

Prof. Dr. Heiner Rindermann
Technical University Chemnitz
Educational and Developmental Psychology
heiner.rindermann@psychologie.tu-chemnitz.de
www.tu-chemnitz.de/~hrin

Prof. Dr. James Thompson
Department of Psychology, University College London, UK
james.thompson@ucl.ac.uk

International Society for Intelligence Research, ISIR 2012
13th Annual Conference
December 13 to 15, 2012
San Antonio (Marriott Riverwalk Hotel), Texas
Symposium: Flynn Effect
Chair James Thompson
Friday, 14th December 2012, 8²⁰-10⁰⁰
HR 9²⁰-9⁴⁰

Heiner Rindermann
TU Chemnitz, Germany

James Thompson
University College London, UK

Continuing rise of NAEP-derived cognitive competence scores in US 1971-2008

Schedule

1 Continuing IQ rise or not?	3
2 Narrowing gaps or not?	8
3 National Assessment of Educational Progress (NAEP)	9
4 Research questions	10
5 Methods	11
6 Results.....	13
7 Causes for development and changes in development	24

1 Continuing IQ rise or not?

In 20th century **all over the world** there were rising IQ test results (Flynn, 2012).

In last decades this was also observable in developing countries (e.g. **Brazil**; Colom et al., 2007; **Dominica**; Meisenberg et al., 2005; **Sudan**; Khaleefa et al., 2008).

Three open questions:

1. Is IQ **continuing to rise** in modern societies?
2. **Causes** for rise or its stop?
3. The meaning of IQ-rises:
IQ-inflation or **real cognitive ability change**?

1. Still continuing IQ rise in modern societies?

Yes.

Flynn (2012)	generally		
Pietschnig et al. (2010)	Austria, Germany, Switzerland	1971-2007	dec=3.5 IQ (per decade)
Wai & Putallaz (2011)	US	1981-2010	dec=3.3 IQ-SAS
te Nijenhuis et al. (2012)	South Korea	cohorts 1970-1990 (1986-1999)	dec=7.7 IQ

No.

Cotton et al. (2005)	Australia	1975-2003	$dec \approx 0$ IQ
Shayer & Ginsburg (2009)	UK	1976-2006	$dec = -2.76$ IQ
Sundet et al. (2004)	Norway	1990-2002	$dec = -0.17$ IQ
Teasdale & Owen (2008)	Denmark	1998-2004	$dec = -2.50$ IQ
Silverman (2010)	UK + others	ca. 1890-1990	$dec_{Men} = -2.17$ IQ-RT
Lynn (2011)	generally	prediction 21 st century	$dec = -0.22$ IQ (genot.=phenot.?)
Meisenberg (2010)	US	prediction 21 st century	$dec = -0.29$ IQ
Nyborg (2012)	Denmark	prediction 1979-2072	$dec = -0.55$ IQ

2a. Causes for IQ rise?

- Better nutrition,
- better health care,
- heterosis,
- education for more people,
- longer education,
- better education (in schools, in families),
- smaller families,
- more cognitive stimulation (books, texts, media, computer, gadgets, challenges in working life),
- average IQ of others (e.g. parents).

2b. Causes for its stop?

- Bumping against the limits of brain,
- exhaustion by affluence,
- low IQ immigration,
- asymmetric reproduction (dysfamilial effects).

3. IQ-inflation or real cognitive ability change?

Yes, real.

Improved environmental quality.

Younger chess grandmasters. Less violence. Less superstition.

(Howard, 1999; Oesterdiekhoff, 2012; Pinker, 2011)

No, inflation.

Flynn (2012): People get accustomed to see through abstract-scientific spectacles.

Must & Must (2012): Changed test taking behavior. (Only?)

Rushton (1999): Increases not related to g .

Woodley (2012): Declining innovation rates (per person) 1850-2000.

2 Narrowing gaps or not?

Yes. (\approx)

E.g. Dickens & Flynn (2006), 4 to 7 IQ points smaller (85->91 IQ);
similarly Nisbett et al. (2012).

No. (\approx)

E.g. Roth et al. (2001): No trend in meta-analysis.
Murray (2006): “No narrowing of the black-white difference”.
Neal (2006): “Black-white skill convergence has stopped”.
Rushton (2012): “No narrowing in Black-White IQ differences”.

3 National Assessment of Educational Progress (NAEP)

NAEP measures cognitive competences of 9, 13 and 17 years old students in US representative student samples (Rampey et al., 2009).

From 1969 on the surveys are repeated at changing intervals (2, 3, 4 or 5 years).

The surveys report academic achievement in reading and mathematics (frequently also in science, writing, U.S. history, civics, geography, arts, economics).

Comparable measurements from 1971 to 2008 in reading and mathematics enable an analysis of trends.

4 Research questions

1. Is cognitive ability still **rising** in the U.S.?
2. Is the **IQ gap** between Whites, Hispanics and Blacks **stable**, **narrowing** or **increasing**?
3. What are the single impacts of a “pure FLynn” effect, of a gap narrowing effect and of population changes on average US **cognitive ability**?
4. According to cognitive human capital theory, what are the **consequences** (of mean and gap development and demographic change) **for economic growth and wealth**?

5 Methods

1. Using 90th, 75th, 25th and 10th percentile ranks for calculating SDs.
2. Using means and SDs for calculating IQs (1971_R or 1978_M as $M=100$, $SD=15$; objective measure problem, Jensen, 2011).
3. Calculation of rises based on the two first and two last measurement points (to balance out fluctuations).
4. Calculation of mean rise per **decade**.
5. Rises for **average** or Reading and Mathematics.
6. Rises for all or 9-, 13- and **17-year-old students**.
7. Rises for Whites, Hispanics, Blacks.
8. Rises for **mean** and **90th percentile** (cognitive classes).

9. “Pure Flynn” effect on average IQ: Whites’ changes.
10. Gap-narrowing effect on average IQ: Effect of gap-narrowing for entire generation assuming no change in population (W-H-B-%s).
11. Population change effect on average IQ: Effect of population-change assuming constant gaps.
12. Total gap-narrowing effect on average IQ: Effect of gap-narrowing weighted by population-change.
13. Economic effects: One IQ-point \approx 810 U.S.-Dollar 2010 per capita and year (Rindermann & Thompson, 2011).

6 Results

SDs going down

15.00 IQ \rightarrow 13.56 IQ (*dec*=-0.38 IQ).

Means going up

100 IQ \rightarrow 103.86 IQ (*dec*=+1.17 IQ).

Mathematics + > Reading +

Mathematics: *dec*=+2.37 IQ; Reading: *dec*=+0.54 IQ.

9 year olds + > 13 year olds + > 17 year olds +

$dec_{9y}=+2.02$ IQ; $dec_{13y}=+1.20$ IQ; $dec_{17y}=+0.30$ IQ.

Blacks + > Hispanics + > Whites +

$dec_B=+3.04$ IQ; $dec_H=+2.27$ IQ; $dec_W=+1.29$ IQ.

White-Black-gap decreased

$gap_{1971}=16.33$ IQ \rightarrow $gap_{2008}=9.94$ IQ ($dec=-1.75$ IQ).

But only in 70s and 80s.

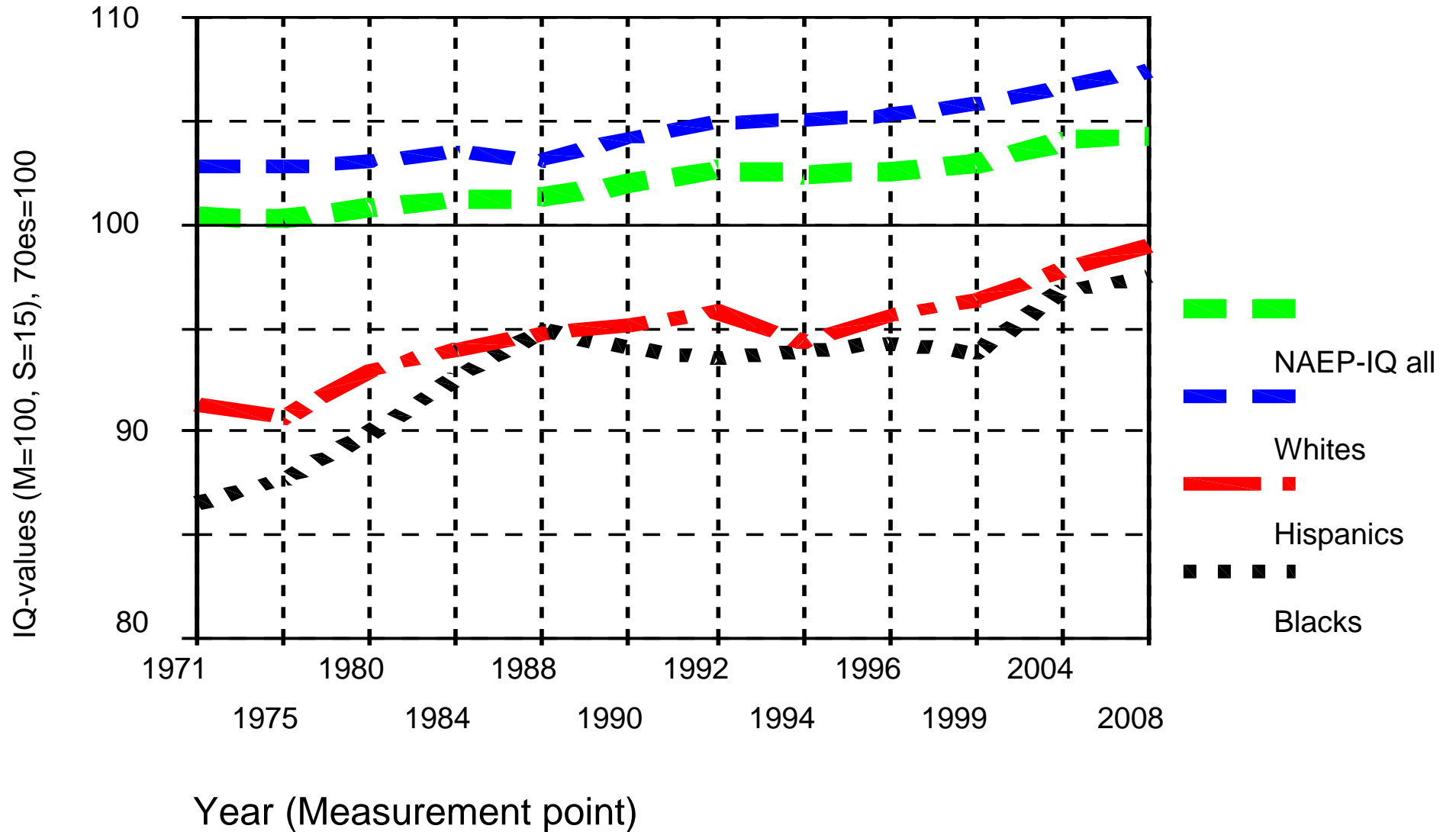
White-Hispanics-gap decreased

$gap_{1971}=11.59$ IQ \rightarrow $gap_{2008}=8.46$ IQ ($dec=-0.98$ IQ).

But only in 70s and 80s.

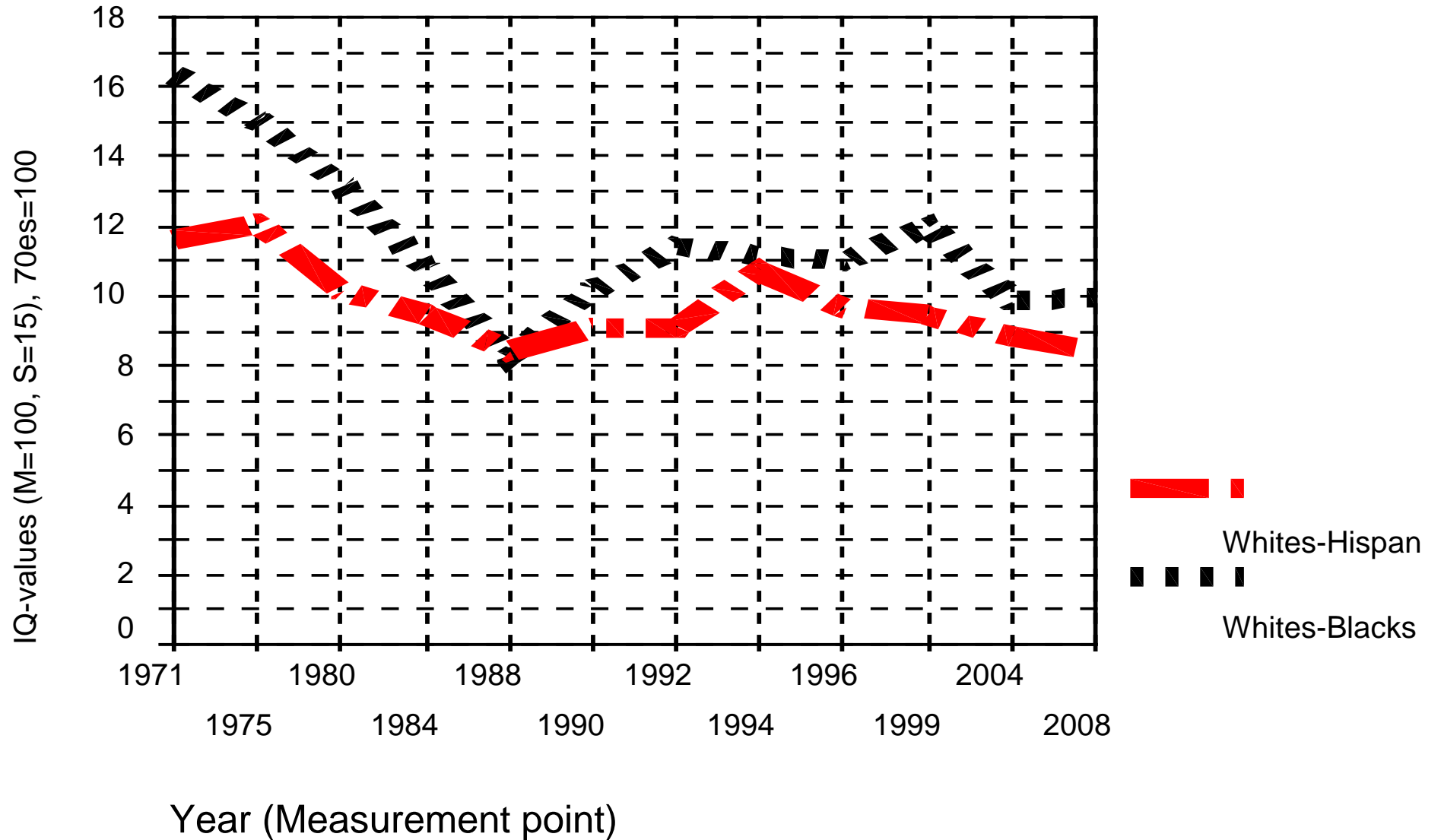
NAEP-development

Means, all ages



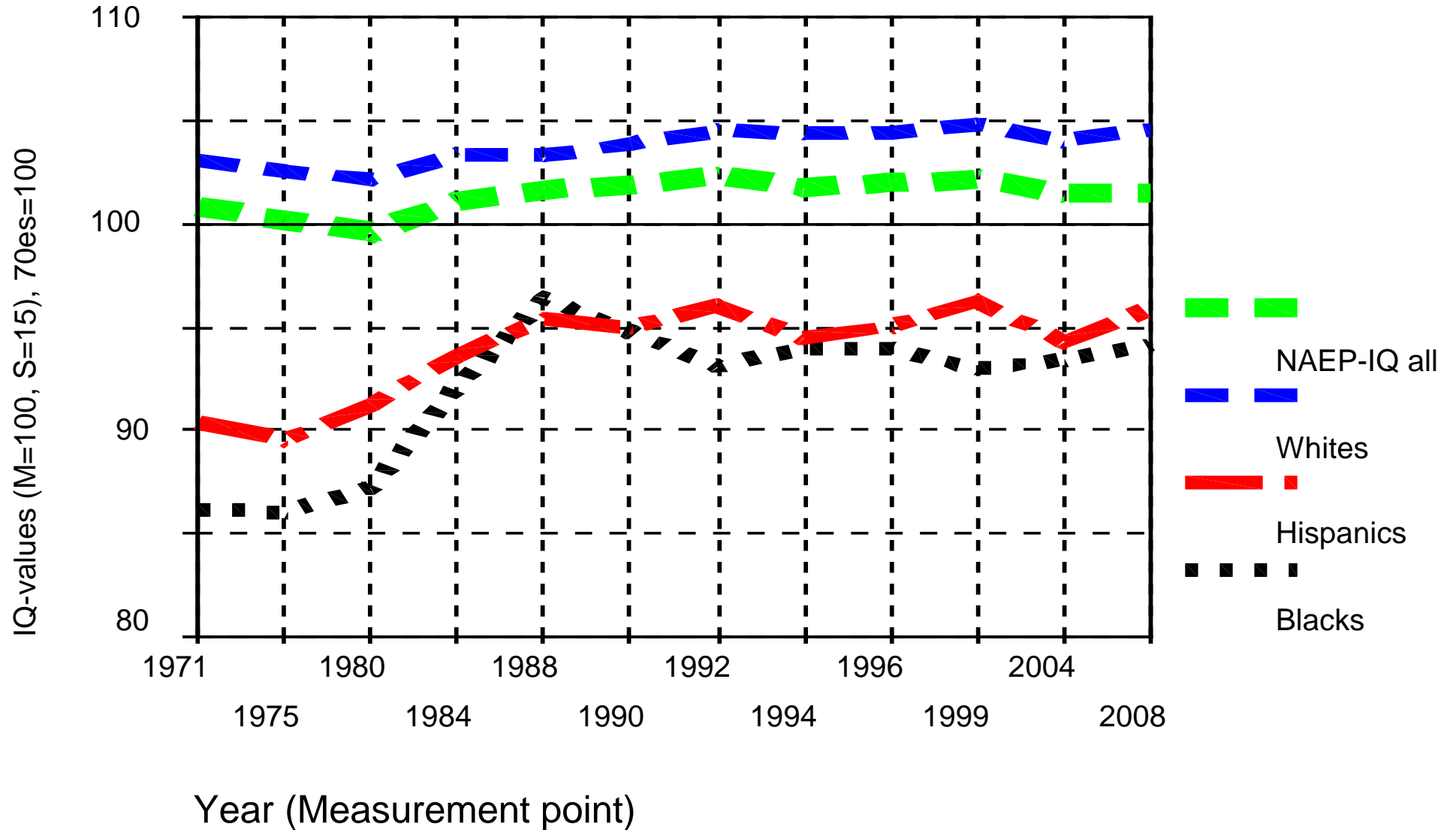
NAEP-differences-development

Differences, all ages



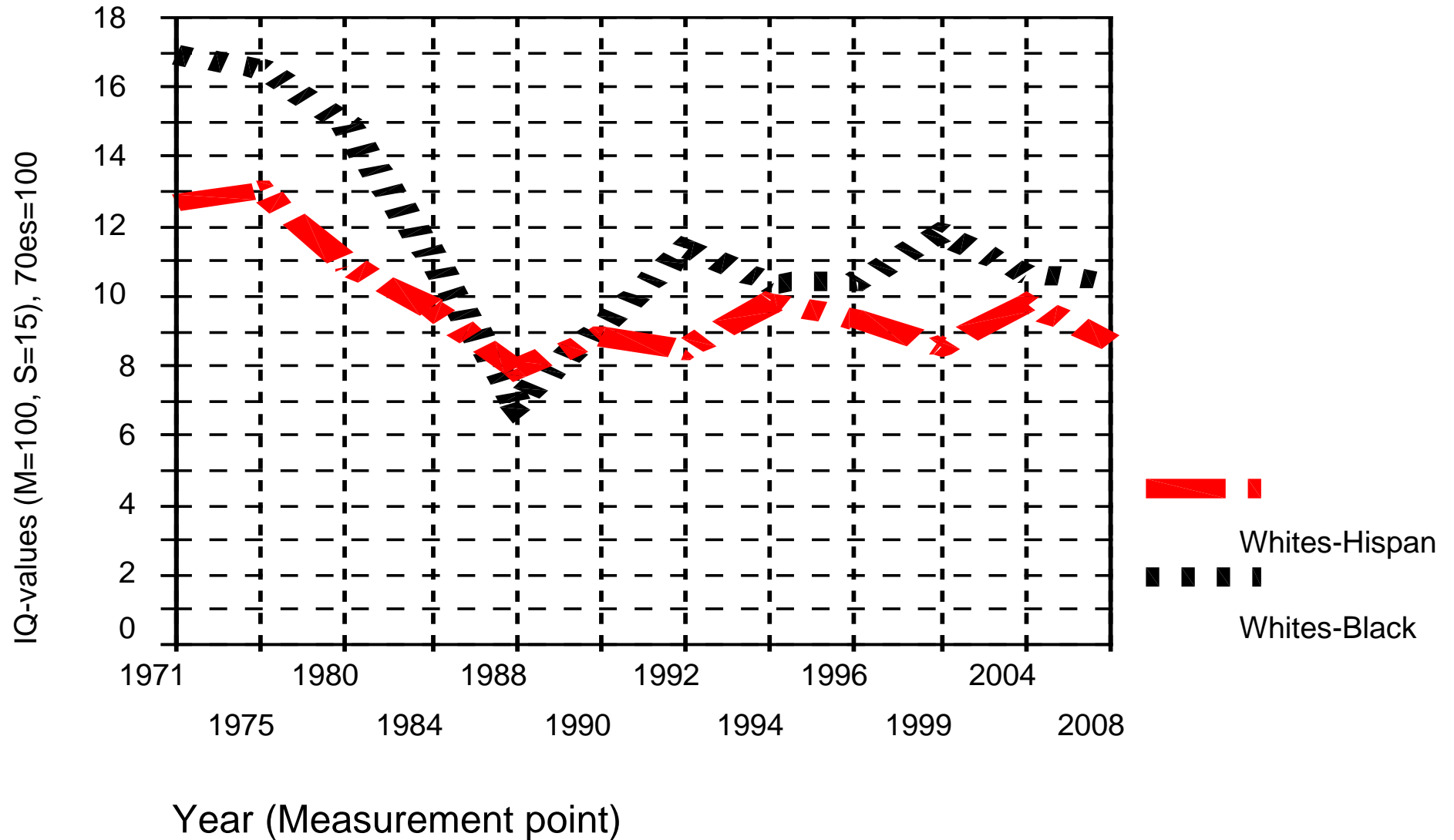
NAEP-development

Means, only 17-year-old students



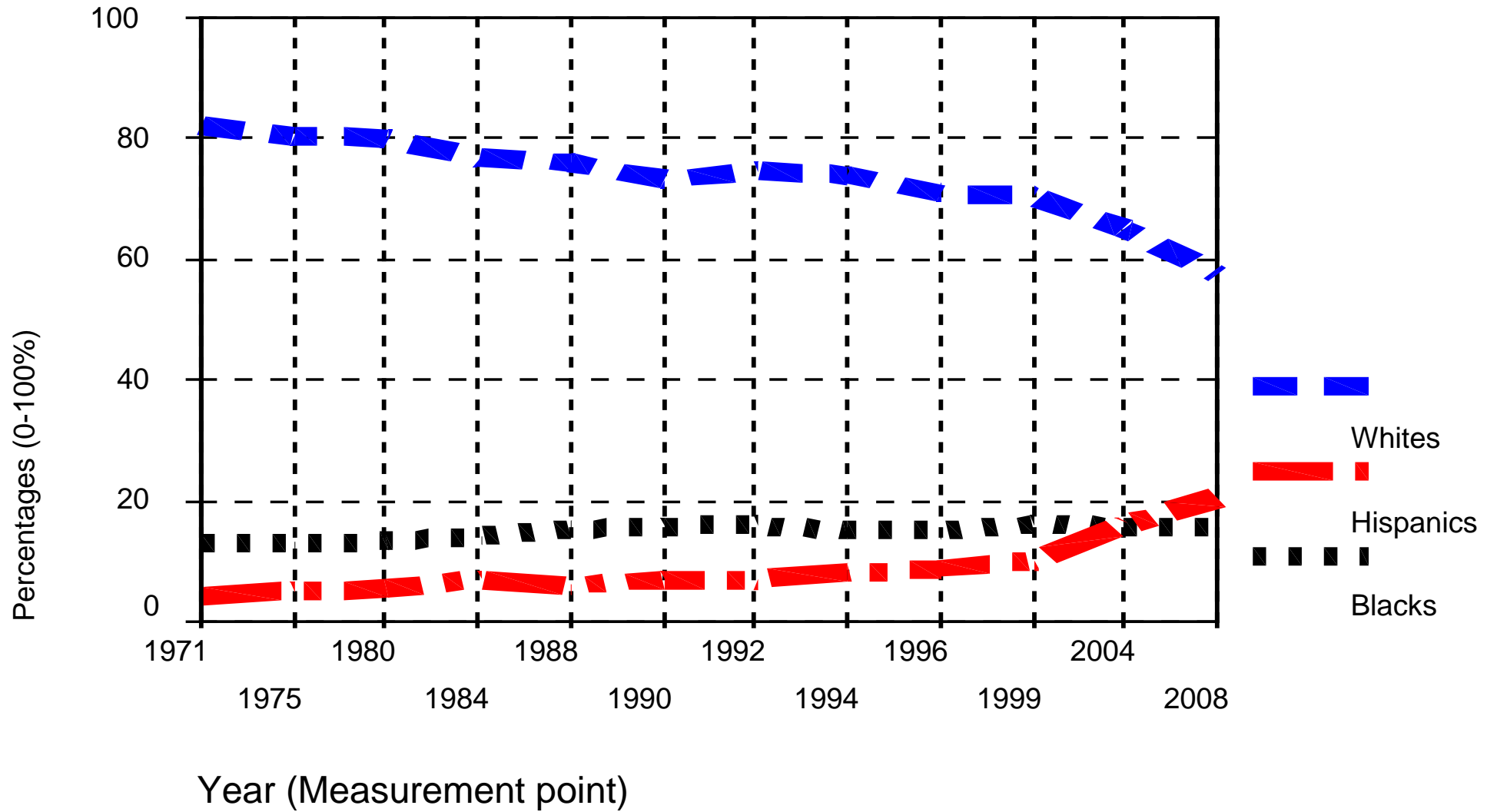
NAEP-differences-development

Differences, only 17-year-old students



NAEP-ethnic/racial distribution

All ages



Low ability groups + > high ability groups +

$dec_{10\%} = +1.79$ IQ; $dec_{90\%} = +1.03$ IQ.

Cognitive class among the oldest group (17 year olds)

$dec_{17y90\%} = +0.08$ IQ.

Peak IQ reached in the seventies?

Contributing factors to the NAEP development 1971-2008

Effect	Age Group	All Age Groups		17-year-old Students	
	Interval	37 Years (est.)	Per Decade	37 Years (est.)	Per Decade
FLynn (net)		4.77	1.29	1.68	0.45
Gap-narrowing		1.01	0.27	0.92	0.25
Population-change		-1.83	-0.49	-2.47	-0.67
Other Group		0.39	0.10	0.99	0.27
Total		4.34	1.17	1.12	0.30

The total gap-narrowing effect on average IQ is larger because the groups of Hispanics and Blacks increased.

Economic effects (Hunt: “*Will we be smart enough?*”)

Ability test results of 17-year-old students provide the best indicator for the ability level of the coming workforce.

17 years’ IQ 1971 to 2008 +1.12 IQ → + **907 U.S. \$**.

But wealth increase was **much** higher (around +22,000 \$).

IQ increase is not necessary for economic growth,
only a sufficient cognitive ability level.

Average IQ 99 is enough (at least in the past).

But for future challenges of cognitive capitalism?

Hypothetically assuming a non-changing racial-ethnic population for 17-year-old 2008 as if 1971:

1971: 86% Whites, 11% Blacks, 2% Hispanics,

2008: 59% Whites, 14% Blacks, 19% Hispanics,

the mean gain would have been 2.47 IQ points higher (in international norms IQ 102 instead of 99).

This represents 2,001 \$ (Ø annual per capita higher productivity).

Gap-narrowing contributed to a substantial IQ increase, as a net effect (without considering population change) a plus of

0.92 IQ → 745 U.S. \$ (17-year-old sample; per year and capita).

The total “gross” effect of gap-narrowing also acknowledging a changing population is 1.70 IQ representing 1,377 U.S. \$.

7 Causes for development and changes in development

Macro-social development.

Problems of causality research for historical developments.

Impossible to find undisputable answers.

Why SD-decrease?

Because **lower-ability groups caught up** (10%-percentiles, Blacks, Hispanics). → Why did they catch up?

Why does the mean continue to increase?

Continuing **improvement of environment** (education, nutrition, health, computer, internet, gadgets).

Why only $dec=+1.17$?

1. **Limits** of environmental improvability.
2. Environmental and cultural **deterioration**.
3. Touching the genetic-biological **limits**.
4. Population **change**.

Why mathematics more than reading?

Maybe youth reads fewer books?

Why age-FLynn-decline?

1. With age the influence of **genetic** factors increases.
2. Stronger **negative peer pressure** in adolescence against learning?
3. More effective **reforms** in **pre-school** and **primary** education?
4. Instructional quality in secondary school **deteriorated**
(less competent students become teacher, anything goes)?
5. Nutritional and environmental improvements in society have simply **speeded up** child development.

Why gap-closing?

Larger environmental improvements (**low-hanging fruits**) in lower-quality environments (e.g. education, health).

Why has gap-closing stopped?

1. **Crack** and cocaine epidemic (Neal, 2006).
2. **Falling real wages** for less skilled workers (effort doesn't pay).
3. **Single mother** families.
4. **Fraud** in education (e.g. Atlanta 2011, No-Child-Left-Behind-Tests).
5. Culture of **opposition** to education (“acting white”, “Gangsta rap”).
6. **Affirmative action** and **affirmative grading** undermine effort (Harber, 1998; McWhorter, 2000; Nieli, 2010).
7. Environmental conditions shaped in larger groups by **themselves**.
8. Touching the genetic-biological **limits**.

Why larger increases for lower ability groups?

1. Easier to improve environment in lower-quality environments (**low-hanging fruits**).
2. Education **focused** on lower-ability groups.

Why has the cognitive class not improved its level?

Peak IQ reached among the high ability group.

1. **Test ceiling** effect.
2. **Limits** of environmental improvability.
3. Education **focused** on lower-ability groups.
4. Touching the genetic-biological **limits**.

References

- Colom, R., Flores-Mendoza, C. & Abad, F. J. (2007). Generational changes on the Draw-a-Man Test. *Journal of Biosocial Science*, 39(1), 79-89.
- Cotton, S. M., Kiely, P. M., Crewther, D. P., Thomson, B., Laycock, R. & Crewther, S. G. (2005). A normative and reliability study for the Raven's Coloured Progressive Matrices for primary school aged children from Victoria, Australia. *Personality and Individual Differences*, 39(3), 647-659.
- Dickens, W. T. & Flynn, J. R. (2006). Black Americans reduce the racial IQ gap: Evidence from standardization samples. *Psychological Science*, 17, 913-920.
- Flynn, J. R. (2012). *Are we getting smarter? Rising IQ in the twenty-first century*. Cambridge: Cambridge University Press.
- Harber, K. D. (1998). Feedback to minorities: Evidence of a positive bias. *Journal of Personality and Social Psychology*, 74, 622-628
- Howard, R. W. (1999). Preliminary real-world evidence that average intelligence really is rising. *Intelligence*, 27, 235-250.
- Hunt, E. (1995). *Will we be smart enough? A cognitive analysis of the coming workforce*. New York: Russell Sage Foundation.
- Jensen, A. R. (2011). The theory of intelligence and its measurement. *Intelligence*, 39, 171-244.
- Khaleefa, O., Abdelwahid, S. B., Abdulradi, F. & Lynn, R. (2008). The increase of intelligence in Sudan 1964-2006. *Personality and Individual Differences*, 45, 412-413.
- Lynn, R. (2011). *Dysgenics. Genetic deterioration in modern populations*. Coleraine: Ulster Institute for Social Research.
- McWhorter, J. (2000). *Losing the race. Self-sabotage in Black America*. New York: Free Press.

- Meisenberg, G. (2010). The reproduction of intelligence. *Intelligence*, 38, 220-230.
- Meisenberg, G., Lawless, E., Lambert, E. & Newton, A. (2005). The Flynn effect in the Caribbean: Generational change of cognitive test performance in Dominica. *Mankind Quarterly*, 46(1), 29-69.
- Murray, Ch. (2006). Changes over time in the black-white difference on mental tests: Evidence from the children of the 1979 cohort of the National Longitudinal Survey of Youth. *Intelligence*, 34, 527-540.
- Must, O. & Must, (2012). *Test-taking patterns have changed over time*. Talk at 14. December 2012 at the 13th Conference of ISIR in San Antonio, Texas.
- Neal, D. (2006). Why has black-white skill convergence stopped? In E. A. Hanushek & F. Welch (Eds.), *Handbook of the economics of education* (I, pp. 511-576). Amsterdam: North-Holland.
- Nieli, R. K. (2010). *The underperformance problem*. 2. September 2010. Retrieved November 28, 2012 from www.mindingthecampus.com/originals/2010/09/the_underperformance_problem.html.
- Nisbett, R. E., Aronson, J., Blair, C., Dickens, W., Flynn, J., Halpern, D. F. & Turkheimer, E. (2012). Intelligence: New findings and theoretical developments. *American Psychologist*, 67(6), 503-504.
- Nyborg, H. (2012). The decay of Western civilization: Double relaxed Darwinian Selection. *Personality and Individual Differences*, 53, 118-125.
- Oosterdiekhoff, G. W. (2012). Was pre-modern man a child? The quintessence of the psychometric and developmental approaches. *Intelligence*, 40(5), 470-478.
- Pietschnig, J., Voracek, M. & Formann, A. K. (2010). Pervasiveness of the IQ rise: A cross-temporal meta-analysis. *PLoS One*, 5(12), 1-6.
- Pinker, S. (2011). *The better angels of our nature: Why violence has declined*. New York: Viking.
- Rampey, B. D., Dion, G. S. & Donahue, P. L. (2009). *NAEP 2008 trends in academic progress*. Washington: National Center for Education Statistics, Institute of Education Sciences. Retrieved April 28, 2012 from <http://nces.ed.gov/nationsreportcard/pdf/main2008/2009479.pdf>.

- Rindermann, H. & Thompson, J. (2011). Cognitive capitalism: The effect of cognitive ability on wealth, as mediated through scientific achievement and economic freedom. *Psychological Science*, 22, 754-763.
- Roth, Ph. L., Bevier, C. A., Bobko, Ph., Switzer, F. S. & Tyler, P. (2001). Ethnic group differences in cognitive ability in employment and educational settings: A meta-analysis. *Personnel Psychology*, 54, 297-330.
- Rushton, J. Ph. (1999). Secular gains in IQ not related to the g factor and inbreeding depression - unlike Black-White differences: A reply to Flynn. *Personality and Individual Differences*, 26, 381-389.
- Rushton, J. Ph. (2012). No narrowing in mean Black-White IQ differences predicted by heritable g. *American Psychologist*, 67, 500-501.
- Shayer, M. & Ginsburg, D. (2009). Thirty years on - a large anti-Flynn effect (II)? 13- & 14-year-olds. Piagetian tests of formal operations norms 1976-2006/7. *British Journal of Educational Psychology*, 79, 409-418.
- Silverman, I. W. (2010). Simple reaction time: It is not what it used to be. *American Journal of Psychology*, 123(1), 39-50.
- Sundet, J. M., Barlaug, D. G. & Torjussen, T. M. (2004). The end of the Flynn effect? *Intelligence*, 32(4), 349-362.
- Teasdale, Th. W. & Owen, D. R. (2008). Secular declines in cognitive test scores: A reversal of the Flynn Effect. *Intelligence*, 36, 121-126.
- te Nijenhuis, J., Cho, S. H., Murphy, R. & Lee, K. H. (2012). The Flynn effect in Korea: Large gains. *Personality and Individual Differences*, 53, 147-151.
- Wai, J. & Putallaz, M. (2011). The Flynn effect puzzle: A 30-year examination from the right tail of the ability distribution provides some missing pieces. *Intelligence*, 39, 443-455.
- Woodley, M. A. (2012). The social and scientific temporal correlates of genotypic intelligence and the Flynn effect. *Intelligence*, 40, 189-204.

Assessment of Educational Progress (NAEP) has a diverse group of stakeholders, from educators to policymakers. For that reason, the panelists for the NAEP include 70% educators, further broken down into 55% classroom teachers and 15% other educators, and 30% non-educators (Loomis, 2012). It is known as the problem of three unobservables (Anderson, 2008). IIT hinges on understanding the underlying unobservable psychological processes that produce a response. Rather, we evaluate the appropriateness of the performance standards, given the general purpose of the decision process. The aim of the validation effort is to provide convincing evidence that the cut score does represent the intended performance standard and that the performance standard is appropriate" (p. 57). The opportunities education provides to develop the student's ability to use cognitive skills to understand and solve problems whose solution is not obvious and the student's willingness to engage in problem solving as a constructive and thinking citizen are essential for the realization of the approach from transversal competences to transversal personality. The study puts an emphasis on exploring the conditions for the development of transversal competence for solving educational-and-cognitive problems that is portable through different learning contents, different activities and ages. National educational quality reduces gaps, especially school enrolment at a young age, the use of tests and school autonomy. A one standard deviation increase in school quality represents a closing of around 1 IQ point in the native-immigrant gap. A new Greenwich IQ estimation based on UK natives' cognitive ability mean is recommended. An analysis of the first adult OECD study PIAAC revealed that larger proportions of immigrants among adults reduce average competence levels and positive Flynn effects. The effects on economic development and suggestions for immigration and educational policy In the United States, 15% to 20% of the Black IQ distribution exceeds the White median IQ, so many Blacks obtain scores above the White average. This same order of mean group differences is also found on "culture-fair" tests and on reaction time tasks. Skuy et al. (2002) tested another 70 psychology students who averaged an IQ equivalent of 83. After receiving training on how to solve Matrices-type items, their mean score rose to an IQ equivalent of 96. Rushton, Skuy, and Fridjhon (2002, 2003) gave nearly 200 African 1st-year engineering students both the Standard and the Advanced version of the Raven's test and found they averaged an IQ of 97 on the Standard and 103 on the Advanced, making them the highest scoring African sample on record.