Included in Supplemental Materials:

1) Search Strategy (pg. 2-6)

2) MOOSE Checklist (pg. 7-8)

3) Supplemental Methods (pg. 9)

4) Supplemental Table 1 (pg. 10)

5) Supplemental Table 2 (pg. 11)

Search Strategy

**PubMed**

| Search | Query | # of Results |
| --- | --- | --- |
| #1 | Search IQ[tiab] OR "intelligence"[MeSH:NoExp] OR "intelligence"[tiab] OR "aptitude tests"[MeSH Terms] OR "aptitude"[tiab] OR "Cognitive Ability"[tiab] OR cognitive function\*[tiab] OR "Executive Function"[Mesh] OR Executive Function\*[tiab] OR "neuropsychological tests"[MeSH Terms] OR neuropsychological test\*[tiab] OR "Achievement"[Mesh] | 165480 |
| #2 | Search MDD[tiab] OR "depressive disorder"[MeSH Terms] OR "depressive disorder"[tiab] OR "depression"[tiab] OR "depressed"[tiab] OR "depression"[MeSH Terms] OR "mood disorders"[ MeSH:NoExp] OR mood disorder\*[tiab] | 344552 |
| #3 | Search "cohort studies"[MeSH Terms] OR "cohort"[tiab] OR longitudinal[tiab] OR prospective[tiab] OR retrospective[tiab] OR "Case-Control Studies"[Mesh] OR case-control\*[tiab] OR "Follow-Up"[tiab] OR "Epidemiologic Studies"[Mesh:NoExp] OR systematic[subset] OR systematic[tw] OR "meta-analysis"[Publication Type] OR "meta-analysis as topic"[MeSH Terms] OR "meta-analysis"[tw] OR "meta-analyses"[tw] | 2492651 |
| #4 | Search "risk factors"[MeSH Terms] OR risk[Mesh] OR risk[tiab] OR premorbid[tiab] OR "Prodromal Symptoms"[Mesh] OR prodromal[tiab] OR prodrome[tiab] OR "first occurrence"[tiab] OR "first episode"[tiab] OR predict[tiab] OR predictive[tiab] OR predicts[tiab] OR predicted[tiab] OR predicting[tiab] OR cause[tiab] OR causes[tiab] OR causality[tiab] OR causal[tiab] OR "statistics and numerical data"[Subheading] OR "epidemiology"[Subheading] OR "Incidence"[Mesh] OR "Prevalence"[Mesh] OR predate[tiab] OR onset[tiab] OR association[tiab] OR associated[tiab] | 6322453 |
| #5 | Search "Age Factors"[Mesh] OR "Adolescent"[Mesh] OR "Middle Aged"[Mesh] OR "Adult"[Mesh:NoExp] OR "Young Adult"[Mesh] OR "Child"[Mesh] OR "Adolescent"[tiab] OR "Adolescence"[tiab] OR childhood[tiab] OR child[tiab] OR youth[tiab] OR teen[tiab] OR teenager\*[tiab] | 6517608 |
| #6 | Search #1 AND #2 AND #3 AND #4 AND #5 | 2612 |
| #7 | Search english[lang] | 20131774 |
| #8 | Search #6 AND #7 | 2524 |
| #9 | Search #8 NOT ((Editorial[ptyp] OR Letter[ptyp] OR Case Reports[ptyp] OR Comment[ptyp]) OR (animals[mh] NOT humans[mh])) | 2479 |

**EMBASE**

|  |  |  |
| --- | --- | --- |
| No. | Query | # of Results |
| #1 | 'intelligence'/de OR 'intelligence quotient'/de OR 'intellect'/de OR 'intelligence test'/exp OR 'aptitude'/de OR 'aptitude test'/exp OR 'neuropsychological test'/exp OR 'executive function'/exp OR 'achievement'/de OR 'academic achievement'/exp OR 'achievement test'/de OR 'performance'/de OR iq:ab,ti OR intelligence:ab,ti OR aptitude:ab,ti OR 'cognitive ability':ab,ti OR 'cognitive function':ab,ti OR 'executive function':ab,ti OR 'executive functioning':ab,ti OR 'neuropsychological test':ab,ti OR 'neuropsychological tests':ab,ti | 228,219 |
| #2 | 'mood disorder'/de OR 'depression'/de OR 'agitated depression'/de OR 'atypical depression'/de OR 'depressive psychosis'/de OR 'dysphoria'/de OR 'dysthymia'/de OR 'endogenous depression'/de OR 'involutional depression'/de OR 'late life depression'/de OR 'major depression'/de OR 'masked depression'/de OR 'melancholia'/de OR 'mixed anxiety and depression'/de OR 'mourning syndrome'/de OR 'organic depression'/de OR 'premenstrual dysphoric disorder'/de OR 'puerperal depression'/de OR 'reactive depression'/de OR 'recurrent brief depression'/de OR 'seasonal affective disorder'/de OR 'treatment resistant depression'/de OR mdd:ab,ti OR 'depressive disorder':ab,ti OR depressed:ab,ti OR depression:ab,ti OR 'mood disorders':ab,ti OR 'mood disorder':ab,ti | 525,429 |
| #3 | 'cohort analysis'/de OR 'longitudinal study'/exp OR 'prospective study'/de OR 'retrospective study'/de OR 'case control study'/exp OR 'systematic review'/de OR 'meta analysis'/de OR cohort:ab,ti OR longitudinal:ab,ti OR prospective:ab,ti OR retrospective:ab,ti OR 'case control':ab,ti OR 'follow up':ab,ti OR systematic:ti OR 'meta analysis;ti' OR 'meta analyses':ti | 2,426,105 |
| #4 | 'epidemiology'/de OR 'epidemiological monitoring'/de OR 'risk'/de OR 'attributable risk'/de OR 'high risk population'/de OR 'intermediate risk population'/de OR 'low risk population'/de OR 'patient risk'/de OR 'high risk patient'/de OR 'intermediate risk patient'/de OR 'low risk patient'/de OR 'population risk'/de OR 'risk assessment'/de OR 'risk factor'/de OR 'risk reduction'/de OR 'incidence'/de OR 'prevalence'/de OR risk:ab,ti OR premorbid:ab,ti OR prodromal:ab,ti OR prodrome:ab,ti OR 'first occurrence':ab,ti OR 'first episode':ab,ti OR predict:ab,ti OR predictive:ab,ti OR predicts:ab,ti OR predicted:ab,ti OR predicting:ab,ti OR cause:ab,ti OR causes:ab,ti OR causality:ab,ti OR causal:ab,ti OR predate:ab,ti OR onset:ab,ti OR association:ab,ti OR associated:ab,ti | 7,265,195 |
| #5 | #1 AND #2 AND #3 AND #4 | 3,421 |
| #6 | [article]/lim OR [article in press]/lim OR [conference abstract]/lim OR [conference paper]/lim OR [conference review]/lim OR [erratum]/lim OR [review]/lim AND [english]/lim AND ([newborn]/lim OR [infant]/lim OR [child]/lim OR [preschool]/lim OR [school]/lim OR [adolescent]/lim OR [young adult]/lim OR [adult]/lim OR [middle aged]/lim) AND [humans]/lim | 4,627,852 |
| #7 | #5 AND #6 | 1832 |

 Top of Form

Bottom of Form

**PsycInfo**

|  |  |  |  |
| --- | --- | --- | --- |
| **#**  | **Query**  | **Limiters/Expanders**  | **# of Results**  |
| S1  | DE "Neuropsychological Assessment" OR DE "Halstead Reitan Neuropsychological Battery" OR DE "Luria Nebraska Neuropsychological Battery" OR DE "Mini Mental State Examination" OR DE "Task Switching" OR DE "Wechsler Memory Scale" OR DE "Wisconsin Card Sorting Test" OR DE "Intelligence" OR DE "Intelligence Quotient" OR DE "Intelligence Measures" OR DE "Benton Revised Visual Retention Test" OR DE "Culture Fair Intelligence Test" OR DE "Frostig Developmental Test of Visual Perception" OR DE "Goodenough Harris Draw A Person Test" OR DE "Illinois Test of Psycholinguistic Abilities" OR DE "Kaufman Assessment Battery for Children" OR DE "Kohs Block Design Test" OR DE "Miller Analogies Test" OR DE "Peabody Picture Vocabulary Test" OR DE "Porteus Maze Test" OR DE "Raven Coloured Progressive Matrices" OR DE "Raven Progressive Matrices" OR DE "Slosson Intelligence Test" OR DE "Stanford Binet Intelligence Scale" OR DE "Wechsler Adult Intelligence Scale" OR DE "Wechsler Bellevue Intelligence Scale" OR DE "Wechsler Intelligence Scale for Children" OR DE "Wechsler Preschool Primary Scale" OR DE "Cognitive Assessment" OR DE "Ability" OR DE "Cognitive Ability" OR DE "Mathematical Ability" OR DE "Reading Ability" OR DE "Spatial Ability" OR DE "Verbal Ability" OR DE "Learning Ability" OR DE "Executive Function" OR DE "Cognitive Control" OR DE "Set Shifting" OR DE "Task Switching" OR DE "Aptitude Measures" OR DE "Armed Services Vocational Aptitude Battery" OR DE "College Entrance Examination Board Scholastic Aptitude Test" OR DE "Differential Aptitude Tests" OR DE "General Aptitude Test Battery" OR DE "Graduate Record Examination" OR DE "Achievement" OR DE "Academic Achievement" OR DE "Occupational Success" OR DE "Achievement Measures" OR DE "Iowa Tests of Basic Skills" OR DE "Stanford Achievement Test" OR DE "Wide Range Achievement Test" OR DE "Woodcock Johnson Psychoeducational Battery" OR TI ( intelligence OR IQ OR aptitude OR "cognitive ability" OR "cognitive function\*" OR "executive function\*" OR "neuropsychological test\*" ) OR AB ( intelligence OR IQ OR aptitude OR "cognitive ability" OR "cognitive function\*" OR "executive function\*" OR "neuropsychological test\*" )  | Search modes - Boolean/Phrase  | 247,255 |
| S2  | DE "Depression (Emotion)" OR DE "Major Depression" OR DE "Dysthymic Disorder" OR DE "Endogenous Depression" OR DE "Postpartum Depression" OR DE "Reactive Depression" OR DE "Recurrent Depression" OR DE "Treatment Resistant Depression" OR DE "Affective Disorders" OR TI ( MDD OR "depressive disorder\*" OR depression OR depressed OR "mood disorder\*" ) OR AB ( MDD OR "depressive disorder\*" OR depression OR depressed OR "mood disorder\*" )  | Search modes - Boolean/Phrase  | 220,555  |
| S3  | DE "Cohort Analysis" OR DE "Longitudinal Studies" OR DE "Prospective Studies" OR DE "Followup Studies" OR DE "Retrospective Studies" OR DE "Meta Analysis" OR DE "Causal Analysis" OR DE "Attribution" OR TI ( cohort OR longitudinal OR prospective OR retrospective OR "case-control\*" OR "follow-up" OR systematic OR "meta-analysis" OR "meta-analyses" ) OR AB ( cohort OR longitudinal OR prospective OR retrospective OR "case-control\*" OR "follow-up" )  | Search modes - Boolean/Phrase  | 274,168  |
| S4  | DE "Risk Assessment" OR DE "At Risk Populations" OR DE "Risk Perception" OR DE "Risk Factors" OR DE "Predisposition" AND DE "Premorbidity" OR DE "Susceptibility (Disorders)" OR DE "Prodrome" OR DE "Epidemiology" OR TI ( risk OR premorbid OR prodromal OR prodrome OR "first occurrence" OR "first episode" OR predict OR predictive OR predicts OR predicted OR predicting OR cause OR causes OR causality OR causal OR Incidence OR Prevalence OR predate OR onset OR association OR associated ) OR AB ( risk OR premorbid OR prodromal OR prodrome OR "first occurrence" OR "first episode" OR predict OR predictive OR predicts OR predicted OR predicting OR cause OR causes OR causality OR causal OR Incidence OR Prevalence OR predate OR onset OR association OR associated )  | Search modes - Boolean/Phrase  | 1,037,431  |
| S5  | S1 AND S2 AND S3 AND S4  | Search modes - Boolean/Phrase  | 1,488  |
| S6  | S1 AND S2 AND S3 AND S4  | Limiters - English; Age Groups: Childhood (birth-12 yrs), Neonatal (birth-1 mo), Infancy (2-23 mo), Preschool Age (2-5 yrs), School Age (6-12 yrs), Adolescence (13-17 yrs), Adulthood (18 yrs & older), Young Adulthood (18-29 yrs), Thirties (30-39 yrs), Middle Age (40-64 yrs); Population Group: Human; Document Type: Dissertation, Erratum/Correction, Journal Article, Review-Any Search modes - Boolean/Phrase  | 1,238  |

Update search was run in December 2015. Additional results from each database were:

PubMed: 294

Embase: 326

PsycInfo: 107

**Supplemental Table 1: MOOSE Checklist**

|  |  |
| --- | --- |
| **Criteria** | **Brief description of how the criteria were handled in the meta-analysis** |
| **Reporting of background should include** |  |
| √ | Problem definition | It is unknown whether cognitive deficits may act as a risk factor for depression  |
| √ | Hypothesis statement | Cognitive function predicts later depression |
| √ | Description of study outcomes | Depression symptoms or diagnosis |
| √ | Type of exposure or intervention used | None, time |
| √ | Type of study designs used | We only included prospective cohort studies |
| √ | Study population | Under age 65, with no MDD diagnosis at baseline |
| **Reporting of search strategy should include** |  |
| √ | Qualifications of searchers | A research librarian (EM) conducted the search |
| √ | Search strategy, including time period included in the synthesis and keywords | See supplemental Materials: Search Strategy |
| √ | Databases and registries searched | PubMed, EMBASE and PsycInfo |
| √ | Search software used, name and version, including special features | We did not employ a search software. EndNote X7 was used to merge retrieved citations and eliminate duplicates |
| √ | Use of hand searching | We hand-searched bibliographies of retrieved papers for additional references. |
| √ | List of citations located and those excluded, including justifications | See figure 1 |
| √ | Method of addressing articles published in languages other than English | An English language search was conducted, if papers were found in other languages, translated versions were used |
| √ | Method of handling abstracts and unpublished studies | Unpublished studies were included if relevant |
| √ | Description of any contact with authors | We contacted the authors by email if additional data was needed for the meta-analysis |
| **Reporting of methods should include** |  |
| √ | Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested | Described in methods section  |
| √ | Rationale for the selection and coding of data | Described in methods section |
| √ | Assessment of confounding | Subgroup analyses and meta-regression. See figure 3. |
| √ | Assessment of study quality, including blinding of quality assessors; stratification or regression on possible predictors of study results | See supplemental Table 3 |
| √ | Assessment of heterogeneity | Heterogeneity of the studies were explored within two types of study designs using Cochrane’s Q test of heterogeneity and I2 statistic  |
| √ | Description of statistical methods in sufficient detail to be replicated | Detailed in methods section |
| √ | Provision of appropriate tables and graphics | See figures 1-4 and supplemental tables 1-3 |
| **Reporting of results should include** |  |
| √ | Graph summarizing individual study estimates and overall estimate | Figure 2 |
| √ | Table giving descriptive information for each study included | Supplemental Table 2 |
| √ | Results of sensitivity testing | Analyses controlling for baseline depression symptoms, see figure 3 |
| √ | Indication of statistical uncertainty of findings | 95% confidence intervals were presented with all summary estimates |
| **Reporting of discussion should include** |  |
| √ | Quantitative assessment of bias | Figure 4 and description in results section  |
| √ | Justification for exclusion | See methods section |
| √ | Assessment of quality of included studies | Supplemental Table 3 |
| **Reporting of conclusions should include** |  |
| √ | Consideration of alternative explanations for observed results | “…performance on cognitive tests may be a sensitive measure of motivational state that could augment self-reported symptoms. Alternatively, the co-occurrence of cognitive deficits and depression symptoms may reflect a shared etiology in dysfunction of neural circuits supporting both cognitive and emotional processes.” |
| √ | Generalization of the conclusions | “…our findings suggest that prior studies of links between cognitive function and depression that did not assess baseline symptoms may have overestimated the potential protective role of higher cognitive function. “ |
| √ | Guidelines for future research | “The findings have important implications for future studies, in highlighting the need to control for subthreshold symptoms when investigating risk factors for psychological disorders.”  |
| √ | Disclosure of funding source | Financial support section |

**Supplemental Methods:**

It was possible to calculate the partial correlation coefficient using the following formula:

ry1.2= $\frac{r\_{y1}- r\_{y2}r\_{12}}{\sqrt{(1- r^{2}\_{y2})(1- r^{2}\_{12})}}$

The adjusted and unadjusted results from these studies were entered into separate subgroup meta-analyses. Subsequently the adjusted effect size was subtracted from the unadjusted effect size to evaluate whether the difference was statistically significant in a third sensitivity meta-analysis.

**Supplemental Table 1.** Quality Assessment adapted from Luppino et al., 2010. Scoring: "+" = 1,"-" = 0, "?" = 0. Interpretation of total score: 0-3= low study quality, 4-7 = medium study quality, 8-12 = high study quality. Ratings apply for statistics utilized in meta-analysis only-- some studies have additional variables in SEM models, which were not amenable to meta-analysis.

Association between Educational Attainment and Self-Reported Cognitive Function with Subsequent Depression

In order to sufficiently study the association between educational achievement it would be important to complete a separate meta-analysis using different search terms to properly capture studies with this data. However, to preliminarily test whether an association might exist, we have reviewed the studies that were originally excluded due to them assessing cognitive function via “educational achievement or self-report.” Of those, 8 samples provided sufficient data to preliminarily test this hypothesis. It was found that across these samples, that educational achievement and self-reported cognitive function did predict subsequent depression (r=-0.229; 95% CI: -0.303, -0.152; p<0.001). Although we again caution that this is not based on a systematic review of available studies, it suggests that educational variables may also predict depressive symptoms (with the additional caveat that future analyses will also need to be careful to control for baseline depressive symptoms, as in the case of our primary analyses).

