



An increase of intelligence in China 1986–2012☆☆☆



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ARTICLE INFO

Article history:

Received 3 May 2013

Received in revised form 10 June 2013

Accepted 18 June 2013

Available online xxxx

Keywords:

Flynn effect

Intelligence

China

WISC

IQ

ABSTRACT

The Flynn effect has been widely researched in Western and European nations, while it has been comparatively understudied in Asian countries. This study examines possible Flynn effects in China from 1985 to 86 and to 2011–12. Results are reported for an IQ increase among 12 year olds on the Full Scale IQ WISC-R (Wechsler Intelligence Scale for Children-Revised) of 6.19 IQ points, a gain on the Performance IQ of 6.55 IQ points, and a gain on the Verbal IQ of 1.91 IQ points.

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1. Introduction

Secular increases in intelligence were reported in the 1930s and 1940s in the United States and Great Britain (Thomson, 1949; Tuddenham, 1948), and subsequently by studies in a number of other countries reviewed in Lynn (in press). Some forty years later, these increases were documented for the United States and other countries by Flynn (1984, 1987, 1998) and have become known as “the Flynn effect”.

The Flynn effect has not been widely studied in Asian countries. In Japan, Lynn and Hampson (1986) reported an average gain of 7.7 IQ points per decade for samples born from 1940 to 1965. In South Korea, IQ gains of 7.7 points per decade were observed for individuals born between 1970 and 1990 that have been reported by te Nijenhuis, Cho, Murphy, and Lee

(2012). In Taiwan, an IQ gain of 2.45 IQ points per decade in children measured by the WISC-III and the WISC-IV was recorded over the years 1997–2007 and an IQ gain in adults measured by the WAIS-III showed a smaller increase of 0.51 IQ points a decade over the years 2001–2011 by Chen, Liao, Chen, Chen, and Lynn (2013) and similar gains have recently been reported in South Africa for Indians and other racial groups by te Nijenhuis, Murphy, and van Eeden (2011).

In China, an increase in the intelligence of 5-to-6-year-olds of 4.53 points on the Chinese Preschool and Primary Scale of Intelligence (WPPSI) from 1984 to 2006 was reported by Liu, Yang, Li, Chen, and Lynn (2012), representing a gain of 2.06 IQ points per decade. In this paper, we contribute to the literature on the Flynn effect in Asian countries by reporting further data for an increase of intelligence in China in recent decades.

2. Method

The Chinese version of the Wechsler Intelligence Scale for Children-Revised (WISC-R) was standardized on a Chinese urban sample of 3812 6–16 year olds in 1985–85 by Yue and Gao (1987). The manual of the Chinese WISC-R does not give details of the socio-economic status of the standardization sample but there is no reason to suppose it was not representative of the Chinese urban population. The WISC-R

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☆☆ Funding: Funding was provided by the National Institute of Environment Health Sciences (NIH/NIEHS, R01-ES018858; K02-ES019878-01), USA. The authors declare no competing interests.

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consists of 12 subtests that are combined to give measures of Verbal IQ and Performance IQs. The Verbal IQ consists of the sum of the Information, Comprehension, Arithmetic, Vocabulary, Similarities and Digit Span tests, and the Performance IQ consists of the sum of the Picture Completion, Block Design, Object Assembly, Mazes, Picture Arrangement and Coding tests. The Verbal IQ and Performance IQs are combined to give a Full-Scale IQ, which is defined as the average of all cognitive abilities and is widely recognized as a good measure of general intelligence.

A further sample was tested with the same Chinese version of the WISC-R in 2011–12. The presence of a Flynn effect in China can be examined by a comparison of the scores of the two samples. The 2011–12 sample was obtained from the Jintan Child Study. This study consisted originally of 1656 Chinese children (55.5% boys, 44.5% girls) consisting of 24.3% of all children in this age range in the Jintan City region born in 1999. The Jintan Child Study is an on-going prospective longitudinal study with the aim of exploring early health risk factors in the development of child cognition and behavior. Details of this cohort study have been described in a previous publication (Liu et al., 2010). The cohort took their first IQ test at age 6 (Liu & Lynn, 2011). To match the 2011–12 sample to the 1985–86 sample two steps were needed. First, the two samples need to be matched for age. The manual for the 1985–86 sample gives IQs for each half year, i.e. for those aged 6.5, 7.5 years, etc.. The IQ of those aged 12.5 years ($n = 346$) is used for comparison with the 2011–12 sample of the same age. Second, because the 1985–86 sample was urban, only urban children were used for the 2011–12 comparison sample. This entailed omitting the rural children and gave an urban sample of 442 for 2011–12, comprising 54.9% boys and 55.1% girls, with an average age 12.2 years. Written consent forms were obtained from parents prior to the administration of measures.

The data for the 2011–12 sample were collected between spring 2011 and spring 2012 when the participants were in sixth grade or had just graduated from sixth grade. Participants were invited to the laboratory, where research assistants, who participated in an intensive training course, administered the paper form of the WISC-R. The research assistants were supervised by a Ph.D. trained clinical psychologist who specializes on cognitive brain assessment at Nanjing Brain Hospital. The same training procedure as described in detail in Liu et al. (2012) was followed. The IQ test was administered

over the course of 1 h in a quiet room in Jintan Hospital. Each test was scored by two individuals to minimize scorer bias.

3. Results

Mean (SD) scaled scores for Verbal, Performance and Full Scale IQs for the 1985–1986 and the 2011–2012 samples are presented in Table 1. The 2011–2012 sample obtained significantly higher scores on Verbal IQs ($t = 2.02$, $p < .05$), Performance IQs ($t = 6.99$, $p < .001$) and Full Scale IQs ($t = 6.19$, $p < .001$) than the 1985–1986 sample, with increases of 1.91, 6.50, and 6.19 IQ points, respectively.

The correlation matrix for the Verbal, Performance and Full Scale IQs in the 2011–2012 Jintan sample is presented in Table 2. Consistent with previous studies, Verbal, Performance and Full Scale IQs were significantly inter-correlated.

4. Discussion

The present study compared WISC-R test scores from a sample of Chinese children with a mean age of 12.5 years obtained in a 1985 to 1986 urban standardization sample with those obtained by children of the same age in 2011 to 2012. The results showed a secular increase of intelligence consisting of increases over the years 1986–2012 of 6.19 IQ points in the Full Scale WISC-R IQ, 1.91 IQ points in the Verbal IQ, and 6.55 IQ points in the Performance IQ. Over the 26 years between the two datasets, these gains represent 2.38 Full Scale IQ points per decade, 0.73 Verbal IQ points per decade, and 2.52 Performance IQ points per decade.

These increases are of similar magnitude to those of approximately 2.18 IQ points a decade for the United States for the years 1948–2002 calculated by Flynn (2012). The greater increase of the Performance IQ than of the Verbal IQ is typical of many previous studies. For instance, in the United States the gain on the Performance IQ was 3.58 IQ points a decade, while the gain on the Verbal IQ was 2.18 IQ points a decade for the years 1972–1989 calculated by Flynn (1998, Table 2) and similar differences in gains have recently been reported in South Africa by te Nijenhuis et al. (2011). The larger gains on the Performance IQ than on the Verbal IQ in China, the United States and South Africa have implications for the causes of the increases of intelligence. These have often been attributed to improvements in education (e.g. Tuddenham, 1948), but these

Table 1
WISC-R IQs in China in 1985–1986 and 2011–2012.

| | 1985–1986 national norm sample (n = 346) | | 2011–2012 sample (N = 495) | | IQ gain | d | t |
|---------------|--|------|----------------------------|-------|---------|-----|---------|
| | Mean | SD | Mean | SD | | | |
| Verbal IQ | 99.7 | 14.5 | 101.61 | 11.84 | 1.91 | .15 | 2.02* |
| Perform IQ | 99.8 | 14.1 | 106.35 | 11.93 | 6.55 | .50 | 6.99*** |
| Full scale IQ | 99.7 | 14.4 | 105.89 | 13.69 | 6.19 | .44 | 6.19*** |

d = the difference between the two means divided by the average sd.

t = the value of t as a test of the significance between the two means.

*** $p < .001$.

** $p < .01$.

* $p < .05$.

Table 2

The correlations matrix of VIQ, PIQ and FIQ in 2011–2012 Jintan sample.

| | VIQ | PIQ | FIQ |
|-----|---------|---------|-----|
| VIQ | 1 | | |
| PIQ | .426*** | 1 | |
| FIQ | .865*** | .813*** | 1 |

*** $p < .001$.

would be expected to lead to greater increases in verbal IQs that are based on material that is taught in schools. Performance IQ is more a measure of fluid intelligence and the greater increases on this suggest improvements in the neurological efficiency of the brain attributable to improvements in nutrition, as proposed by Lynn (1990, 2009, in press).

There are several important factors to consider in interpreting the increase in intelligence observed in this study. First, increases in intelligence may be attributable to the rapid growth in the Chinese economic sector, as previous researchers have shown that IQ increases are subject to level of economic development (Lynn & Vanhanen, 2012; te Nijenhuis et al., 2012). Along with economic growth, the overall standard of living in China has improved since the 1980s. Poverty and low family income have been strongly linked to poorer cognitive performance, IQ test scores, and educational attainment (Duncan et al., 1998). Furthermore, improvements in nutrition and a decline in under-5 and infant mortality suggest a healthier China, which too may have had a positive effect on student IQ levels (Lynn, 1990, 2009; Lynn & Harland, 1998; Lynn & Vanhanen 2012). In addition, Ma et al. (2011) recently found that puberty in Chinese boys occurs earlier today than in the 1980s, and given the ages of our subjects are pre-adolescence, it is possible that earlier physical maturation may lead to earlier mental maturation, which can be exhibited through the increases in IQ. Finally, China's increase in IQ occurred concurrently with improvements in early childhood education and national education level, including declining illiteracy rates and increasing preschool education rates (Lynn & Vanhanen, 2006, 2012). These improvements are accompanied by an increased awareness of education, which, along with changes in the educational level of the parental generation, may have contributed to the rise in fluid intelligence, which encompasses logical thinking and problem solving.

5. Conclusion/implications

Documenting Flynn effects is vital to ensuring proper intelligence test construction and validity, and differentiation of changes in crystallized versus fluid intelligence informs construction and validity of specific subtests. Furthermore, Flynn effects are important for ensuring appropriate test norms, which can become obsolete as a population IQ increases. Understanding trends in generational IQ changes across different cultural populations may have real-world implications for better understanding the nature of intelligence and identifying potentially malleable factors (e.g., nutrition)

that may increase specific areas of cognition related to increases in IQ (e.g., fluid intelligence).

Our specific focus on Chinese populations fills a gap in the literature, but an added strength to this study is our use of the same instrument in the 2011 to 2012 sample (WISC-R) as was used in the original sample. Past studies on the Flynn effect have been criticized for possibly exaggerating the extent of the Flynn effect due to changes in intelligence measures due to the use of different tests. This paper employed the same test in both samples, thereby allowing easy comparison across results.

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