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Identification of a Flynn Effect in the NLSY: Moving from the center to the boundaries

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Abstract

The Flynn Effect [Flynn, J.R. (1984). The mean IQ of Americans: Massive gains 1932 to 1978. Psychological Bulletin 95, 29–51.] is an increase in IQ of around .33 points per year, observed in developed (and some developing) countries during the past century. It emerges from problem solving and other non-verbal components of IQ. The cause has been argued and theories proposed. Rodgers [Rodgers, J.L. (1998). A critique of the Flynn Effect: Massive IQ gains, methodological artifacts, or both? Intelligence 26, 337–356.] noted that the search for causes has preceded specification of the nature of the effect. Our study uses a national sample of U.S. children to test for the Flynn Effect in PIAT-Math, PIAT-Reading Recognition, PIAT-Reading Comprehension, Digit Span, and PPVT. An effect of the predicted magnitude was observed for PIAT-Math when maternal IQ was controlled. This finding in a large representative sample with thousands of variables supports more careful evaluation of the Flynn Effect, in demographic, geographic, environmental, and biological domains.

Keywords: Flynn Effect; PPVT; PIAT-Math; PIAT-Reading Recognition; PIAT-Reading Comprehension; IQ changes; NLSY; NLSY-children

The basic empirical status of the Flynn Effect is well-established. In developed countries, measured IQ has been increasing at a rate of approximately .33 IQ points per year for most of the past century, a pattern consistent across both time and geography. Flynn (1984) documented the trend in U.S. IQ data and then showed its existence in 14 developed countries (Flynn, 1987). The effect has recently been shown in developing countries as well (Daley, Whaley, Sigman, Espinosa, & Neumann, 2003). The increase occurs primarily within the problem solving/spatial reasoning domain, as captured by culture free tests (e.g., the Raven's Progressive Matrices) — i.e., for fluid intelligence (Horn & Cattell, 1966). Verbal IQ – crystallized intelligence – has been stable or may even have fallen slightly during this period (for discussion, see Flynn, 1987, 2006; Jensen, 1991; Loehlin, 1996).

But aside from these basic empirical findings, a great deal is *not* known about the Flynn Effect. There is no consensual agreement as to the cause of the Flynn Effect, though many have contended to provide an ultimate explanation. Theories include nutritional improvements (Lynn, 1998; Martorell, 1998), exposure to movies and optical displays (Greenfield, 1998), the increased use of speeded tests (Brand, 1996), an ever-broadening cultural knowledge base that emerges from collective memory (Mahlberg, 1997), schooling and educational methods (Blair, Gmson, Thorne, & Baker, 2005), pre-school education in particular (Teasdale & Berliner, 1991), and

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a multiplicity hypothesis suggesting a great many small causes that combine together (Jensen, 1996).

Many argue that the Flynn Effect necessarily must have environmental, and not biological/genetic origins — could the genome change so rapidly and consistently? But this belief yields a paradox, given that cognitive performance scores have a moderate-to-high and stable heritability and low shared environmental variance (e.g., Loehlin, 1989; Rodgers, Rowe, & May, 1994). Dickens and Flynn (2001) referred to this paradoxical cause as "Factor X" and proposed a dynamic gene–environment interaction model to explain the paradox; the dynamic features of their model allow small environmental changes to magnify into large influences on IQ (also see critiques by Loehlin, 2002; Rowe & Rodgers, 2002). Mingroni (2004) suggested a genetic-based hypothesis based on heterosis (also called hybrid vigor); as the ratio of heterozygous to homozygous genotypes increases in the population due to broadening mating patterns, IQ responds positively (see also Jensen, 1998). Kanaya, Ceci, and Scullin (2005) used a growth-curve modeling approach to investigate the interaction of age with IQ norming patterns in relation to the Flynn Effect, and recommended more attention to longitudinal research and accounting for age in future investigations of the Flynn Effect.

Earlier, Flynn himself was not sure that the Flynn Effect has much to do with intelligence; for example, Flynn (1996) consistently referred to "ersatz intelligence gains," suggesting that the effect is an artifact. Wicherts et al. (2004) found lack of factorial invariance in the Flynn Effect across cohorts, raising fundamental questions about the stability of norming samples and even the consistent meaning of subscales and item information across cohorts. Flynn (1998) reviewed the causal hypotheses and updated his positions in Flynn (2006). There he begins to rebuild a case for the legitimacy of IQ. After he re-states the earlier position – "we are driven to the conclusion that massive IQ gains are not intelligence gains or, indeed, any kind of significant cognitive gains" – he follows by suggesting that the "best way to show that IQ gains are real is to show how they illuminate what is going on in the real world." Then he reviews the substantive import of real IQ gains in educational, economic, and cognitive domains.

Development of causal theories, though tempting, may still be premature. Rodgers (1998), in a general critique of research on the Flynn Effect, suggested that "research addressing the *legitimacy* and *meaning* of the effect should precede research *testing for* and evaluating *causes of* the effect" (p. 338, italics in original). Rodgers proposed a number of important questions that had not been adequately addressed. Does the Flynn Effect operate within individuals, within families, within cohorts? Does the effect hold up as consistent across race, gender, and ability strata? In normed or raw cognitive ability scores? In overall scale scores, in subscale scores, or in item scores? He concluded with 10 proposals for future research to specify the nature and meaning of the effect. Indeed, as substantial research attention has been devoted to the Flynn Effect, some of these questions are being carefully evaluated, and legitimate evidence brought to bear. But almost a decade later, many of the questions posed by Rodgers have not been resolved; indeed, many have not even been addressed. Prerequisite for addressing many of those questions is the existence of appropriate and powerful data and designs.

The research presented in this article provides both a motivation and a mechanism to look at the Flynn Effect more deeply and more broadly. We begin our treatment by re-framing the Flynn Effect. Then, our empirical analysis tests for the Flynn Effect in a national database that is broad enough to provide variables and context to address many previously unanswered Flynn Effect questions. We conclude by specifying a number of critical research agendas.

1. Re-framing the Flynn Effect

The Flynn Effect has been empirically identified by a number of different research efforts (e.g., Flynn, 1984, 1987; Lynn, 1990; Lynn & Hampson, 1986; Teasdale & Owen, 1987, 1989). Flynn (2006) notes that knowledge of the effect preceded his original attention. Lynn (1982) reported a Flynn Effect in a comparison of Japanese and U.S. data slightly earlier than Flynn, prompting Rushton's (1997) suggestion to rename the phenomenon the "Lynn–Flynn Effect." As Flynn (2006) noted, the effect itself was observed much earlier (see, e.g., Smith, 1942; Tuddenham, 1948). But with few exceptions, no careful and systematic accounting has been done to define the various domains – demographic, geographic, environmental, and biological – and the boundaries within each domain in which the Flynn Effect occurs. Our proposal is to move research on the Flynn Effect to those boundaries and away from the middle. Rodgers (1998) criticized the automatic interpretation of the Flynn Effect as a change in population means; there are variance (and other moment) interpretations (see Rowe & Rodgers, 2002 and responses from Dickens & Flynn, 2002 for further discussion). Our suggestion is even broader — to more sharply define the Flynn Effect by specifying the boundary conditions, which have never been systematically treated.