

Table 1**Studies Excluded From Analyses of Premorbid IQ**

Note: This table includes only published English language studies reporting original data on premorbid IQ (or equivalent) in schizophrenia. Only studies that conducted standardized psychometric testing *prior* to acute psychosis are listed. This table does not include studies reporting data on school performance, grades, or composite or factor scores derived from these.

Exclusion criteria:

A) Study estimated IQ from achievement tests, single tests such as word reading, or solely verbal IQ or performance IQ scores.

B) Study did not report premorbid IQ data from a healthy control group *or* reported control data solely from a control group at high risk for psychosis, with known cognitive delays in childhood, or matched on childhood IQ.

C) Study did not provide sufficient data for calculating a mean ES for schizophrenia-control group differences in premorbid IQ (in some cases data provided was not specific to a group that developed schizophrenia, schizoaffective, or schizophreniform disorder).

D) Study was not the most complete or relevant report of premorbid IQ data for a given sample.

| Reason(s) Excluded | Study |
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| B | Albee GW, Lane EA, Corcoran C, Werneke A: Childhood and intercurrent intellectual performance of adult schizophrenics. <i>J Consult Psychol</i> 1963; 27:364-366 |
| C | Ambelas A: Preschizophrenics: adding to the evidence, sharpening the focus. <i>Br J Psychiatry</i> 1992; 160:401-404 |
| A | Ang YG, Tan HY: Academic deterioration prior to first episode schizophrenia in young Singaporean males. <i>Psychiatry Res</i> 2004; 121:303-307 |
| A | Bilder RM, Reiter G, Bates J, Lencz T, Szeszko P, Goldman RS, Robinson D, Lieberman JA, Kane JM: Cognitive development in schizophrenia: Follow-back from the first episode. <i>J Clin Exp Neuropsychol</i> 2006; 28:270-282 |
| B | Birren JE: Psychological examinations of children who later became psychotic. <i>J Abnorm Soc Psychol</i> 1944; 38:84-96 |
| C | Bollini AM, Walker EF, Mednick SA: Course of general cognitive functioning in high-risk individuals with psychosis outcomes. <i>Schizophr Res</i> 2005; 79:347-348 |
| A, B | Brown AS, Cohen P, Harkavy-Friedman J, Babulas V, Malaspina D, Gorman JM, Susser ES: A.E. Bennett Research Award. Prenatal rubella, premorbid abnormalities, and adult schizophrenia. <i>Biol Psychiatry</i> 2001; 49:473-486 |
| C, D | Cannon TD, Rosso, IM, Bearden, CE, Sanchez, LE, Hadley, T: A prospective cohort study of neurodevelopmental processes in the genesis and epigenesis of schizophrenia. <i>Dev Psychopathol</i> 1999; 11:467-485 |
| D | Carter JW, Schulsinger F, Parnas J, Cannon, T, Mednick SA: A multivariate prediction model of schizophrenia. <i>Schizophr Bull</i> 2002; 28:649-682 |
| D | Caspi A, Reichenberg A, Weiser M, Rabinowitz J, Kaplan Z, Knobler H, Davidson-Sagi N, Davidson M: Cognitive performance in schizophrenia patients assessed before and following the first psychotic episode. <i>Schizophr Res</i> 2003; 65:87-94 |
| C | Clegg J, Hollis C, Mawhood L, Rutter M: Developmental language disorders: a follow-up in later adult life. Cognitive, language and psychosocial outcomes. <i>J Child Psychol Psychiatry</i> 2005; 46:128-149 |

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| C | Crow TJ, Done DJ, Sacker A: Childhood precursors of psychosis as clues to its evolutionary origins. <i>Eur Arch Psychiatry Neurosci</i> 1995; 245:61-69 |
| C, D | David AS, Malmberg A, Brandt L, Allebeck P, Lewis G: IQ and risk for schizophrenia: a population-based cohort study. <i>Psychol Med</i> 1997; 27:1311-1323 |
| C, D | Davidson M, Reichenberg A, Rabinowitz J, Weiser M, Kaplan Z, Mordechai M: Behavioral and intellectual markers for schizophrenia in apparently healthy male adolescents. <i>Am J Psychiatry</i> 1999; 156:1328-1335 |
| C | Eastvold AD, Heaton RK, Cadenhead KS: Neurocognitive deficits in the (putative) prodrome and first episode of psychosis. <i>Schizophr Res</i> 2007; 93:266-277 |
| B | Fenton WS, McGlashan T: Risk of schizophrenia in character disordered patients. <i>Am J Psychiatry</i> 1989; 146:1280-1284 |
| B | Fish B: Biological antecedents of psychosis in children. <i>Res Publ Assoc Res Nerv Ment Dis</i> 1975; 54:49-83 |
| A, B | Fuller R, Nopoulos P, Arndt S, O'Leary D, Ho BC, Andreasen NC: Longitudinal assessment of premorbid cognitive functioning in patients with schizophrenia through examination of standardized scholastic test performance. <i>Am J Psychiatry</i> 2002; 159:1183-1189 |
| A | Gheorghe MD, Baloescu A, Grigorescu G: Premorbid cognitive and behavioral functioning in military recruits experiencing the first episode of psychosis. <i>CNS Spectrums</i> 2004; 9:604-606 |
| C, D | Gunnell D, Harrison G, Rasmussen F, Fouskakis D, Tynelius P: Associations between premorbid intellectual performance, early-life exposures and early-onset schizophrenia. Cohort study. <i>Br J Psychiatry</i> 2002; 181:298-305 |
| B | Hans SL, Auerbach JG, Auerbach AG, Marcus J: Development from birth to adolescence of children at-risk for schizophrenia. <i>J Child Adolesc Psychopharmacol</i> 2005; 15:384-394 |
| A | Ho BC, Andreasen NC, Nopoulos P, Fuller R, Arndt S, Cadoret RJ: Secondary prevention of schizophrenia: utility of standardized scholastic tests in early identification. <i>Ann Clin Psychiatry</i> 2005; 17:11-18 |
| D | Johnstone EC, Ebmeier KP, Miller P, Owens DGC, Lawrie SM: Predicting schizophrenia: findings from the Edinburgh High-Risk Study. <i>Br J Psychiatry</i> 2005; 186:18-25 |
| C | Johnstone EC, Lawrie SM, Cosway R: What does the Edinburgh High-Risk Study tell us about schizophrenia? <i>Am J Med Genet</i> 2002; 114:906-912 |
| C | Jones P, Done DJ: From birth to onset: a developmental perspective of schizophrenia in two national birth cohorts, in <i>Neurodevelopment and adult psychopathology</i> . Edited by Keshavan MS, Murray RM. Cambridge, Cambridge University Press, 1997, pp 119-136 |
| B | Jones P, Guth C, Lewis S, Murray R: Low intelligence and poor educational achievement precede early onset schizophrenic psychosis, in <i>The Neuropsychology of Schizophrenia</i> . Edited by David S, Cutting J. Hove, Lawrence Erlbaum, 1994, pp 131-144 |
| D | Lane EA, Albee GW: Childhood intellectual development of adult schizophrenics. <i>J Abnorm Soc Psychol</i> 1963; 67:186-189 |
| B | Lane EA, Albee GW: Early childhood intellectual differences between schizophrenic adults and their siblings. <i>J Abnorm Soc Psychol</i> 1964; 68:193-195 |
| B | Lane EA, Albee GW: On childhood intellectual decline of adult schizophrenics: A |

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| | reassessment of an earlier study. <i>J Abnorm Psychol</i> 1968; 73:174-177 |
| C | Mason CF: Pre-illness intelligence of mental hospital patients. <i>J Consult Psychol</i> 1956; 20:297-300 |
| C | Miner JB, Anderson JK: Intelligence and emotional disturbance: Evidence from army and veterans administration records. <i>J Abnorm Soc Psychol</i> 1958; 56:75-81 |
| B | Munro J, Russell A, Murray R, Kerwin R, Jones P: IQ in childhood psychiatric attendees predicts outcome of later schizophrenia at 21 year follow-up. <i>Acta Psychiatr Scand</i> 2002; 106:139-142 |
| D | Niendam TA, Bearden CE, Rosso IM, Sanchez LE, Hadley T, Nuechterlein KH, Cannon TD: A prospective study of childhood neurocognitive functioning in schizophrenic patients and their siblings. <i>Am J Psychiatry</i> 2003; 160:2060-2062 |
| D | Offord DR, Cross LA: Adult schizophrenia with scholastic failure or low IQ in childhood. <i>Arch Gen Psychiatry</i> 1971; 24:431-436 |
| B | Pollack M, Woerner MG, Klein DF: A comparison of childhood characteristics of schizophrenics, personality disorders, and their siblings, in <i>Life History Research in Psychopathology</i> . Edited by Roff M, Ricks D. Minneapolis, University of Minnesota Press, 1970, pp 208-225 |
| A, C | Pukrop R, Schultze-Lutter F, Ruhrmann S, Brockhaus-Dumke A, Tendolkar I, Bechdorf A, Matuschek E, Klosterkötter J: Neurocognitive functioning in subjects at risk for a first episode of psychosis compared with first- and multiple-episode schizophrenia. <i>J Clin Exp Neuropsychol</i> 2006; 28:1388-1407 |
| D | Rabinowitz J, Reichenberg A, Weiser M, Mordechai M, Kaplan Z, Davidson M: Cognitive and behavioral functioning in men with schizophrenia both before and shortly after first admission to hospital: Cross-sectional analysis. <i>Br J Psychiatry</i> 2000; 177:26-32 |
| B | Rappaport SR, Webb WB: An attempt to study intellectual deterioration by premorbid and psychotic testing. <i>J Consult Psychol</i> 1950; 14:95-98 |
| C | Reichenberg A, Rabinowitz J, Weiser M, Mark M, Kaplan Z, Davidson M: Premorbid functioning in a national population of male twins discordant for psychoses. <i>Am J Psychiatry</i> 2000; 157:1514-1516 |
| C | Reichenberg A, Weiser M, Caspi A, Knobler HY, Lubin G, Harvey PD, Rabinowitz J, Davidson M: Premorbid intellectual functioning and risk of schizophrenia and spectrum disorders. <i>J Clin Exp Neuropsychol</i> 2006; 28:193-207 |
| D | Reichenberg A, Weiser M, Rabinowitz J, Caspi A, Schmeidler J, Mordechai M, Kaplan Z, Davidson M: A population-based cohort study of premorbid intellectual, language, and behavioral functioning in patients with schizophrenia, schizoaffective disorder, and nonpsychotic bipolar disorder. <i>Am J Psychiatry</i> 2002; 129:2027-2035 |
| C | Reichenberg A, Weiser M, Rapp MA, Rabinowitz J, Caspi A, Schmeidler J, Knobler HY, Lubin G, Nahon D, Harvey PD, Davidson M: Premorbid intra-individual variability in intellectual performance and risk for schizophrenia: A population-based study. <i>Schizophr Res</i> 2006; 85:49-57 |
| B | Roff JD, Knight R: Preschizophrenics: low IQ and aggressive symptoms as predictors of adult outcome and marital status. <i>J Nerv Ment Dis.</i> 1980; 168:129-132 |
| B | Russell AJ, Munro JC, Jones PB, Hemsley DR, Murray RM: Schizophrenia and the myth of intellectual decline. <i>Am J Psychiatry</i> 1997; 154(5):635-639 |

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| B | Russell AJ, Munro J, Jones PB, Hayward P, Hemsley DR, Murray RM: The National Adult Reading Test as a measure of premorbid IQ in schizophrenia. <i>Br J Clin Psychol</i> 2000; 39:297-305 |
| A, D | Schiffman J, Lam CW, Jiwatram T, Ekstrom M, Sorensen HJ, Mednick SA: Perspective-taking deficits in people with schizophrenia spectrum disorders: a prospective investigation. <i>Psychol Med</i> 2004; 34:1581-1586 |
| B | Schwartzman AE, Douglas VI: Intellectual loss in schizophrenia: Part I. <i>Can J Psychol</i> 1962; 16:1-10 Schwartzman AE, Douglas VI, Muir WR: Intellectual loss in schizophrenia: Part II. <i>Can J Psychol</i> 1962; 16:161-168 |
| B | Sheitman BB, Murray MG, Snyder JA, Silva S, Goldman R, Chakos M, Volavka J, Lieberman JA: IQ scores of treatment-resistant schizophrenia patients before and after the onset of the illness. <i>Schizophr Res</i> 2000; 46:203-207 |
| C | Tiihonen J, Haukka J, Henriksson M, Cannon M, Kieseppä T, Laaksonen I, Sinivuo J, Lönnqvist J: Premorbid intellectual functioning in bipolar disorder and schizophrenia: results from a cohort study of male conscripts. <i>Am J Psychiatry</i> 2005; 162:1904-1910 |
| B, D | Weiser M, Reichenberg A, Rabinowitz J, Kaplan Z, Mordechai M, Nahon D, Davidson M: Gender differences in premorbid cognitive performance in a national cohort of schizophrenic patients. <i>Schizophr Res</i> 2000; 45:185-190 |
| B | Werry JS, McClellan JM, Chard L: Childhood and adolescent schizophrenic, bipolar, and schizoaffective disorders: a clinical and outcome study. <i>J Am Acad Child Adolesc Psychiatry</i> 1991; 30:457-465 |

Table 2

References of Studies Included in the Meta-Analysis of Premorbid IQ by Name of Study and Level

Level 1

Vienna Follow-Back to Child Psychiatric Unit: Amminger GP, Schlögelhofer M, Lehner T,

Looser Ott S, Friedrich MH, Aschauer HN: Premorbid performance IQ deficit in schizophrenia. *Acta Psychiatr Scand* 2000; 102:414–422

Victoria, Australia Prodrome Follow-Up: Brewer WJ, Francey SM, Wood SJ, Jackson HJ,

Pantelis C, Phillips LJ, Yung AR, Anderson V, McGorry PD: Memory impairments identified in people at ultra-high risk for psychosis who later develop first-episode psychosis. *Am J Psychiatry* 2005; 162:71–78

Philadelphia NCPP: Cannon TD, Bearden CE, Hollister JM, Rosso IM, Sanchez LE, Hadley T:
Childhood cognitive functioning in schizophrenia patients and their unaffected siblings:

a prospective cohort study. *Schizophr Bull* 2000; 26:379–393

New York High Risk Study: Ott SL, Spinelli S, Rock D, Roberts S, Amminger GP,

Erlenmeyer-Kimling L: The New York High-Risk Project: social and general
intelligence in children at risk for schizophrenia. *Schizophr Res* 1998; 31:1–11

New England NCPP: Seidman LJ, Buka SL, Goldstein JM, Tsuang MT: Intellectual decline in
schizophrenia: evidence from a prospective birth cohort 28 year follow-up study. *J Clin*

Exp Neuropsychol 2006; 28:225–242

Copenhagen High Risk Study: Sorensen HJ, Mortensen EL, Parnas J, Mednick SA: Premorbid
neurocognitive functioning in schizophrenia spectrum disorder. *Schizophr Bull* 2006;

32:578–583

Edinburgh High Risk Study: Whyte M-C, Brett C, Harrison LK, Byrne M, Miller P, Lawrie S,
Johnstone EC: Neuropsychological performance over time in people at high risk of

developing schizophrenia and controls. *Biol Psychiatry* 2006; 59:730–739

Level 2

Dunedin 1972-1973: Birth Cohort Follow-Up: Cannon M, Caspi A, Moffit TE, Harrington H,
Taylor A, Murray RM, Poulton R: Evidence for early-childhood, pan-developmental

impairment specific to schizophreniform disorder. *Arch Gen Psychiatry* 2002; 59:449–
456

British 1946: Birth Cohort Follow-Up: Jones PB, Rodgers B, Murray R, Marmot M: Child
developmental risk factors for adult schizophrenia in the British 1946 birth cohort.

Lancet 1994; 344:1398–1402

Vietnam Era Twin (VET) Registry Follow-Back to Induction Testing: Kremen WS, Lyons MJ, Boake C, H. X, Jacobson KC, Waterman B, Eisen SA, Goldberg J, Faraone SV, Tsuang MT: A discordant twin study of premorbid cognitive ability in schizophrenia. *J Clin Exp Neuropsychology* 2006; 28:208–224

Glen Oaks, NY: Prodrome Follow-Up: Lencz T, Smith CW, McLaughlin D, Auther A, Nakayama E, Hovey L, Cornblatt BA: Generalized and specific neurocognitive deficits in prodromal schizophrenia. *Biol Psychiatry* 2006; 59:863–871

Israeli Birth Cohort-Conscript Linkage: Reichenberg A, Weiser M, Rapp MA, Rabinowitz J, Caspi A, Schmeidler J, Knobler HY, Lubin G, Nahon D, Harvey PD, Davidson M: Elaboration on premorbid intellectual performance in schizophrenia: premorbid intellectual decline and risk for schizophrenia. *Arch Gen Psychiatry* 2005; 62:1297–1304

Level 3

Cleveland Hospital Follow-Back to School Records: Albee GW, Lane EA, Reuter JM: Childhood intelligence of future schizophrenics and neighborhood peers. *J Psychol* 1964; 58:141–144

California VA Hospital Follow-Back to High School: Bower EM, Shelhammer TA, Daily JM: School characteristics of male adolescents who later became schizophrenic. *Am J Orthopsychiatry* 1960; 4:712–729

Walter Reed General Hospital Follow-Back to Army Induction Testing: Lubin A, Giesecking CF, Williams HL: Direct measurement of cognitive deficit in schizophrenia. *J Consult Psychol* 1962; 26:139–143

Pennsylvania Hospital Follow-Back to School Records: Offord DR: School performance of adult schizophrenics, their siblings and age mates. *Br J Psychiatry* 1974; 125:12–19

Massachusetts Hospital Follow-Back to School Records: Watt NF, Lubensky AW: Childhood roots of schizophrenia. *J Consult Clin Psychol* 1976; 44:363–375

Swedish Conscript Cohort Follow-Up: Zammit SAP, David AS, Dalman C, Hemmingsson T, Lundberg J, Lewis G: Longitudinal study of premorbid IQ score and risk of developing schizophrenia. *Arch Gen Psychiatry* 2004; 61:354–360