The relationship between reading age, education and life outcomes

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Executive Summary

Reading ability has a considerable impact on both educational attainment and wider life outcomes.

Research finds robust associations between reading ability and educational success, and reading enjoyment and reading behaviour appear to be key mechanisms in this relationship. Reading ability affects attainment in literacy and, due to the need to read to gather information and understand examination instructions, reading ability also affects attainment across the curriculum.

The effect of reading ability continues throughout life. Compared to their counterparts with 'functional literacy' levels (a reading age of 11 or above), individuals with low reading ability are:	
Less likely to gain employment, particularly skilled roles	More likely to exhibit behavioural problems and delinquency
Less like to earn an above average salary	More likely to offend, be incarcerated and develop a habit of lifelong offending
Less likely to achieve qualifications or receive work based training or promotion	More likely to have low levels of psychological wellbeing and life satisfaction
Less likely to use preventative health services, remain healthy or manage treatment and medications well	

As poor reading ability is associated with such profound negative life outcomes, it can have huge cost to an individual and also to the economy.

The relationships between reading ability, education and wider life outcomes are complex and difficult to establish. Whilst poor reading may cause unemployment for some individuals, not all poor readers are unemployed. However, on balance the existing literature suggests that reading is a crucially important component of achieving success in education and throughout life.

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Introduction

Many children and adults fall below a basic level of reading. Around 16% of UK adults are functionally illiterate (NLT, 2011) and the UK has one of the highest youth illiteracy rates in the developed world (OECD, 2015). The situation in the UK is not unique, in the US 14% of adults have a 'below basic' reading ability and 21% have a reading ability below a reading age of 11 (NIL, 2015).

Ensuring that all children achieve a reading age of 11, ideally by age 11, is seen as essential to their school career and their ability to make a successful transition into adulthood and the labour market (Dugdale and Clark, 2008a; Gross, 2008; Allen, 2011). Poor readers are less likely to achieve 5 A* to C grades at GCSE (DfE, 2015) and are less likely complete compulsory education (Hernandez, 2011). The impact of poor reading is seen across all subjects, as independent reading is often crucial to gaining knowledge in the wider curriculum (Cimmiyotti, 2013).

Ensuring young people can read well by the age of 11 also has much wider social and economic benefits. Research has linked poor reading ability to an increased likelihood of unemployment, homelessness, divorce, health problems and incarceration, and a reduced likelihood of employment, home ownership, life satisfaction and community and political engagement (Dugdale and Clark, 2008a; Parsons and Bynner, 2008).

Further steps to ensure all children read well by age 11 would have a substantial economic impact. Research estimates that had this been achieved in the past decade, the economy as a whole would have benefitted, potentially raising GDP by an extra £32.1 billion or 2.1% by 2025 (Save the Children and Stanford University, 2014). KPMG (2006) calculated the long-term cost of literacy difficulties as £1.73 billion per annum due to the cost of crime, poor health, special educational needs support and unemployment.

This report reviews the research on how reading age impacts on both educational outcomes and long-term life outcomes including occupation and earning potential, health, offending risk and psychological wellbeing. It considers:

1. How reading age is measured
2. The impact of reading age on educational attainment
3. The impact of reading age on wider life outcomes

Assessment of reading age

An individual's 'reading age' expresses their reading ability in terms of the average ability of others at that age. An individual is defined as 'reading well' if they are reading at or above that average. An adult is considered to be 'functionally illiterate' if their reading age is below the average expected of an 11 year old (NLT).

Reading tests measure ability through the assessment of a range of reading skills including:

- Sight word reading: reading words without sounding them out
- Decoding: sounding words out
- Non-word reading: sounding out made up words e.g. fot
- Reading comprehension
- Reading fluency: the rate of word naming
- Reading accuracy: the number of words correctly read

Scores are allocated a corresponding 'reading age' which is the average score for a large standardised sample of each age group. There are three commonly used scoring systems: WRAT and SWRT which are commonly used in the UK and STAR which is commonly used in the US. Each test has a number of advantages and disadvantages and these can be compared by examining their 'internal reliability' and 'validity':

- internal reliability: the extent to which all parts of the test contribute to the measuring of reading ability
- validity: the extent to which the test measures reading ability precisely rather than anything else

The wide ranging achievement score (WRAT) is a widely used measure of the basic academic skills of word reading, sentence comprehension, spelling and maths computation. The reading score measures letter and word decoding as well as the understanding of words and the ability to comprehend ideas. The WRAT has an extremely high internal reliability and moderate validity (Robertson and Wilkinson, 2006), making it a useful test which does measure reading ability.

The single word reading test (SWRT) is most commonly used with children to assess their word reading skills. The test involves reading aloud sets of words which are graded in difficulty. Sight vocabulary and error analysis can provide a child's overall reading score. It has been found to have both high reliability and high validity (Foster, 2007; Snowling et al., 2009; Stothard et al., 2010), making it an accurate measure of reading ability.

STAR assessments are computer adaptive tests (CAT) widely used in the US. STAR early literacy measures awareness of phoneme and words concepts, comprehension and higher level skills. STAR reading assessment tests reading skills of pupils aged 8 and above. Both tests have high reliability and STAR reading has high validity, though STAR early literacy has only moderate validity (STAR reading, 2010) which supports it's wide usage but highlights that other skills such as communication may interfere slightly with the STAR early literacy scores.

The impact of reading age on educational outcomes

Reading is a core component of education and is crucial for independent learning. Reading enjoyment and reading for pleasure have also been found to have significant impacts on educational attainment, often a larger impact than other factors such as socioeconomic background (Kirsch et al., 2003). Reading age can impact on:

- overall literacy ability including writing ability and reading related skills such as text comprehension
- attainment across the curriculum in subjects such as maths and science
- higher level comprehension skills necessary for educational success
- the likelihood of completing education

1. How does reading age affect attainment in literacy?

The development of early reading and early writing are closely interconnected. Some theories suggest that reading precedes writing in the same way that listening precedes speaking, (Shanahan, 2006).

Reading ability impacts directly on writing ability and literacy skills, with reading ability at 6, 9 and 11 years old accurately predicting reading comprehension, vocabulary and general knowledge at 16 years old even when controlling for cognitive ability (Cunningham and Stanovich, 1997). Regular reading improves writing skills and grammar (Cunningham and Stanovich, 1997; Krashen, 2004) as well as spelling and verbal vocabulary (Sullivan and Brown, 2013).

However, the literature also suggests that the relationship between reading and writing is bidirectional: word recognition can impact spelling and the ability to write fluently, but learning to spell can also influence word recognition (Berninger et al., 2002).

2. How does reading age affect overall educational attainment?

Research suggests that reading ability affects attainment in all subjects. A study of 16 year old students found a relationship between basic reading ability and academic success. This relationship strengthens in most education systems when pupils are around 8 years old as they move from 'learning to read' to 'reading to learn' (Espin and Deno, 1993). In all subjects, pupils are required to read to gather knowledge and to understand written instructions and questions in examinations. Pupils must reach a reading level of 250, approximately a reading age of 13, in order to understand the main ideas in a literature or science based text (NAEP; NCES, 2006). This reading level is also necessary for the use of higher level comprehension skills, such as making generalizations and inferences, which are necessary for success across a range of subjects.

The impact of reading ability on overall educational success is most strongly illustrated by the fact that poor readers are less likely to complete secondary education. Studies from both the US and the UK have shown that between 70% and 80% of pupils that drop out of education are poor readers (Codding, 2001; Dugdale and Clark, 2008a). This relationship is set in motion at an early age: 1 in 6 pupils who are poor readers at age 7 will not complete secondary education, a dropout rate that is six times higher than the rate for proficient readers and for those who have a below basic reading ability the dropout rate rises to 1 in 4 (Hernandez, 2011).

In maths, pupils with low text comprehension ability are less likely to be able to solve mathematical word problems, and this relationship holds when controlling for technical reading skill, indicating that text comprehension specifically hinders understanding of concepts across subjects (Vilenius-Tuohimaa et al. 2008). Children with a higher level of reading comprehension have also been found to learn problem solving and data interpretation skills faster than lower ability readers, suggesting that reading comprehension is linked to a conceptual understanding of mathematics (Grimm, 2008).

In science, a large scale international study by Cromley (2009) found a high correlation between reading ability and science proficiency, with higher ability readers scoring significantly better in PISA tests. This finding is particularly significant as the PISA test is specifically designed to require less reading to avoid reliance on reading ability. This correlation does not mean that reading ability causes science proficiency directly, it is possible that a third factor affects both reading and science ability, however, the strong, robust correlation is worth considering as it is reasonable to assume that being unable to read will hinder students' attempts to access written information about science (Cromley, 2009).

3. Reading enjoyment and reading behaviour

The relationship between time spent reading and reading ability is bidirectional: the best readers read the most, and those that read the most improve their reading skills more quickly (Cunningham and Stanovich, 1997). Research finds that time spent reading impacts positively on a variety of skills and subject outcomes including writing ability, research skills, maths ability, vocabulary breath, spelling and content specific knowledge (Krashen, 2004; Sullivan and Brown, 2013) even when controlling for IQ and text decoding skills, (Cunningham and Stanovich, 1997). Miller (2009) found that time spent reading had a greater impact on achievement than any other school activity.

Reading enjoyment also predicts reading ability. Children who read for pleasure regularly are likely to do significantly better across educational outcomes than their peers who read less often. Research suggests reading for pleasure is more influential than a child's family's socio-economic background (Kirsch et al., 2003) and "is more important for children's cognitive development between age 10 and 16 than their parents' level of education" (Battye and Rainsberry, 2013).

The relationship between reading age and long term life outcomes

A huge amount of research has compared the long-term life outcomes of high ability readers with those of low ability readers. However, the relationships between reading ability, educational attainment and life outcomes are difficult to disentangle. Existing research associates reading age with a wide range of long-term life outcomes but these effects may simply be due to differences in educational outcomes which are influenced by reading ability. Furthermore, other factors such as socio-economic background and cognitive ability are predictive of both literacy ability and life outcomes (Noble et al., 2006) and thus mediate these associations. For this reason, research which controls for socio economic background or educational attainment when examining the effect of reading ability on life outcomes is particularly useful.

1. Employment and earning potential

Reading ability is predictive of the likelihood of unemployment, type of occupation and salary level (Caspi et al., 1998; Bynner and Parsons, 2006; McIntosh and Vignoles, 2001). Basic literacy skills are a major concern for recruiters, with 85% of employers reporting that basic literacy should be the top priority for primary schools (CBI, 2014).

Employment

Men and women with poor literacy have the lowest levels of full-time employment at age 30 (Bynner and Parson, 2006). Moreover, individuals with poor literacy who *are* employed are more likely to be in semi-skilled or unskilled jobs and are less likely to receive work based training or promotion opportunities (Bynner and Parsons, 2006).

Earnings

Adults with 'functional literacy' (a reading age of 11 or above) earn on average 16% more than those without 'functional literacy' (Bynner and Parsons, 1997). Although the effect of numeracy on earnings appears to be more significant and when variables such as parental attitudes and socio-economic background are accounted for the impact of literacy ability on earnings drops (McIntosh and Vignoles, 2001).

2. Health

Research has found links between reading ability and both mental and physical health outcomes. These links can be explained by patterns of 'health behaviour' (any action taken to prevent ill health and promote good health), and 'health literacy', which is defined by Adams as "the ability to seek, understand and act on health information" (2012: page 61).

Health behaviour and outcomes

Poor reading ability is associated with:

- A reduced likelihood of using preventative health services, such as sexual health and cancer screening services
- Less knowledge of health issues such as smoking (Berkman et al. 2004)
- An increased likelihood of risky health behaviours. For instance, women with low literacy scores are more than twice as likely to smoke everyday compared to those with high literacy scores (Bynner and Parsons, 2006).
- Poorer health outcomes. For instance, women with poor literacy skills are 5 times more likely to report being depressed than those with good literacy skills (Bynner and Parsons, 2000). Studies from both the US and Scotland have also linked low literacy with higher incidents of chronic illness (Berkman et al., 2004; Parson and Bynner, 2008).

Health literacy

Patients with low reading ability are less likely to understand common health terms, and are therefore less able to recognise their symptoms, understand their condition and manage their medication and treatment (Williams et al, 1998; Gazmarian et al., 2003; Kriplani et al., 2006). This may result in considerably worse health and recovery outcomes for individuals (Save the Children, 2014). Not following medical advice and poor management of medication has both a 'personal' health cost (to the patient) and also an 'economic' cost to society (Vermeire et al., 2003).

3. Offending risk

The existing literature identifies a strong relationship between reading ability and crime. The prison population has a disproportionately low reading ability, literacy ability is also linked to rates of reoffending. Therefore, literacy interventions with prison populations have been investigated as a potential way to reduce crime.

Literacy and the prison population

60% of prisoners have difficulties with basic literacy (Clark and Dugdale, 2008b); 48% of offenders in the UK have a reading age below that expected for an 11 year old (Devitt, 2011), and 25% of young offenders have a reading age below that expected for a seven year old, (Clark and Dugdale, 2008b). However, Clark and Dugdale (2008b) and Rice, Howes and Connell (1998) suggest these patterns largely disappear when controlling for factors such as gender and socioeconomic status.

The relationship between delinquency, offending and reading ability

Reading ability has been linked to behavioural problems, delinquency, anti-social behaviour and in turn, offending and reoffending risk (Putnins, 1999; Drakeford, 2002). The evidence, however, suggests this link flows both ways (Fergusson and Lynskey, 1997; Williams and McGee, 2006), is indirect (Home Office, 2005) and becomes insignificant when factors such as social disadvantage or attention problems (e.g. ADHD, hyperactivity and ADD) are accounted for (Fergusson and Lynskey, 1997; Maguin et al., 1993).

Reoffending

Improving prisoners' literacy, either through reading interventions or general education programmes, can contribute to reducing rates of reoffending (Drakeford, 2002). For instance, a reading intervention that improved reading ages by an average of a year reduced reoffending by 3.5% (Williams et al., 1996). Despite these potential benefits, very few interventions in prisons focus on reading education, with most programmes being worksheet based and reading instruction rarely rigorous or thorough (Leone et al., 2005).

4. Psychological Wellbeing

An individual's psychological wellbeing lies in their self-concept (the way they perceive themselves) and their resilience to failure and negative feelings such as anxiety. Psychological wellbeing is strongly associated with our general perception of our ability (Luck and Heiss, 1972; Pelham and Swann, 1989; Westaway and Wolmarans, 1992) and our social experiences (Lee and Robbins, 1998). Research has linked reading ability and overall literacy ability with a range of psychological wellbeing outcomes, but some concepts are poorly defined and the complexity of the relationship is often unexplored.

Social experience

Individuals with low reading ability may have less positive social interactions through childhood and into adulthood. Kiuru (2012) found that pre-school children at risk of reading difficulties, as identified through a phoneme recognition test, were more likely to be rejected

by their peers in their first year of school. This finding is notable as peer rejection can increase the risk of later difficulties such as school disengagement (Buhs et al. 2006), academic achievement (Guay et al. 1999) and psychiatric problems (Lansford et al., 2007).

Self-concept and emotional wellbeing

Poor reading ability has also been linked to poor emotional wellbeing and poor self-concept. Poor readers at age 11 are found to have less self-belief regarding their ability to succeed at a task, are more likely to give up and show little resilience following failure (Butkowsky and Willows, 1980). Casey et al. (1992) found that children with a delay in reading age of 9 months were more anxious, less happy and were rated as less competent academically by their parents, regardless of their socioeconomic backgrounds and their parents' level of education.

Life satisfaction

Adults with low literacy levels are less likely to rate their lives positively: 75%-80% of adults with high literacy ability agreed they were 'satisfied with life so far' compared to 45%-50% of those with very low literacy levels (Bynner and Parsons, 1997). However, rather than suggesting a direct effect of literacy on life satisfaction, this relationship is likely due to the effect of reading ability on the other life outcomes discussed above such as education, employment and health.

Conclusion

Reading ability is predictive of educational attainment across subjects, and also of wider life outcomes, perhaps via the effect of reading on educational success.

Poor readers are less likely to achieve well in education, in literacy and across the curriculum, an effect which is amplified as children move through the school system and more independent learning, which requires reading, is necessary to studying and achieving well.

The detrimental effect of poor reading ability continues throughout life:

- Poor readers are more likely to be unemployed
- Poor readers who do gain employment tend to earn less and receive fewer training and promotion opportunities
- Poor readers make less use of preventative health services and engage in more risky health behaviour
- Poor readers experience more health issues and illness but are less likely to understand and manage their treatment
- Poor readers are more likely to exhibit delinquent, antisocial behaviours and are more likely to offend
- Poor readers experience lower life satisfaction and lower wellbeing

Although these relationships are often significant, they may also be mediated by a range of variables such as socio economic status. Nevertheless, the profound impact that reading ability can have on individuals' lives and on society as a whole should not be underestimated

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"Society should ensure that all young people receive the support they need in order to make a fulfilling transition to adulthood"