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Were the Victorians cleverer than us? The decline in general intelligence estimated from a meta-analysis of the slowing of simple reaction time

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ABSTRACT

The Victorian era was marked by an explosion of innovation and genius, per capita rates of which appear to have declined subsequently. The presence of dysgenic fertility for IQ amongst Western nations, starting in the 19th century, suggests that these trends might be related to declining IQ. This is because high-IQ people are more productive and more creative. We tested the hypothesis that the Victorians were cleverer than modern populations, using high-quality instruments, namely measures of simple visual reaction time in a meta-analytic study. Simple reaction time measures correlate substantially with measures of general intelligence (*g*) and are considered elementary measures of cognition. In this study we used the data on the secular slowing of simple reaction time described in a meta-analysis of 14 age-matched studies from Western countries conducted between 1889 and 2004 to estimate the decline in *g* that may have resulted from the presence of dysgenic fertility. Using psychometric meta-analysis we computed the true correlation between simple reaction time and *g*, yielding a decline of −1.16 IQ points per decade or −13.35 IQ points since Victorian times. These findings strongly indicate that with respect to *g* the Victorians were substantially cleverer than modern Western populations.

1. Introduction

1.1. The Victorians

Queen Victoria of the United Kingdom reigned from 1837 to 1901. The Victorian era was a period of immense industrial, cultural, political, scientific, and military change in Western Europe marked by an explosion of creative genius that strongly influenced all other countries in the world. In international relations there was a long period of peace, known as the *Pax Britannica*. Breakthroughs in science led to an escape from the Malthusian trap: increasing populations did not starve and longevity increased. The growth in economic efficiency before the Victorian era was a miniscule 1% per century (Clark, 2008), but started increasing spectacularly in the Victorian era. The height of the per capita numbers of significant innovations in science and technology and also the per capita numbers of scientific geniuses was clearly situated in the Victorian era; after which there was a decline (Huebner, 2005; Murray, 2003; Woodley, 2012; Woodley & Figueredo, 2013).

IQ scores are excellent predictors of job performance (Schmidt & Hunter, 1999) and high-IQ people are more productive and more creative (Jensen, 1998). A population with a higher intelligence will in general be more productive and

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creative than a population with lower intelligence (Lynn & Vanhanen, 2012; Rindermann, Sailer, & Thompson, 2009). Were the Victorians therefore cleverer than us? Here we test this hypothesis using measures of reaction time (RT), which give a good indication of general intelligence (e.g. Johnson & Deary, 2011) in a meta-analytic study.

1.2. Measured IQ scores increase: The Flynn effect

At first sight, the case for a decrease in intelligence since Victorian times seems highly implausible. After all, there is now consensus that at least since World War II, IQ scores have been going up, the so-called Flynn effect. Flynn (1987, 2009) showed a worldwide increase in measured IQ scores of approximately 3 points a decade. Recent studies show similar gains in South Africa (te Nijenhuis, Murphy, & van Eeden, 2011) and much larger effects in South Korea (te Nijenhuis, Cho, Murphy, & Lee, 2012). These gains are thought to be due almost entirely to environmental improvements stemming from factors such as improved education, nutrition, hygiene, and exposure to cognitive complexity (Neisser, 1997). The Flynn effect has therefore been described as an increase in *phenotypic* intelligence, i.e. the intelligence that results from a combination of genes and environmental factors (Lynn, 2011).

1.3. The dysgenics paradox

Dysgenic trends result from socially valued and heritable traits, such as intelligence, declining within populations over time due to the effects of selection operating against those traits (Galton, 1869; Lynn, 2011). Before 1825 Western countries were in eugenic fertility, in that those with the highest levels of education and/or social status had the largest numbers of *surviving* offspring (Lynn, 2011; Skirbekk, 2008). The majority of these countries completed the transition into dysgenic fertility for these IQ proxies by around the middle of the 19th century (Lynn, 2011;Skirbekk, 2008).

The presence of a dysgenic effect on intelligence has proven difficult to detect via direct measurement, i.e. by comparing IQ scores of different age-matched generations on the same IQ battery. The earliest cross-sectional studies (1930s–1950s), attempting to quantify the decline actually found the opposite effect i.e. rising IQ scores (e.g. Cattell, 1950). This presented a paradox as studies from the same time period consistently found negative correlations between IQ and variables such as fertility and family size (Lynn, 2011; van Court & Bean, 1985). Given the observation that IQ is substantially heritable, this finding should have entailed declining rather than increasing IQ (Lynn, 2011; van Court & Bean, 1985). The failure to directly measure a dysgenic effect on IQ is now attributed to the Flynn effect: the strong secular rise in IQ simply masks the likely much weaker dysgenic decline in IQ (Lynn, 2011).

Nonetheless attempts have been made to estimate the theoretical rate of dysgenic change in IQ based on the magnitude of the negative correlation between fertility and IQ (see: Lynn, 2011 for an overview of these studies). These estimates, which range from a low of −.12 (Retherford & Sewell, 1988) to a high of approximately −1.6 points per decade (Lentz, 1927), are however *inferred* rather than *observed* declines. So, dysgenic effects appear to be unmeasurable directly using standard IQ tests.

1.4. Genotypic IQ decreases

Other research has examined whether dysgenic effects have a genetic component by testing for so-called Jensen effects (Rushton, 1998). When looking at the subtests of an IQ battery these subtests range from high complexity (high loadings on the *g* factor of intelligence) to low complexity (low loadings on the *g* factor). Jensen effects refer to the tendency for the test's *g* loadings to positively correlate with the size of the effect of other variables on the same subtests. So, subtests with high *g* loadings go with strong effects and subtests with low *g* loadings go with weak effects. Jensen effects exist on genetic variables, such as heritability, inbreeding depression, and it's opposite, hybrid vigour (Jensen, 1998; Rushton & Jensen, 2010). Clear Jensen effects have also been found for dysgenic fertility (Woodley & Meisenberg, 2013). This indicates that dysgenic fertility is predominantly a genetic effect: i.e. *genotypic* IQ or more accurately 'genetic *g*' (Rushton & Jensen, 2010) decreases. However, the Flynn effect is clearly not a Jensen effect, as it exhibits a modest, negative correlation with subtest *g* loadings (te Nijenhuis & van der Flier, 2013–this issue). In summary therefore the pattern of genetic effects such as heritabilities on the subtests of an IQ battery are highly similar to the pattern in dysgenic effects, however both show no resemblance to the pattern in the Flynn effect.

1.5. Reaction time as a high-quality measure of general intelligence

Galton (1883) was the first to suggest that RT might be an elementary cognitive measure as it appeared to be an indicator of speed of mental processing. Subsequent research has confirmed many key predictions of the speed-of-processing theory of intelligence via the demonstration of robust correlations between measures of RT and IQ (see: Jensen, 2006 for an overview). Moreover, there is a Jensen effect on RT, as more *g*-loaded subtests of an IQ battery correlate more strongly with RT measures than do less *g*-loaded ones (Jensen, 1998, pp. 234–238). This has led Jensen (1998, 2006, 2011) to suggest that RT is in fact a biological marker of mechanisms fundamental to the operation of general intelligence, such as neurophysiological efficiency. Furthermore, RT is a 'ratio-scale' measure of intelligence meaning that it has a true zero (analogously to the Kelvin scale in temperature measurement). This means that RT can be used to meaningfully compare historical and contemporary populations in terms of levels of general intelligence (Jensen, 2011).

Even the most simple measure of RT (i.e. the time that it takes for an individual to respond to a sensory stimulus) appears to be robustly associated with IQ. Rijsdijk, Vernon, and Boomsma (1998) for example investigated the relationship between simple RT and IQ in a genetic analysis using twins. Simple RT and IQ as measured using the Raven's Advanced Progressive Matrices were found to exhibit identical levels of heritability (.58 and .58, respectively) and furthermore the phenotypic correlation between the two of −.21 (increasing IQ goes with decreasing RT speed, hence the correlation is negative) was completely mediated by *common* genetic factors. Another relevant study is that of Deary, Der, and Ford (2001) who set out to generate benchmark estimates for the correlation