or high creativity scores (hypothesis 1b).

Because links to creativity may be specific to a component of the reading system (Coltheart, Rastle, Perry, Langdon, & Ziegler, 2001), we test whether irregular-word or nonword reading skills are differentially related to creativity (hypothesis 1c). With a similar rationale, we also test if spelling ability is related to creativity (hypothesis 1d). Finally, because the six facets of Openness differentially relate to more aesthetic versus intellectual activity (Gignac, Stough, & Loukomitis, 2004), we test for differential links of creativity to these facets (hypothesis 1e).

Because of the comorbidity evidenced between reading disability and specific language impairment (e.g. Catts, Adolf, Hogan, & Weismer, 2005) it may be that, rather than reading disability, creativity is driven by deficits or alterations in components of the language system, and so individuals with language deficits will show enhanced creativity (though this would be incompatible with the proposed enhanced language skills in entrepreneurs, discussed above). We examined the relationship between these two abilities as hypothesis 2, using measures of nonword repetition ability, which is linked to language impairment (Baird, Slonims, Simonoff, & Dworzynski, 2011; Gathercole, 2006).

2. Method

2.1. Participants

Participants were drawn from the Brisbane Adolescent Twin Sample (Wright & Martin, 2004), which comprises twins and their non-twin siblings recruited since 1992 through primary and secondary schools in south-east Queensland and constitutes a representative sample of this largely urban region of Australia. Data from this sample have previously been analyzed in a range of genetic studies, replicating genes previously found relating to severe dyslexia (e.g. Bates et al., 2011; Lind et al., 2010). The firstborn sibling from 855 twin pairs was selected for study; a total of 418 male and 437 female participants. These individuals were tested at varying ages (ranging 12.3–28.7 years across studies) on a range of cognitive and other phenotypes as part of three main studies – Cognition, Personality and Reading (not all participants were assessed on all measures; see Table 1 for *n* by phenotype). Participants were excluded from IQ assessment if there was parental report of head injury, neurological or psychiatric illness, substance abuse/dependence, or current use of psychoactive medication. Availability was the main criterion for the Reading and Personality studies. Written, informed consent was obtained from all participants, as well as a parent/guardian for those

aged under 18 years, and all studies were approved by the Human Research Ethics Committee at the Queensland Institute of Medical Research.

2.2. Measures and procedure

2.2.1. Reading and spelling ability

Regular-word, irregular-word and nonword reading and spelling were assessed using the CORE (Bates et al., 2004), a 120-word test with additional items included to increase the difficulty level for an older sample. The CORE has shown high test–retest reliability (Lind et al., 2010). This test was administered using written test materials mailed to participants, with testing conducted over the telephone by trained researchers. 53.8% of participants' reading and spelling scores were collected 1 month–8.3 years before IQ testing, with the remaining 46.2% being tested 1 month–9 years after IQ assessment.

2.2.2. Creativity

Creativity was assessed using two versions of the Openness to Experience scale, the short-form 12-item NEO-FFI and the long-form 48-item NEO-PI-R (Costa & McCrae, 1992; Wainwright, Wright, Luciano, Geffen, & Martin, 2008). The NEO-PI-R Openness scale assesses both domain-level Openness, and six individual 8-item facets of Openness (Openness to Fantasy, Aesthetics, Feelings, Actions, Ideas, and Values). Those participants in which Domain level openness was available were all 16 years and over (range 16.70–23.33), with the NEO-PI-R questionnaire being completed within three months of the reading and spelling assessment. Whereas the NEO-FFI was generally collected at the same time as IQ was assessed and 1 to 5 years after the assessment of reading and spelling.

In addition, participants completed the Queensland Core Skills Test (QCST) in their final year at school (typically at age 17 and one year after assessment of IQ), from which 'create and present' (C&P) scores were extracted to index expressed creative ability (Wainwright, Wright, Luciano, Geffen, & Martin, 2005). C&P consists of a creative writing task, based on visual and/or written stimuli, which the subject must use to generate a creative written work. This test was marked on creativity, as well as grammar and spelling ability.

2.2.3. Nonword repetition

Individuals in the sample were tested on two measures of nonword repetition (NWR), the Children's Test of Nonword Repetition (Gathercole & Baddeley, 1996), involving repetition of forty nonwords, and the Nonword Repetition Test (Dollaghan & Campbell, 1998), comprising sixteen nonwords. These were standardized and summed to produce a total NWR score with improved reliability. NWR was assessed at the same time as reading and spelling in 29.6% of the sample, and in the remainder up to 4.1 years after reading and spelling.

2.2.4. Full-scale IQ

The sample completed a shortened version of the Multidimensional Aptitude Battery (MAB; see Luciano et al., 2003 for test–retest reliability data), which consists of three verbal subtests (Vocabulary, Arithmetic, and Information) and two performance subtests (Spatial and Object Assembly). The majority of participants were assessed at age 16 (see Table 1).

2.3. Analyses

To control for the effects of sex and age at time of testing for each measure, we calculated the residual from a regression model predicting variance in reading (or NWR) score from each participants' age at test, age at test squared, and sex. This residual was then used as a predictor in a series of simultaneous linear regression models with creativity measures as dependent variables. These models also controlled for IQ test score, to ascertain whether reading is related to creativity independent of general cognitive ability.

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