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The impact of relative age effects on psychosocial development: A systematic review

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Abstract

Background: Within the same school class, it is usual to find children who differ in age by almost a full calendar year. Although associations between being relatively young and poor academic outcomes are well documented, and relatively consistent, the associations between being relatively young and psychosocial outcomes are less clearly documented.

Aims: To review research which presents data relating to associations between a child's relative age and their psychosocial development.

Methods: A systematic review was conducted and reported in accordance with PRISMA guidelines.

Results: Fifty-nine papers met the inclusion criteria. The outcomes of the narrative synthesis and three meta-analyses found consistent, but very small, associations with relative age indicating that those who are relatively young are more likely to have more negative behaviour, mental well-being, and social experiences.

Conclusions: Although being relatively young is associated with more negative psychosocial outcomes, the magnitude of these associations is consistently small. Furthermore, many of the outcome measures used are likely to be the result of multiple influences, not limited to the effects of relative age. Therefore, the findings are reassuring as they suggest that relative age itself is unlikely to substantially increase an individual's risk of poor psychosocial development.

KEYWORDS
mental health, psychosocial, relative age effect, summer born, well being

Across the world school entry is commonly based on a child's date of birth and cut-off dates are used to determine when a child will begin school (Gledhill et al., 2002; Verachtert et al., 2010). Therefore, within the same class it is usual to find children who differ in age by almost a full calendar year. It is well established that during the early years of a child's life, rapid development occurs across all domains, and therefore, it follows that relatively younger children may be disadvantaged. This difference, between those children who are older within their year group and those who are younger, is known as the relative age effect. This effect has been studied and well documented in terms of children's educational attainment: those who are younger perform less well than their older counterparts (Bedard & Dhuey, 2006; Boardman, 2006; Crawford et al., 2007, 2011; Daniels et al., 2000; Department for Education, 2010; Lawlor et al., 2006; Martin et al., 2004; McEwan & Shapiro, 2008; Menet et al., 2000; Oshima & Domaleski, 2006; Strom, 2004; Sykes et al., 2009). Furthermore, the relative age effect has been well recognized in the context of sport: older, and therefore, more physically developed children have obvious advantages over younger peers (Barnsley et al., 1985; Grondin et al., 1984; Musch & Grondin, 2001). However, less is known about the impact that this relative age effect may have on children's psychosocial development (Alasker & Olweus, 1993; Crawford et al., 2014; Thompson et al., 2004). The current review explores the extent to which research evidence indicates that the relative age effect is linked to psychosocial development. This may also be associated with greater adjustment and mental health issues, lowered confidence in one's ability. and lowered life satisfaction both in the short and long term.

Challenges experienced by relatively younger children (e.g., less school experience, teacher-reported language and behaviour difficulties, see Carroll, 1992; Cobley et al., 2009; Norbury et al., 2016) combined with their poorer academic performance may contribute to them being disproportionately diagnosed with special educational needs (Cobley et al., 2009; Wilson, 2000), developmental disorders (Dhuey & Lipscomb, 2010; Elder & Lubotsky, 2009; Gledhill et al., 2002; Wallingford & Prout, 2000), temperamental differences such as increased levels of hyperactivity (Mühlenweg et al., 2012), and being over-represented in referrals to specialist Child and Adolescent Mental Health Services (Berg & Berg, 2014). Risky health behaviours have also been associated with relatively young students (Bahrs & Schumann, 2020; Routon & Walker, 2022) along with lowered self-reported general health and life satisfaction in adolescence (Fumarco et al., 2020). The link between being relatively young at school and mental health problems has also been supported by Thompson et al. (1999) who identified a significant link between being relatively young and suicidal behaviour in Canadian youths. There are indications that relatively young children may be more unhappy at school (Crawford et al., 2011), more likely to be bullied (Department for Education, 2010; Mühlenweg, 2010), have a lowered preference for competition (Page et al., 2017), have problems with peer relationships (Fumarco et al., 2020; Lien et al., 2005) and lower levels of self-esteem (Fenzel, 1992; Thompson et al., 2004). Nonetheless, recent research has revealed a more mixed pattern of results in these areas, possibly because of a greater emphasis on mental health awareness in recent times.

Lien et al. (2005) compared 15- to 16-year-olds classed as oldest, middle, and youngest in their class in terms of average grades, psychological distress symptoms, and scores on the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997). The youngest group scored lowest on average grade and highest on SDQ peer problems. Of the peer problem questions in the SDQ questionnaire, the age groups differed most on the item "being generally liked" (significant among boys and not girls). Furthermore, no differences on other SDQ measures (including prosocial and emotional problems) were revealed. Similarly, mixed results were found by Price et al. (2017) who investigated the relationships between relative age effects and several psychosocial adjustment measures (mental health, measured by teacher and parent report using the SDQ; disruptive behaviour, reported by teachers; and happiness, reported by child participants). Relatively younger children had marginally higher SDQ Total Difficulties scores, as reported by teachers and parents, compared with their older peers. On average, an 8-month difference in relative age resulted in the younger children (born later in the academic year) having higher SDQ Total Difficulties scores (as reported by both teachers and parents). However, no differences were found between relatively younger and older children on the

behavioural and happiness outcomes. This suggests relatively younger children are at risk for greater mental health difficulties; however, this was measured by teachers and parents. Previous research has indicated teachers may well have a bias in their judgements of younger children based on their perceived lack of maturity when compared to older children, consequently, this evidence may not be robust.

Other research has focussed more specifically on self-esteem and how relative age effects may impact the self-concept. Thompson et al. (2004) found that in a large sample of 6 to 14-year-olds in Canada, there was a linear increase in self-esteem with relative age and those over age for 1st grade entry (those that had been held back a year) had the highest self-esteem. In contrast, Crawford et al. (2014) found no differences on self-esteem issues when comparing August and September-born children in a large sample (drawn from 2 UK cohort studies) tested between age 6 and 8 years, whereas the authors found strong evidence that scholastic competence is significantly different (lower for August born children) even when questions are asked at around the same age. Crawford et al. (2014) conclude relative age effects may become exacerbated when there are other challenges for the youngest children related to mental health and learning difficulties. To date, the most recent research investigating this area (Parker et al., 2019) has supported the idea that the relative age effect (referred to as the "Negative Year in School Effect – NyiSE") is a critical predictor of academic self-beliefs. The NYiSE suggests that, holding achievement constant, grade-relative-to-age influences self-concept (i.e., perceptions of competence within a given domain). Parker et al. (2019) surveyed 10,370 Australian 15-year-olds over 10 years. Participants were asked about their maths, English and general academic self-concepts and attendance at university. The NYiSE had a significant negative effect on university entry when achievement was controlled. When controlling for all self-beliefs (math self-concept, math, English, and academic social comparison), the significant NYiSE was found to be non-significant. The authors concluded that the relative age effects on achievement were completely explained by self-beliefs, stating that "any decision that effects who a child's peers will be, will play a significant determining role in the way they feel about themselves" (Parker et al., 2019, p. 128). This evidence suggests that relative age negatively impacts psychosocial development with respect to lowered academic confidence linked to negative self-concept, particularly for those children who are experiencing learning or behavioural difficulties. Perceiving oneself as less able than older peers may well be an important source of such negative self-beliefs. Research has also indicated differences in "grit" and determination, with relatively older students showing more perseverance with their goals; however, there were subtle differences found with respect to effort and interest measures according to relative and absolute age (Peña & Duckworth, 2018).

To date, no one theory (or set of theories) on the primary cause(s) of the relative age effect has definitively been supported (Crawford et al., 2011; Sharp et al., 2009; Sykes et al., 2009). While there is a wealth of evidence linking attainment, by contrast, there is a paucity of studies which have considered the impact of relative age on a child's mental health and well-being in school. It is quite possible that psychosocial problems may mediate the relationship between relative age and attainment. Research in this area has not yet confirmed the developmental process involved in the relative age effect phenomenon and its relationship with psychosocial development. Furthermore, our understanding of this area is complicated by the mixture of methodologies to identify the oldest and youngest children, the age at which the child or significant others are tested, various participant groups (e.g., teacher, parent and child reports), and differing outcome measures (e.g., scholastic competence, self-esteem, emotional problems, happiness). Therefore, a systematic review is warranted to clearly establish the extent of the links between relative age effects, psychosocial development and reflect on how this may relate to the main body of evidence which has shown a clear relationship between relative age effects and academic progress. The aim of this review is to identify the extent and consistency of associations between a child's relative age and their psychosocial development, rather than to disentangle the causal direction (or otherwise) of cognitive and non-cognitive development.

METHOD

The systematic review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA; Moher et al., 2009). Research questions, search strategy, inclusion criteria, and method of analysis were specified in advance and documented in a protocol which was pre-registered with PROSPERO (https://www.crd.york.ac.uk/prospero/display_record. php?RecordID=140586).

Search strategy

A systematic computerized search was performed in PsycINFO and Scopus. The databases were searched using the following two search strings combined; "Summer born*" OR "August born*" OR "Relative age" OR "August-Born*" OR "Summer-born*" OR "Season of birth" OR "month of birth" OR "school starting age" OR "age at school entry" AND "Well Being" OR "Well-being" OR "Mental Health" OR "Life Satisfaction" OR "Referral*" OR "self worth" OR "self-worth" OR "Self-Concept" OR "Self-Perception" OR "Self Concept" OR "Self Perception" OR "Psychosocial development" OR "Behaviour Problem*" OR "Behaviour Problem*" OR "Adolescent Development" OR "Confidence" OR "Adjustment" OR "Academic Confidence." No restrictions were used when conducting the searches.

The reference lists of papers screened at the full-text stage for inclusion were checked for possible additional papers to include in the review. Furthermore, key authors in the area were emailed with brief details of the review and asked to suggest any key papers, including in press papers, for inclusion.

Selection criteria

All studies that met the following criteria were included: (1) referred to relative age effects in relation to school starting age and or being younger/older than others in the same class; (2) referred to psychosocial outcomes including mental health/well-being; (3) included quantitative, qualitative, or secondary data analysis; and (4) published in a peer-reviewed journal as a full or short report in English, German, or Spanish. An inclusive approach was taken when assessing whether articles included an outcome variable relevant to psychosocial development. Both conventional measures of psychosocial development and proxy measures used by authors to assess psychosocial outcomes were included (e.g., school attendance as a measure of motivation; suicide as a measure of well-being). Studies from any country and any time point were included with participants of any age. Studies focusing on cognitive development exclusively, including educational attainment and IQ, were excluded as were studies that refer to season of birth but did not relate this to relative age differences experienced at school.

Data extraction

First, the search results from the two databases were combined. Next, duplicates were removed. After removing duplicates, both authors shared the screening of all titles and abstracts to determine whether the inclusion criteria were met. This process was systematic. First, the titles of the manuscripts were screened to assess suitability. Secondly, for the studies that appeared relevant from their title's, abstracts were screened to evaluate whether the manuscript met the inclusion criteria. If during each of these steps there was doubt about the suitability of the manuscript, then the manuscript was included in the next, more specific, step. To confirm consistency between the two authors, 15% ($N = 91$) of the papers were screened independently by both authors (agreement 100%, $\kappa = 1$).

If suitability was expected, hard copies of the manuscripts were obtained. These were independently read by both reviewers to examine whether the article fitted the inclusion criteria. This was done

systematically using a pre-agreed checklist. Both authors reviewed all the full-text manuscripts, any disagreements on whether a study should be included or not were resolved through discussion.

For all studies that met the inclusion criteria, information was extracted using a pre-defined form; two versions of this form were used, one for quantitative and one for qualitative studies. The information recorded included study design and aims, participant characteristics, variables being studied, and how these were measured (quantitative studies only) or defined, methods of analysis, main findings (including effect sizes for quantitative studies) and authors' interpretations/conclusions. The first and second author shared this data extraction process. To ensure consistency, 15% of the included papers ($N = 9$) were reviewed independently by both authors (agreement 100%, $\varkappa = 1$). After this, the first author reviewed all the studies and data extraction sheets completed by the second author and the second author reviewed all those completed by the first author. Again, any disagreements were resolved through discussion.

The Wallace Criteria (Wallace et al., 2004) was used to assess bias and methodological quality of each study based on theoretical perspective, appropriateness of question, study design, context, sampling, data collection, analysis, reflexivity, generalizability, and ethics. This was chosen as it was appropriate for evaluating the quasi-experimental, non-intervention studies included. The scoring method reported by Husk et al. (2016) was followed. Specifically, for each study it was reported whether each criterion was met (assigned "yes") or not (assigned "no") or if it was not described (assigned "cannot tell"). From this, an overall assessment score was derived. Where the "essential" Wallace Criteria were all met, and seven or more of the "desirable" criteria were answered positively, studies were graded "good"; between four and six "desirable" positive answers were graded "moderate"; and nought to three were graded "poor". Any studies where any of the "essential" criteria were not met were also graded as "poor." To ensure consistency in these ratings 15% of the studies ($N = 9$) were reviewed by both authors independently (agreement 100%). All the remaining studies were reviewed by both authors (they were not blind to the assessment made by the other author during this). Any disagreements were resolved through discussion.

Data synthesis

Characteristics of the included studies are reported first, then a narrative synthesis of the findings from these provided. The approach of an integrative narrative synthesis (Dixon-Woods et al., 2005) was chosen from the scoping of the literature considerable variability in study designs, populations studied, and outcome measures was observed. Nonetheless, it was decided that if three or more of the included studies were sufficiently similar the results would be pooled using a random-effects meta-analysis, with sample weighted average correlations for continuous outcomes, odds ratios for binary outcomes and 95% confidence intervals and two-sided *p*-values for each outcome.

Within the discussion, the three subheadings recommended by Cochran (Higgins & Green, 2011) are used; "overall completeness and applicability of evidence," "quality of the evidence," and "potential biases in the review process" to provide further interpretation of the evidence.

RESULTS

Figure 1 summarizes the searching and screening processes. This resulted in 59 papers identified for inclusion. These were all quantitative studies published between 1986 and 2022, with 58% ($n = 34$) being published since 2015. Seventy-six per cent of studies were based on samples from Western Europe (30) and America (15). The risk of bias in the papers was high with 83% ($n = 49$) rated as poor, 3% as moderate ($n = 2$), and 14% as good ($n = 8$). The full risk of bias table is provided in the Supporting Information.

The key characteristics, including risk of bias, are summarized in Table 1. The psychosocial outcomes considered in each of the papers were categorized as follows: "behaviour" (internalizing & externalizing behaviours [$n = 25$], risky behaviour [$n = 8$]), "mental well-being" (self-report measures [$n = 9$], referral
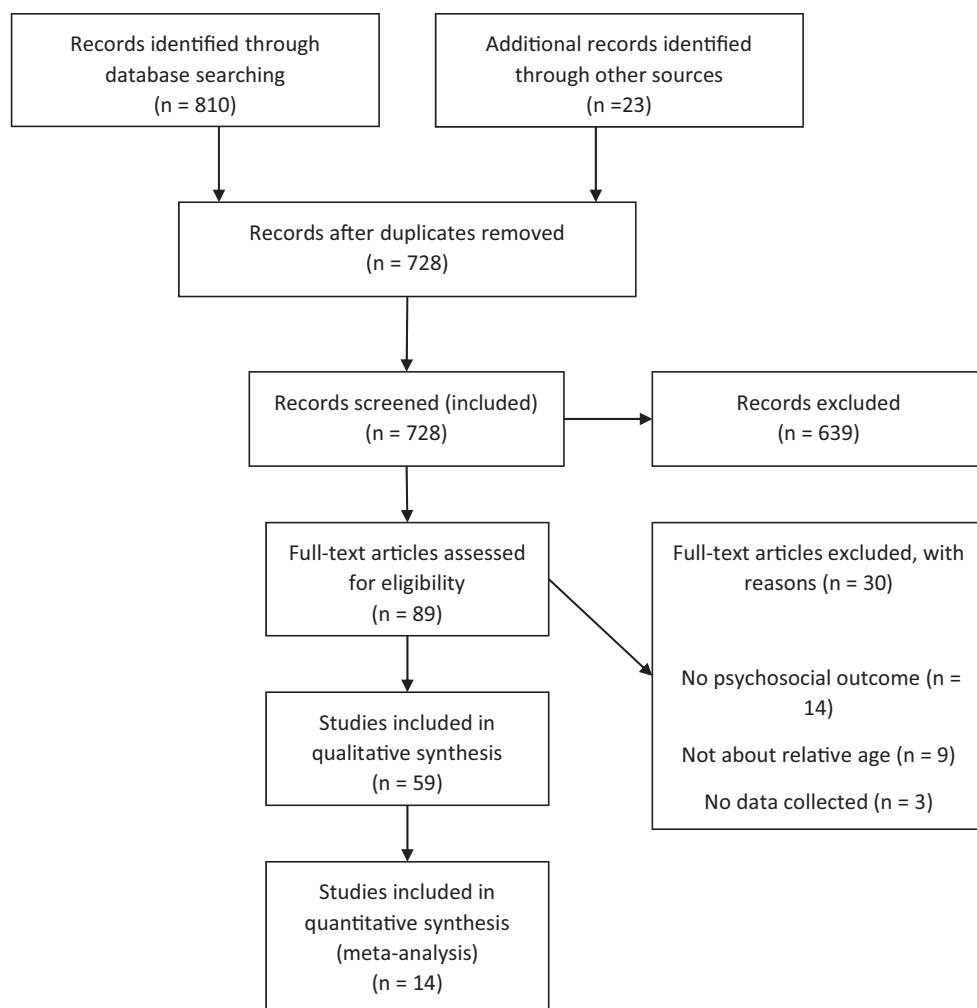
FIGURE 1   Prisma 2009 flow diagram (Moher et al., 2009) summarizing searching and selection.

for assessment [$n = 4$], diagnosis of mental health condition [$n = 5$], suicide [$n = 2$] and self-perception [$n = 9$]), and social functioning (social experiences [$n = 11$], school attendance [$n = 2$] and leadership [$n = 3$]). Some papers are included in multiple categories as multiple outcome measures were reported. Tables summarizing the studies and their key outcomes grouped by each of these categories and subcategories are included as Supporting Information.

Behaviour

Internalizing and externalizing behaviours

Twenty-two studies investigated the association between relative age and behaviour using questionnaires to assess internalizing and externalizing behaviours. The necessary information to obtain effect sizes was only available for ten studies (Broughton et al., 2022; Diefenbach et al., 2021; Goodman et al., 2003; Lien et al., 2005; Lincove & Painter, 2006; Price et al., 2017; Reijneveld et al., 2006; Wendt et al., 2018; Wienen et al., 2018; Wisniewski et al., 1995). These studies were included in a random effect meta-analysis. The sample weighted average correlations between relative age and behavioural measures

TABLE 1 Summary of key study characteristics, findings, ratings from risk of bias assessment (E = no. of essential characteristics, D = no. of desirable characteristics) and categorization of studies based on outcome variables reported.

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E + D)	Relevant category/ categories based on outcome variables
Alasker and Olweus (1993)	1689 children aged 10–15 years in Norway, cohort longitudinal data collected at 3 time points	2 groups (younger and older groups for each grade using absolute age, for example, at time point 1 those in grade 4 were divided into relatively young [10 years old] and relatively old [11 years old])	Cohort, sex	Child-reported Global Negative **Self-Evaluations** (GSE) scores; **Perceived Instability of Self** (PIS) scores – these scales were adaptions of Rosenberg's self-esteem and stability of self-scales	Relatively young students had more negative self-perceptions, both in terms of global self-esteem and perceived self-stability compared to relatively old students	Poor (4 + 3)	Mental Well-being; Self-perception
Ando et al. (2019)	4478 children aged 10 years in Japan	Continuous (unit of measurement 1 day)	Academic achievement, bullying experiences, age at time of survey, sex, height, child's IQ, annual household income, harsh parenting	Child reported emotional well-being **WHO-Five Well-Being Index** (WHO-5). Child & Parent-reported **experience of being bullied** (using adapted Olweus Questionnaire)	Being relatively young was associated with lower levels of emotional well-being ($r = -.044$) and increased experiences of being bullied at school ($r = .044$). When academic performance and bullying were controlled for the association between RA and well-being became non-significant	Good (5 + 7)	Mental Well-being; Self-report measures, Social Functioning; Social experience
Auger et al. (2012)	647 children aged 12–13 years in Canada. Longitudinal data collected at 4 time points over 8 years	Continuous (unit of measurement 1 day)	Sex, ethnicity, parent education, impulsivity	Age of **gambling onset** – using post-secondary school self-report questionnaire	Being younger relative to one's peers became a risk factor for gambling initiation around age 10.5 years, and the strength of the association increased progressively with age	Poor (3 + 6)	Behaviour: Risky

(Continues)

TABLE 1 (Continued)

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E + D)	Relevant category/ categories based on outcome variables
Bahrs and Schumann (2020)	10,400 adults with average age of 37 in Germany, data extracted from population survey: German Socio-Economic Panel (SOEP), earliest time point only used	Continuous (unit of measurement 1 month)	Number of friends, average age of friends, relative age of friends, gender, migration background, respondents' highest secondary school degree attained, both parents' highest secondary school degree attained	Smoking behaviour (**smoker vs. non-smoker**), Mental health: **SOEP's Short Form 12 (SF12) Health Survey. Number of friends** is also reported	Being relatively young was associated with increased likelihood of being a smoker. Support reported for relative age composition of peers and the school environment being important mechanisms. No association between RA and mental health ($r < -.02$) or number of friends ($r < -.01$)	Poor (4 + 5)	Behaviour: Risky, Mental Well-being: Self-report measures, Social Functioning; Social experience
Berg and Berg (2014)	9157 children aged 0–17 years in the UK	Continuous (unit of measurement 1 month)	None	Mental health referrals – used **NHS referral data**	Being relatively young was associated with an increased likelihood risk of referral to mental health services, while being among the oldest is a protective factor. The effect is present for boys and girls and for children in both primary and secondary school	Poor (3 + 6)	Mental Well-being: Referral
Biederman et al. (2014)	1091 children aged on average 11.5 years ($SD = 3.8$) in America	Compared children born in August (youngest) with those born in September (oldest)	Moos family Environment Scale	Parent-reported **CBCL and Social Adjustment Inventory for Children and Adolescents** (SAICA)	Relatively young had increased attention ($d = .3$) and thought problems ($d = 2$) compared to relatively older on CBCL, with no other differences on CBCL subscales or SAICA	Poor (3 + 6)	Behaviour: internalizing & externalizing, Social Functioning; Social experience
Black et al. (2011)	Sample size not reported. Population of Norway	Continuous (unit of measurement 1 month)	Maternal education, birth order, family size	**Mental health** – using Norwegian military records; **teenage birth** – using Norwegian registry data	Being relatively young increases the likelihood of giving birth as a teenager but reduces the likelihood of giving birth within twelve years of starting school. Being relatively young is associated with an increased likelihood of poor mental health	Poor (3 + 6)	Behaviour: Risky, Mental Well-being: Diagnosis

TABLE 1 (Continued)

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E + D)	Relevant category/ categories based on outcome variables
Broughton et al. (2022)	14,643 children aged 4 years in UK, longitudinal to age 25, multiple time points	Continuous (unit of measurement 1 week)	Age, sex, maternal background, pregnancy and birth, household crowding, ethnic background, home ownership	**SDQ** parent reported 8 × between 4 & 25 years. **Short Mood and Feelings Questionnaire (SMFQ)** parent report 4 × between 9 & 17 years and child report 9 × between 10 & 25 years	At age 4 & 25 no association between RA and SDQ, but at age 7 & 17 being relatively young was associated with higher SDQ Total and Hyperactivity Scores. For self-reported SMFQ being relatively young was associated with higher distress at ages 14 & 25, but no association at other ages. For parent-reported SMFQ being relatively young was associated with higher distress at ages 9 & 11 but no association at other ages & all effect sizes small	Poor (4 + 7)	Behaviour: internalizing & externalizing, Mental Well-being: Self-report measures
Carroll (1992)	5429 Children aged 8–9 years in the UK	Three groups (each 4 months)	Family size, gender	**School attendance** using headteacher and class teacher questionnaires	Being relatively young associated with increased likelihood of being a "poor" attender ($d = .03$)	Poor (3 + 5)	Social functioning: School attendance
Caudillo (2019)	3530 women in Mexico	Compared children born in August (youngest) with those born in September (oldest)	Age, percentage population with less than elementary schooling in 2000, ratio of higher secondary schooling to population aged 15–19, age at interview, state dummy variables, and 2014 survey year dummy variable	**Sexual activity, pregnancy,** union, school dropout, and **risky behaviours** – using the 2009 and 2014 National Surveys of Demographic Dynamics (ENADID)	Teenage girls who are relatively young are more likely to have earlier sexual onset, first pregnancy, and first union formation in the form of cohabitation. Being relatively young was also associated with increased likelihood of drinking alcohol, smoking, and using drugs before getting pregnant	Poor (3 + 5)	Behaviour: Risky

(Continues)

TABLE 1 (Continued)

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E+D)	Relevant category/ categories based on outcome variables
Caye et al. (2020)	9735 children aged 6–14 years in Brazil	Continuous (unit of measurement 1 day)	None	SDQ parent report	Association between being relatively young and higher score on Hyperactivity subscale. No association between RA and other sub-scales (no total score reported)	Poor (3 + 7)	Behaviour: internalizing & externalizing
Chen et al. (2021)	9,548,393 children aged 3–17 years in Taiwan	Continuous (unit of measurement 1 month)	Age, sex, residence (level of urbanization), income	Diagnoses by health professional of childhood mental health disorders (anxiety/depression/ disruptive behaviour disorder)	Being relatively young was associated with increased likelihood of being diagnosed with anxiety (in preschool, primary and high school boys & girls), depression (in primary school boys, but not girls and secondary school boys but not girls), disruptive behaviour disorder (in preschool boys & primary school boys & girls)	Poor (4 + 6)	Mental Well-being: Diagnosis
Cobley et al. (2009)	657 children aged 11–14 years in the UK	Four groups (each 3 months)	None	Pupil attendance as a proxy for motivation – using generic attendance records	Relatively younger were more likely to have worse attendance (on average attending 6 days less) than their relatively older peers	Poor (4 + 7)	Social functioning; School attendance
Cook and Kang (2016)	Sample size not clear, children aged 11–15 years in the USA	Two groups: 60 days either side of cut-off	Gender, ethnic group, unwed mother, teenage mother, mother education, low birth weight, free school meals	Criminal activity: the official-juvenile- complaint data and adult-felony- convictions	Being relatively young was associated with juvenile delinquency, however, being relatively old increased the likelihood of an adult conviction	Poor (3 + 3)	Behaviour: Risky
DeMeis and Stearns (1992)	1676 children aged 5–18 years in the USA	Continuous (unit of measurement 1 month)	None	Referrals to school psychologist for behavioural/social difficulties, Placed in Mental Health Project	Relatively young were more likely to be referred to school psychologist for behavioural/social difficulties than older peers. No association between RA and likelihood of being placed in Mental Health Project	Poor (3 + 4)	Mental Well-being: Referral

TABLE 1 (Continued)

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E + D)	Relevant category/ categories based on outcome variables
DeVylder et al. (2015)	2263 adults recruited general population (aged 18+) in the USA	Asked respondents whether they were usually older, younger, or average in relation to their year group. Defined as younger and not younger	School mobility, completed education, age, race/ ethnicity, country region, whether raised by both parents, poverty level	**Psychotic experiences** using WHO-CIDI 3.0 psychosis screen	Younger perceived relative age is associated with increased risk for psychotic experiences	Poor (4 + 4)	Mental Well-being; Self-report measures
Dhuey and Lipscomb (2010)	USA Talent: 273,123 students (but excluded 3874 for missing data); NLSHS: 16,000; HS&B 18,000 303, 249: Children aged 15–18	Four groups (each 3 months)	Race, gender, parental education, height, BMI, team membership	Identify leaders as individuals that have **served either as a sports team captain or club president**	Being relatively old is associated with increased likelihood of holding a leadership position	Poor (4 + 6)	Social functioning: Leadership
Diefenbach et al. (2021)	1633 children aged 5–7 years in Germany. Longitudinal over 1.5 years, data collected at 3 time points	Continuous (unit of measurement 1 day)	Gender, socio-economic status, migrant background, family structure (nuclear family vs. other)	**SDQ** parent reported, prior to school entry, 3 months afterschool entry and end of 1st school year. SDQ teacher-reported end of 1st school year. Hyperactivity subscale only reported	Before, and 3 months after, school entry, no association between RA and reported hyperactivity. At end of 1st year of school being relatively young was significantly associated with higher hyperactivity scores reported by parents ($r = -.03$) and teachers	Poor (4 + 7)	Behaviour: internalizing & externalizing
Du et al. (2012)	USA 375 CEOs of S&P 500 companies between 1992 and 2009	Birth month of CEO (June/July, June only, July only, other 10 months)	Not including August borns	**Being a CEO**	Relatively older are more likely to be CEOs	Poor (3 + 1)	Social functioning: Leadership

(Continues)

TABLE 1 (Continued)

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E + D)	Relevant category/ categories based on outcome variables
Duncan et al. (2022)	49,921 children aged 13–18 years in Canada	Three groups (each 4 months)	Sex, educational year, ethnicity, SES	Self-reported **depressive symptoms:** Centre for Epidemiologic Studies Depression Scale Revised (CESDR-10), **anxiety symptoms:** Generalized Anxiety Disorder Scale (GAD7), **psychosocial well-being:** Flourishing Scale (FS)	No associations between RA and depressive or expressive symptoms. But those who were relatively young more likely to have lower scores FS ($d = .05$)	Poor (3 + 5)	Mental Well-being; Self-report measures, Social functioning; Social experience
Elder (2010)	11,784 children aged 5 years in America. Longitudinal over data from two population surveys used (ECLS & NLSY) 8 years	Two groups – those with birthday 181 days before vs. 181 after cut-off	Health problems (hearing, vision, speech, mobility, asthma), background characteristics (gender, SES, birth weight, mothers' education, race)	Teacher and Parent completed **Social Rating Scales** (SRS) at 3 time points	For teacher SRS "approaches to learning" ($d = .2$), "self-control" ($d = .3$), and "interpersonal skills ($d = .07$)," those who were relatively young had lower scores. Differences not found for other subscales or parent SRS	Poor (3 + 5)	Behaviour: internalizing & externalizing
Fenzel (1992)	103 children aged 10 years in America. Data collected at 3 time points, shortly prior to transition to middle school, 3 weeks and 4 months after this transition	Continuous (unit of measurement 1 day)	Fathers' educational level, gender	Self-competed **Self-esteem, Self-Perception Profile** for Children, The Early Adolescent **School Strain** Inventory and **Trait anxiety scale**	For girls, but not boys, being relatively young was associated with lower self-esteem and higher strain at all 3 time points and was associated with higher trait anxiety but only at time points 1 and 2	Poor (3 + 3)	Mental Well-being; Self-report measures, Mental Well-being: Self-perception

TABLE 1 (Continued)

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E+D)	Relevant category/ categories based on outcome variables
Folgar et al. (2015)	1547 children aged 11–15 years in Spain	Four groups (each 3 months)	None	Rosenberg self-esteem scale & **Self-esteem** scale for adolescents Bullying: self-report 22 item measure of **victimization** (social, physical and verbal). Series of single questions about **smoking** status, smoking recency, & age started	Being relatively young was associated with increased likelihood of having smoked. No associations between relative age and self-esteem (r=.05) or victimization	Poor (2 + 3)	Behaviour: Risky, Mental Well-being: Self-perception, Social Functioning; Social experience
Fumarco et al. (2019)	423,575 children aged 10–16 years, in USA and several European countries	Continuous (unit of measurement 1 month)	SES, absolute age, gender	Child reported frequency of **e-communications with friends, quantity of friends, frequency of meetings with friends** that take place after the school day	Relative age is negatively associated with e-communication in 24 out of 33 countries and positively associated with both quantity of friends (r<.01) and meetings with them after school for 21 and 22 countries, respectively	Good (5 + 7)	Social Functioning: Social experience
Fumarco and Schultze (2020)	521,544 children aged 10–17 years from 33 countries within Europe	Continuous: Calculated as the difference between student's absolute age and the average absolute age of their classmates (results in a value between 0 [oldest] −1 [youngest])	Absolute age, gender, family structure, family SES, season of birth	Self-rated **Self-perceived performance** (1–4 scale), self-perceived school pressure (1–4 scale)	Being relatively older is associated with increased self-perceived performance (r=.049) and lower self-perceived school pressure. These associations with RA are more prevalent at younger ages and disappear as students grow older	Good (5 + 7)	Mental Well-being: Self-perception

(Continues)

TABLE 1 (Continued)

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E + D)	Relevant category/categories based on outcome variables
Fumarco et al. (2020)	379,524 children aged 10.5–16.5 years from 32 countries within Europe	Continuous: Calculated as the difference between student's absolute age and the average absolute age of their classmates (results in a value between 0 [oldest] −1 [youngest]	Absolute age, gender, family structure, family SES, season of birth	**Life satisfaction** using the Cantril ladder, and psychosomatic complaints as a proxy for mental health created an index based on a symptoms checklist	Being relatively young was associated with lower life satisfaction ($r < -.02$) and increased psychosomatic complaints	Good (5 + 7)	Mental Well-being: Self-report measures
Goodman et al. (2003)	10,438 children aged 5–15 years in Britain	Three groups (each 4 months)	Age, sex, maternal educational level, family type, number of children at home, maternal psychopathology, family dysfunction, IQ of child, and SLD	**SDQ** teacher and parent report and child report for children >11 years-old. **Psychiatric diagnoses** derived from research interviews	Association between being relatively young and higher SDQ Total Difficulties scores from teacher, parent and child ($r = -.04$) reports and increased likelihood of psychiatric diagnosis. No subscale scores reported	Poor (3 + 6)	Behaviour: internalizing & externalizing, Mental Well-being: Diagnosis
Halldner et al. (2014)	10,760 children aged 9 years and 6970 adults aged 20–47 years from Sweden	Two groups: November/December (youngest) birthdates January/February birthdates the following year (oldest)	None	Parent-reported **ADHD symptom** (19-item checklist based on DSMIV). Adult self-reported ADHD symptoms (18-item checklist based on DSM-IV)	No association between RA and ADHD symptoms	Poor (4 + 7)	Behaviour: internalizing & externalizing
Harvey (1991)	114 children referred and 120 children not referend to psychological service in the USA. All children aged 5–11 years	Two groups: July–October birthdates (youngest) and November–February birthdates (oldest)	None	**Referrals** to psychological services for behaviour problems, learning problems. All children referred had average IQ	More referred children were relatively young, compared to relatively old. However, this difference was only found up to the age of 7–8 years	Poor (2 + 3)	Mental Well-being: Referral

TABLE 1 (Continued)

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E + D)	Relevant category/ categories based on outcome variables
Hirvonen et al. (**2016**)	198 children aged 3 years in Finland. Data collected at multiple time points over 7 years	Continuous (unit of measurement 1 month)	Familial risk of dyslexia, parents' level of education	Parent-reported temperament using the **CBQ** at age 3. Teacher-reported task avoidance (linked to motivation) using the **Behavioural Strategy Rating Scale** at 5 time points between age 6 and 10 years	No association between RA and CBQ. Being relatively young was associated with increased task avoidance in the Autumn and Spring of Grade 2, but no association was found in Kindergarten or Grade 3	Poor (2 + 5)	Behaviour: internalizing & externalizing
Jeronimus et al. (**2015**)	2230 children aged 10–11 years at Time 1, age 13 at time 2 and age 15–16 at time 3 in the Netherlands	Continuous (unit of measurement 1 month)	SES	**Peer status** assessed using a socio-metric nomination procedure in classrooms. **Affective Problem scales** of the Youth Self-Report (YSR). Parent-reported **CBCL**, and Early Adolescent Temperament Questionnaire (**EATQR**)	No associations between RA and peer status (association with popular status $r = .00$, rejected status .06) or EATQR (fear $r = -.01$, Frustration $r = -.03$). Association between being relatively young and having a higher mean on YSR and CBCL ($r = .03$) but only for children who had repeated a year at school	Poor (4 + 7)	Behaviour: internalizing & externalizing, Mental Well-being: Self-report measures, Social functioning; Social experience

(Continues)

TABLE 1 (Continued)

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E + D)	Relevant category/ categories based on outcome variables
Kinard et al. (1986)	467 preschool children with mean age 4 years 11 months in the USA. Longitudinal data collected	Continuous (unit of measurement 2 months)	Preschool screening measure of information processing skills	Parent completed **Simmons Behaviour Checklist** (SBCl) prior to school entry, and again when children were in 3rd grade. At the end of kindergarten teachers completed the **Preschool Behaviour Questionnaire**. During 3rd grade, teachers and parents completed the **Child and Adolescent Adjustment Profile (CAAP)**. From kindergarten through to 4th grade **referrals** to psychological guidance services were analysed	No association between RA parent- or teacher-reported behaviour, adjustment (including peer relations) or referrals to psychological guidance services at any time point	Poor (3 + 4)	Behaviour: internalizing & externalizing; Mental Well-being: Referral
Kretschmann et al. (2021)	18,956 children aged on average 10.35 years (SD = 0.32) in Germany	Continuous (unit of measurement 1 month) adjusted by mean age in class	Academic achievement scores, SES, gender, immigration status, class SES, academic achievement scores	**Academic self-concept** in maths, German and reading; 4 items each adapted from TIMSS, **peer relations**: (HEEESS 3–4)	No association between RA and academic self-concept in reading or math's. Relatively young associated with lower score for academic self-concept in German and for peer relations, but effect sizes small ($d < .04$)	Poor (4 + 4)	Mental Well-being; Self-perception, Social Functioning; Social experience
Kuntsche et al. (2006)	7088 children aged 13–17 years in Switzerland	The deviation of each student from the mean class age (unit of measurement not specified)	None	Risky Single Occasion **Drinking** (ROSD) using the European School Survey Project on Alcohol and Drugs (ESPAD)	In early adolescence being relatively old is associated with increased RSOD. In late adolescence, there is no association between RA and ROSD	Poor (3 + 7)	Behaviour: Risky

TABLE 1 (Continued)

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E + D)	Relevant category/ categories based on outcome variables
Li et al. (2020)	327 children aged 11–12 years in China	4 groups (3 months each)	Gender	Self-reported **Perceived Physical Literacy** Instrument and actual physical literacy measured using the Canadian Assessment of Physical Literacy 2nd ed.	No association between RA and perceived ($r = .0234$) or actual physical literacy	Poor (4 + 5)	Mental Well-being; Self-perception
Lien et al. (2005)	6752 children aged 15–16 years in Norway	Three groups (each 4 months)	Perceived social support, parental education level, ethnicity	Pupil reported **SDQ** & Symptoms Checklist (SCL-10)	For SDQ association between being relatively young and increased peer problems among boys ($d = .14$ for boys, $d = .06$ for both genders). All other subscales and total not associated with RA. For SCL-10 association between being relatively young and increased psychological distress for girls only ($d = .09$ for girls only, $d = .06$ for both genders)	Poor (4 + 7)	Behaviour: internalizing & externalizing, Mental Well-being: Self-report measures
Lincove and Painter (2006)	5556 children aged 13–14 in America followed to adulthood	3 groups (older, younger & redshirted)	SES, gender, race, student's position in a family, family structure, religious observance, parents' involvement & expectations for the child's future, learning environment at home	Survey questions on teacher-reported **behaviour,** self-reported feeling put down by teacher or peers, **ever arrested, teenage pregnancy**	No associations between RA teacher-reported behaviour ($r = -.011$) or any other outcome variable	Poor (3 + 6)	Behaviour: internalizing & externalizing, Behaviour: Risky

(Continues)

TABLE 1 (Continued)

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E + D)	Relevant category/ categories based on outcome variables
Lubotsky and Kaestner (2016)	Approx. 15,000 children aged 5 years children living in America. Longitudinal over 10 years, data from two population surveys used (ECLS & NLSY) data collected at 6 time points	Continuous (unit of measurement unclear)	Child's race and Hispanic ethnicity, the presence of each biological parent in the household, parents' marital status, state, urbanicity, parents' education, family income, quarter of birth	Participants from the ECLS teachers completed **Social Rating Scales** (SRS) at 5 time points. Participants from the NLSY had parent completed **Behavioural Problems Index** (BPI) at 6 time points	At age 5 being relatively older was associated with more positive teacher ratings for Approach to Learning, Self-Control, Interpersonal Skills, Externalizing Problem Behaviours, and Internalizing Problem Behaviours. This the advantage of being relatively older in kindergarten faded away as children progress through school. No association between RA and parent-reported BPI scores	Poor (4 + 5)	Behaviour: internalizing & externalizing
Matsubayashi and Ueda (2015)	Unspecified number of young people aged 15–25 years in Japan	Continuous (unit of measurement 1 day)	Gender	**Suicide** as reported cause of death	Being relatively young increased the likelihood of suicide being cause of death	Good (5 + 7)	Mental Well-being; Suicide
Menet et al. (2000)	108 children aged 6–10 years in Northern Ireland	Two groups (2 months before compared to 2 months after cut of date)	None	Teacher-reported behaviour on survey-specific 8-item measure	Being relatively young was associated with poorer behaviour	Poor (2 + 3)	Behaviour: internalizing & externalizing
Mühlenweg (2010)	Approx. 4900 children aged 10 years from each of 17 countries	Continuous (unit of measurement 1 month)	Gender, season of birth, birth month	School **victimization**, 3 self-report questions with yes/no responses	Being relatively young was associated with being more likely to experience victimization at school	Poor (4 + 5)	Social Functioning: Social experience
Mühlenweg et al. (2012)	360 children aged 4.5 years in German. Longitudinal, data collected at 4.5, 8 and 11 years	Continuous (unit of measurement 1 month)	Season of birth	**Temperament** assessed through standardized parent interviews and structured observations by trained judges at each time point	Being relatively young is associated with greater hyperactivity and activity, but lower persistence at age 8 but not 11. Being relatively young is associated with greater irritability and lower adaptability at age 11. No association between RA and other temperament characteristics	Moderate (5 + 4)	Behaviour: internalizing & externalizing

TABLE 1 (Continued)

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E+D)	Relevant category/categories based on outcome variables
Muller and Page (2016)	443 adults in the USA	Continuous (unit of measurement 1 month)	Distribution of births throughout the year	Leadership as evidenced by being a **US Senator or Representative**	US Senators and Representatives more likely to have older relative age than average American population	Good (5 + 7)	Social functioning; Leadership
Page et al. (2017)	233 children aged 13–15 years in Australia	2 groups (those born in month prior to cut of date and those born in month after cut-off date)	Gender	Experimental tasks were used to measure self-**confidence, and competitiveness. Risk and ambiguity attitudes** were accessed through ordered choice lists, and the BART was used as an additional measure of risk attitudes	Stronger preference for competition found in relatively older pupils (esp. males). No associations between RA and self-confidence, attitudes towards risk or ambiguity	Moderate (5 + 6)	Behaviour: internalizing & externalizing, Mental Well-being: Self-perception
Page et al. (2019)	1007 adults aged 24–60 years in Australia	2 groups (those born in two months prior to cut of date and those born in two months after cut-off date)	Gender	Experimental tasks were used to measure **self-confidence, risk tolerance and competitiveness. Trust** was measured through a single question from the World Values Surveys and **patience** through ordered choice lists	Adults with relatively older RA display greater self-confidence, competitiveness, and risk tolerance (but only in real-world contexts). The was no association between RA and patience and the association with trust was inconsistent	Poor (4 + 5)	Behaviour: internalizing & externalizing, Mental Well-being: Self-perception
Parker et al. (2019)	10,370 children aged 15 years in Australia. Longitudinal over 10 years. Data collected each year	Continuous (unit of measurement 1 month)	Parents' highest education level, parents' highest occupational prestige, number of older siblings, ethnicity, state/jurisdiction	**Maths self-concept and academic social comparison** using LSAY PISA surveys	Being relatively young was associated with lower maths self-concept and academic social comparison across a range of subjects	Good (5 + 7)	Mental Well-being; Self-perception

(Continues)

TABLE 1 (Continued)

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E+D)	Relevant category/ categories based on outcome variables
Patalay et al. (2015)	23,379 children aged 11–13 years in Britain	Three groups (each 4 months)	Gender, SES	**SDQ** and impact supplement of SDQ pupil self-report	Association between being relatively young and increased emotional symptoms, peer problems, total difficulties, and total impact but authors state all effects sizes are small	Poor (3 + 6)	Behaviour: internalizing & externalizing
Peña and Duckworth (2018)	14,762 children aged 14–15 years in Mexico. Longitudinal, additional data collection point when adolescence was aged 17–18 years	Continuous (unit of measurement 1 day)	Absolute age	Self-reported "**Grit Scale**"	Being relatively young is associated with decreasing consistency of interest scores. No association between RA and perseverance of effort score	Poor (3 + 5)	Behaviour: internalizing & externalizing
Price et al. (2017)	2075 children aged 4–9 years in Britain	Continuous (unit of measurement 30 days)	Gender, homeowner status, year group	**SDQ** (teacher & parent reports), **Pupil Behaviour Questionnaire** (PBQ; teacher-report) & **How I Feel About My School Questionnaire** (HIFAMS; child self-report)	Youngest compared to oldest groups reported higher SDQ Total Difficulties score (parent report $d = .07$, teacher report $d = .06$). SDQ subscales not reported. No association between HIFAMS ($d = <.01$) or PBQ ($d = .04$) and RA	Poor (4 + 4)	Behaviour: internalizing & externalizing
Reijneveld et al. (2006)	12,221 children aged 5–16 years in the Netherlands	Three groups (each 4 months)	Grade, parental education, parental employment status, family structure	Parent completed **CBCL. Assessment by child health care professional (CHP)** for mental health problems	At ages 5–6 years relatively young more likely to be associated with increased likelihood of mental health problems (CBCL, [$d = .3$] and for assessments by CHPs). No association between RA and either measure in older age groups ($d < .01$)	Poor (4 + 5)	Behaviour: internalizing & externalizing; Mental Well-being; Diagnosis
Root et al. (2019)	1,041,929 children aged 4–15 years in UK	Four groups (each 3 months)	SES, sex, calendar year	**Depression** diagnosis as recorded in READ codes	Relatively young were more likely to have been diagnosed with depression	Poor (3 + 7)	Mental Well-being; Diagnosis

TABLE 1 (Continued)

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E + D)	Relevant category/ categories based on outcome variables
Schmiedeler et al. (2015)	928 children aged 6 years in Germany	Four groups (each 3 months)	Gender	**SDQ** teacher report	Association between being relatively young and higher score on Hyperactivity subscale for boys only. No association between RA and other sub-scales	Poor (3 + 5)	Behaviour: internalizing & externalizing
Stipek and Byler (2001)	237 children aged 5–10 years in USA	3 groups (4 months each)	Gender, PPVT (vocab assessment)	Self-reported using survey questions **perceptions of academic skills, feelings about school, feelings about the teacher.** Teacher ratings of children's **social competence, academic engagement, or their relationships with other children** using adapted Child Behaviour Scale	Being relatively young was associated with less positive feelings about the teacher. No association between RA and perceptions of academic skills or feelings about school. No association between RA and any of the teacher-reported variables	Poor (2 + 4)	Mental Well-being: Self-perception, Social Functioning; Social experience
Thompson et al. (1999)	564 young people under 20 (all you had died by suicide) in Canada	2 groups (relatively old [6 month span] and relatively young 96 month span)	None	Suicide as reported cause of death	Being relatively young increased the likelihood of suicide being cause of death ($d = .2$)	Poor 3 + 1	**Mental Well-being: Suicide**
Thompson et al. (2004)	1129 children aged 6–15 years in Canada	Six groups (each 3 months), this included an extraordinarily young and extraordinarily old group who were children being educated out of year but whose DOB was within 3 months of cut of date	Family structure	Child completed Free **Self-Esteem** Inventory	Being relatively young was associated with lower self-esteem ($r = .061$)	Poor (3 + 1)	Mental Well-being: Self-perception

(Continues)

TABLE 1 (Continued)

References	Sample characteristics	Assessment of relative age	Confounding variables controlled for	Outcome variable	Main findings	Quality rating (E + D)	Relevant category/ categories based on outcome variables
Tiiri et al. (2020)	8149 children aged 8–9 years in Finland	Three groups (each 4 months)	Sex, year, victimization controlled for bullying perpetration and vice versa, psychopathology	Teacher, parent and child completed questions on **bullying perpetration and victimization**	Being relatively young is associated with increased likelihood of being a victim of bullying. Being relatively old is associated with being a perpetrator but for child and teacher reports only (not parent)	Poor (3 + 6)	Social Functioning: Social experience
Wendt et al. (2018)	2671 children aged 5–7 years in Germany	Continuous (unit of measurement 1 day)	ADHD-related symptoms at baseline, gestational age at birth (preterm vs. term birth), family structure (nuclear family vs. single-parent family), socioeconomic status of parents, migrant background	**SDQ** teacher and parent report but hyperactivity subscale only	Association between being relatively young and higher teacher-reported hyperactivity. No association between RA and parent-reported hyperactivity	Poor (4 + 6)	Behaviour: internalizing & externalizing
Wienen et al. (2018)	1973 6–12 years children aged in the Netherlands	Continuous (unit of measurement 1 day)	Gender	**SDQ** teacher report	No association between RA and any of the subscales or total scores	Poor (4 + 6)	Behaviour: internalizing & externalizing
Wisniewski et al. (1995)	318 children with a 9.6 years (SD = 2.4) in USA who had been referred for learning disabilities services	4 groups (3 months each)	Gender, race, grade	Teacher-reported internalizing and externalizing behaviour: **Teacher Report Form**	No association between RA and teachers reports of internalizing problems (d = .2), externalizing problems (d = .2)	Poor (3 + 4)	Behaviour: internalizing & externalizing

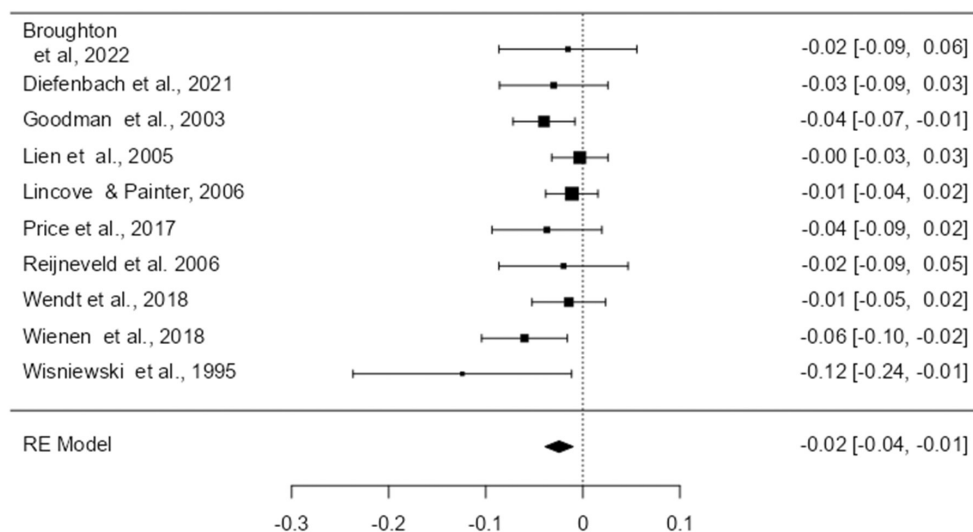Abbreviations: CBCL, Child Behaviour Checklist; SDQ, Strengths and Difficulties Questionnaire.

FIGURE 2   Forest plot for internalizing and externalizing behaviour meta-analysis.

was $r = -.024$, *CI* -.039; −.01, $p < .001$, indicating a small but significant association between being relatively young and higher reported behavioural problems, see Figure 2. There was homogeneity of the results $I = 12.76\%$, $Q = 9.99$, $p = .351$. The Fail-Safe $N = 47$, this indicates the number of studies with an effect of 0 required to make the combined effect size statistically nonsignificant.

Of the 12 other questionnaire-based studies, three found no significant association between relative age for any of measures reported (Halldner et al., 2014; Hirvonen et al., 2016; Kinard et al., 1986). For the remaining nine studies (Biederman et al., 2014; Caye et al., 2020; Elder, 2010; Jeronimus et al., 2015; Lubotsky & Kaestner, 2016; Menet et al., 2000; Patalay et al., 2015; Peña & Duckworth, 2018; Schmiedeler et al., 2015), there was some evidence of poor behavioural outcomes, especially increased parent and teacher-reported hyperactivity in young children; however, effect sizes were small, and many non-significant behavioural outcomes were also reported. Therefore, these findings support those of the meta-analysis suggesting that there is an association between being relatively young and an increase in some reported behavioural problems; however, the magnitude of this association is small and consequently may not always be detected.

In addition to the 22 questionnaire-based studies, one study (Mühlenweg et al., 2012) reported direct child observations and parent interviews and found that children who entered school relatively young were less persistent, more irritable, and less adaptive to change. Two further studies reported experimental data. Page et al. (2017) found that relatively older adolescents had a stronger preference for competition but that relative age was not associated with attitudes towards risk or ambiguity. Page et al. (2019) found that relatively older adults were more competitive and risk tolerant, but found no association between relative age and patience. Overall, these 25 studies investigating the association between relative age and behavioural outcomes suggest that outcomes are not always consistent between studies and that where associations with relative age exist, these are small.

Engaging in risky behaviour

Eight studies investigated relative age and risky behaviour, including smoking, drinking and criminal behaviour. Due to the disparate study designs, conducting a meta-analysis was not appropriate. Three papers found being relatively young was associated with greater likelihood of smoking behaviour in adolescence (Bahrs & Schumann, 2020; Caudillo, 2019; Folgar et al., 2015). Caudillo

also found relatively younger female adolescents were more likely to drink alcohol and use drugs, whereas Kuntsche et al. (2006) found being relatively old was associated with risky drinking behaviour in adolescence. Both Black et al. (2011) and Caudillo found being relatively younger increased the likelihood of earlier sexual activity; however, Lincove and Painter (2006) did not find any differences between younger and older groups. Similarly, Lincove and Painter found no association between relative age and criminal activity while Cook and Kang (2016) found juvenile delinquency was more likely for relatively young adolescents but relatively older individuals were more likely to commit crime in late adolescence and early adulthood. Finally, Auger et al. concluded being younger than one's peers was a risk factor for gambling behaviour initiation around 10.5 years of age which strengthened progressively with age. Overall, these studies suggest that those who are relatively young may be at greater risk of risky behaviour.

Mental well-being

Self-report measures of mental well-being

Nine studies reported data from self-reported measures of mental well-being. Five of these could be included in a random-effects meta-analysis (Ando et al., 2019; Bahrs & Schumann, 2020; Broughton et al., 2022; Jeronimus et al., 2015; Lien et al., 2005). The sample weighted average correlation between relatively age and psychological distress was very small, $r = -.031$, CI -.05; $-.016$, $p < .001$, see Figure 3. The results were homogenous $I = 0\%$, $Q = 2.44$, $p = .655$. The Fail-Safe $N = 17$, suggesting that relatively few studies would be required with an effect of 0 to make the combined effect size statistically nonsignificant.

Of the remaining four studies, Duncan et al. (2022) found no association between relative age and adolescents' mental health while Fenzel (1992) found that mental health was lower among children who were relatively young. Two further studies reported increased self-reported psychosis (DeVylder et al., 2015) among relatively younger adults and decreased life satisfaction in relatively younger children (Fumarco et al., 2020). Overall, these nine studies suggest that those who are relatively young are at greater risk of negative outcomes, but effect sizes tend to be very small, and findings are not always consistent.
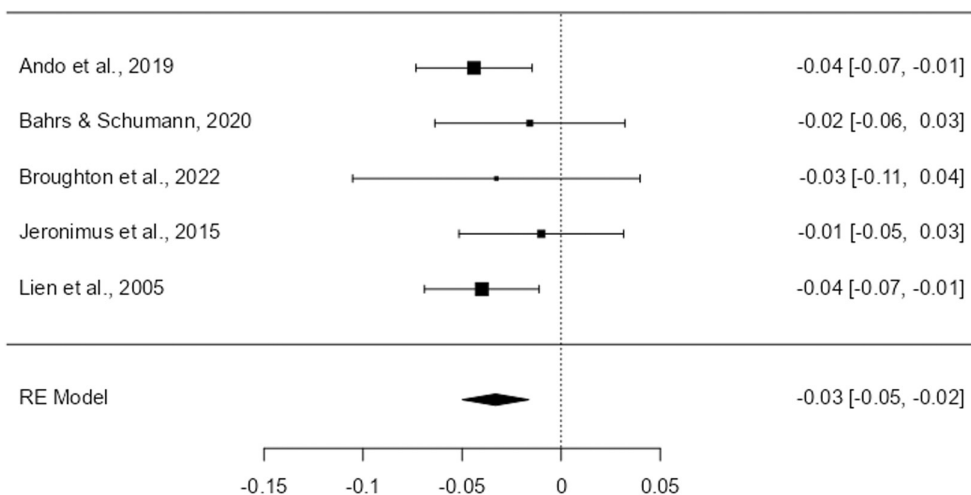

Ando et al., 2019	-0.04 [-0.07, -0.01]
Bahrs & Schumann, 2020	-0.02 [-0.06, 0.03]
Broughton et al., 2022	-0.03 [-0.11, 0.04]
Jeronimus et al., 2015	-0.01 [-0.05, 0.03]
Lien et al., 2005	-0.04 [-0.07, -0.01]
RE Model	-0.03 [-0.05, -0.02]

FIGURE 3 Forest plot for self-report well-being measures meta-analysis.

Referral for assessment

Studies reporting referrals for assessment by a psychologist for mental health or behaviour concerns, as opposed to referrals relating to academic progress/suspected learning difficulties, were considered. Although four relevant studies were found, it was not possible to conduct a meta-analysis as insufficient data were included in the papers and attempts to contact the authors were unsuccessful. Three studies (Berg & Berg, 2014; DeMeis & Stearns, 1992; Harvey, 1991) found that relatively younger children and adolescents were more likely to be referred for assessment; however, Kinard et al. (1986) found no such difference among pre-schoolers. All these studies were of poor quality and only Kinard & Reinherz controlled for any confounding variables. Therefore, although there is some consistency in the findings which suggest increased likelihood of referral for relatively young children, confidence in these findings is low.

Diagnosis of mental health condition

Five studies considered the association between relative age and likelihood of diagnosis of a mental health condition. Three were suitable for inclusion in a meta-analysis (Goodman et al., 2003; Reijneveld et al., 2006; Root et al., 2019). This found that those who were relatively younger were more likely to be diagnosed with a mental health condition compared to their relatively older peers, OR .204, CI .081; .327, $p = .001$, see Figure 4. The results were homogenous $I = .01\%$, $Q = 3.46$, $p = .177$. The Fail-Safe $N = 5$, suggesting that relatively few studies would be required with an effect of 0 to make the combined effect size statistically nonsignificant. However, the two studies (Black et al., 2011; Chen et al., 2021) which could not be included in the meta-analysis, also reported an increased likelihood of those who were relatively young being diagnosed with a mental health condition. Nevertheless, the odds ratios are small, so the increase in likelihood is also small.

Suicide

Matsubayashi and Ueda (2015) and Thompson et al. (1999) found an association between being relatively young and increased likelihood to have died by suicide among youths.
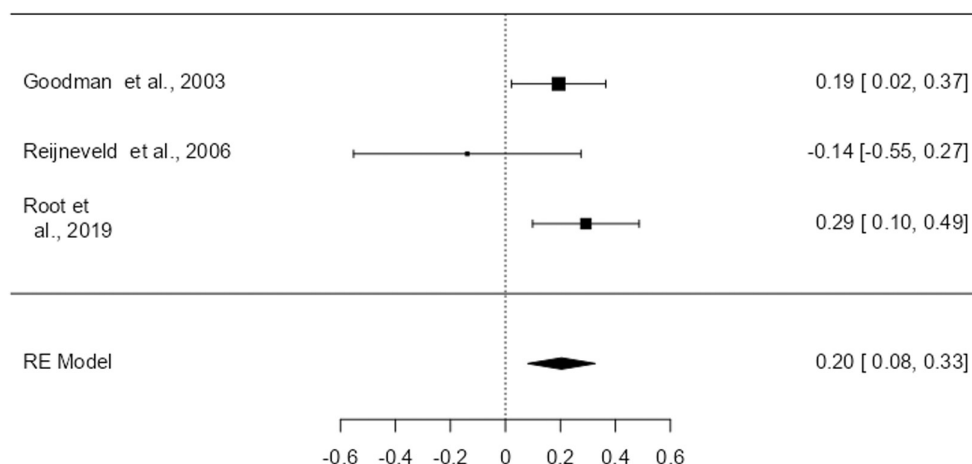

FIGURE 4   Forest plot for diagnosis of a mental health condition meta-analysis.

Self-perception

Four studies focused on global self-esteem, two on self-confidence and five on perceived competence in different aspects of development. The design of the studies was disparate, and effect sizes were not consistently available, so conducting a meta-analysis was not appropriate.

Page et al. (2019) found that relatively older adults had greater self-confidence, but conversely Page et al. (2017) found no association between relative age and self-confidence among adolescents. Similarly, the finding for global self-esteem was mixed with Alasker and Olweus (1993) and Thompson et al. (2004) finding that children who were relatively young had lower self-esteem (r = .061) and while Fenzel (1992) partially replicated this finding, Folgar et al. (2015) found no association. Furthermore, for self-evaluation Stipek and Byler (2001) found no association between relative age and perceptions of academic skill, and similarly, Li et al. (2020) found no differences in perceived physical literacy. However, Fumarco and Schultze (2020) and Parker et al. (2019) found that being relatively young was associated with lower self-perceived academic performance and maths self-concept respectively and Kretschmann et al. (2021) found that being relatively young was associated with lower self-concept in German, but relative age was not associated with self-concept in reading or maths. Therefore, there is little consistency in the association between being relatively young and negative self-perceptions.

Social functioning

Social experiences

The study designs in the 11 studies investigating social experience were disparate, and effect sizes were not available for many of the findings. Therefore, conducting a meta-analysis was not appropriate. Four studies (Biederman et al., 2014; Duncan et al., 2022; Kretschmann et al., 2021; Stipek & Byler, 2001) reported self or teacher report measures of social functioning. While Biederman et al. and Stipek and Byler found no association with relative age, Duncan et al. and Kretschman et al. found that that being relatively young was associated with lower self-reported social functioning. However, it must be noted that the effect size for both these findings was very small ($d < .05$).

Five studies considered children's experiences of being a victim of bullying (Ando et al., 2019; Folgar et al., 2015; Jeronimus et al., 2015; Mühlenweg, 2010; Tiiri et al., 2020). Folgar et al. and Jeronimus et al. found no association between relative age and being a victim. In contrast, Ando et al., Mühlenweg, and Tiiri et al. found that those who were relatively young were more likely to be a victim. Additionally, Tiiri et al. found that those who are relatively old were more likely to be perpetrators of bullying. However, like the more general scales of social functioning effect sizes, where available, were very small ($d < .04$).

Finally, two studies considered the number of friends that children reported having. While Bahrs and Schumann (2020) found no association with relative age, Fumarco et al. (2019) found that that being relatively young was associated with reporting having fewer friends (very small effect, $d = .03$). Taken together, the findings from these 11 studies suggest that where differences do exist the experiences are more negative for those who are relatively young; however, the effect sizes for these differences are consistently very small.

School attendance

Two studies reported school attendance as a proxy for motivation to attend school. Both found that those who were relatively young were more likely to have lower rates of school attendance at primary (Carroll, 1992) and secondary school (Cobley et al., 2009).

Leadership

Three studies identified that relatively older individuals experience and demonstrate leadership while at school (Dhuey & Lipscomb, 2010) and longer-term career success (Du et al., 2012; Muller & Page, 2016).

DISCUSSION

Summary of main results

The systematic review synthesized evidence which suggested that those who are relatively young are more likely to have more negative behaviour, mental well-being, and social experiences. This conclusion is supported by the narrative synthesis and the three meta-analyses which found consistent, but very small, associations with relative age. Across all areas, effect sizes, where reported, were consistently small and many studies contained both significant and non-significant associations. For example, significant associations were not found consistently across age groups, samples (e.g., teacher vs. parent report) or measures (e.g., subscale of SDQ vs. total SDQ score).

Overall completeness and applicability of evidence

The aim of this review was to identify the extent and consistency of associations between a child's relative age and their psychosocial development. Based on the 59 papers identified, the most common outcome measure was children's behaviour. Evidence was primarily based on self-reports (or teachers'/ parents' reports) and focused on the internalizing and externalizing behaviours of children. A range of behavioural measures were reported, with a particular focus on attention-related problems. This could reflect the emerging evidence that being relatively young is associated with increased likelihood of ADHD diagnosis (Holland & Sayal, 2019). In support of this, being relatively young was often associated with greater reported hyperactivity and attention problems; however, some studies have found no such association (Halldner et al., 2014) and effect sizes were consistently small. One explanation for this is that studies used many different self-report measures of attention, ranging from checklists based on the DSM-IV criteria for ADHD to attention subscales of common self-report measures such as the SDQ.

All but two (Halldner et al., 2014; Page et al., 2019) of the studies of internalizing and externalizing behaviour focused on children, and many of these focused on young children under the age of 10. When the behaviours of older adolescents and young adults were considered, instances of engaging in risky forms of behaviour (e.g., smoking, drugs/alcohol use) were more commonly considered. Again, finding that often those who were relatively young were more likely to engage in these perceived problem behaviours. However, contradictions for this were also found. Explanations for these findings include those who are relatively older having greater opportunity for earlier school drop-out (Cook & Kang, 2016) and those who are relatively younger students being influenced by older peers (Bahrs & Schumann, 2020). However, there is inconsistent exploration of these potential mediating factors. Therefore, understanding the longer-term associations between relative age and behavioural outcomes requires further scrutiny.

The second area commonly focused on was children's mental health, and again here it was found that being comparatively younger was associated with more negative outcomes. However, not all studies found significant associations (Duncan et al., 2022) and effect sizes for the associations were consistently small. Furthermore, as noted by Matsubayashi and Ueda (2015) mental well-being is likely to be influenced by academic success, which has consistently been found to be negatively associated with relative age (Crawford et al., 2011). This is supported by those studies who found academic self-perception was lower for those who were relatively young (Fumarco & Schultze, 2020; Kretschmann et al., 2021).

However, only a few studies included measures of academic achievement, and therefore, little is known about the potential mediating role that this may play.

Comparably fewer studies focused on social functioning and although these produced some mixed results, overall evidence suggested that relatively younger children were at increased likelihood of poorer outcomes, for example, victimization (Ando et al., 2019). Related domains such as leadership and school attendance were also associated with worse outcomes for the relatively young; however, the evidence was limited. Furthermore, school attendance has been associated with poorer academic attainment (Hancock et al., 2017) and academic success is likely to be associated with being a CEO or US Senator, two of the measures of leadership used. Therefore, the bidirectionality and multiple influences on these various outcome variables are likely to be complex. This is further evidenced by Carroll (2011) finding that those who have fewer friends are also likely to be those with lower school attendance.

This aim of this review was to consider the extent and the consistency of the evidence, not to attempt to disentangle the causal direction (or otherwise) of cognitive and non-cognitive development. Nonetheless, it has been observed that many of the studies included do make attempts to explain associations between relative age and increased likelihood of more negative psychosocial development. However, the explanations used are varied and very few consider the roles of academic achievement as a mediating factor. Future research should prioritize investigating the interplay between academic achievement and psychosocial development among those that are relatively young. This could inform interventions to address potential negative consequences of being relatively young. Furthermore, it was notable that no qualitative research studies were identified as part of this review. Gaining insight into the experiences of those who are relatively young, and their teachers, may provide new insight which could inform school-based support.

Quality of the evidence

Overall, the quality of the evidence was low. Many of the studies reviewed did not include a control for absolute age, this is the children's age at the time their behaviour, mental well-being or social functioning was assessed. From an empirical perspective, the effects of absolute age and relative age are hard to disentangle, since a pupil who is chronologically older at the point of assessment is also older in comparison to others being assessed. Therefore, the association is colinear and overcoming this would require independent variation between absolute and relative ages.

There was considerable variability in study design. Specifically, whether relative age was analysed as a continuous or categorical variable. Furthermore, many studies did not control for pupils who were being educated out of year, with it often being unclear whether these pupils were included in the sample or not. Yet, the presence, or absence of these pupils who are extraordinarily young, or old, in comparison to their classmates has been found to be influential. For example, Wienen et al. (2018) reported analysis, both with and without these pupils being educated out of year, and found that significant associations between behavioural difficulties and relative age were found when they were included, but when they were removed the associations did not remain significant. Furthermore, support for this explanation comes from Thompson et al. (2004) who found a significant positive association between relative age and self-esteem, but only when children extraordinarily young or old (who were upto 3 months older and 3 months younger than the cut-off ages for the year group) were included in the sample.

The amount of research on relative age effects and psychological development has increased recently, potentially reflecting an increasing awareness of relative age effects. The evidence tends to be biased towards western populations. However, relative age effects may be mediated by country characteristics, such as social norms, legal context (which could affect the opportunity to delay school entry) and availability of mental health support. Therefore, research from more diverse cultures and multi-country studies is needed so that the generalizability of findings can be better considered.

Potential confounding variables were controlled for in some studies but not in others. For example, some studies found sex differences, but other studies did not consider the presence or absence of these

within their data. SES might be particularly important to consider as low socioeconomic status is likely to contribute to some of the negative psychosocial outcomes associated with relative age and it has been noted (Dhuey & Lipscomb, 2010) that parents with higher SES may be more likely to delay school start. Therefore, there may be an over-representation of low SES in relatively young cohorts due to these parents being less likely to delay school entry.

Potential biases in the review process

A strength of this review is the inclusive approach used when assessing whether articles included an outcome variable relevant to psychosocial development. This resulted in a wide range of outcome variables being included, for example, suicide, leadership, and risky behaviour. This has resulted in an overview of outcomes that include both conventional measures of psychosocial development and proxy measures. The potential disadvantage of including the proxy measures is that these are more likely to be influenced by factors other than psychosocial development, and therefore, we must be aware of potential bias when drawing conclusions.

Due to the heterogeneity of outcome measures, study designs and results reported obtaining comparable effect sizes was challenging. In many cases, it was not possible to obtain the information necessary for inclusion in a meta-analysis as many authors were no longer contactable, or no longer had access to the relevant data. So, although a strength of the current review was the inclusion of three meta-analyses not all relevant findings could be included within these. Furthermore, the majority of studies included in the meta-analysis had large sample sizes which may have resulted in very small combined effect sizes being statistically significant.

The influence of publication bias on this review must also be acknowledged. Studies reporting significant effects of relative age are more likely to be published, and this gives the impression that these effects may be ubiquitous (Peña & Stephens-Davidowitz, 2021). However, the small effect sizes found would suggest that many non-significant results potentially exist, which may not have been included in the review as they had not been published in peer-reviewed journals. Considering these non-significant findings is important to gain a more accurate understanding of the extent of any short or long terms impact of relative age differences on children's development.

CONCLUSION

The aim of this review was to identify the extent and consistency of associations between relative age and psychosocial development. A large and disparate body of evidence was rigorously and systematically synthesized providing conclusive evidence that although being relatively young is associated with more negative psychosocial outcomes, the magnitude of these associations is consistently small. Furthermore, many of the outcome measures used are likely to be the result of multiple influences, not limited to effects of relative age. Therefore, the findings are reassuring as they suggest that relative age itself is unlikely to substantially increase an individual's risk of poor psychosocial development.

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CONFLICT OF INTEREST STATEMENT

DATA AVAILABILITY STATEMENT

All data extraction sheets and data relating to any quantitative statistics will be made available on the Open Science Framework.

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REFERENCES

*= Source identified as part of the evidence review

*Alasker, F. D., & Olweus, D. (1993). Global self-evaluations and perceived instability of self in early adolescence: A cohort longitudinal study. *Scandinavian Journal of Psychology*, *34*, 47–63. https://doi.org/10.1111/j.1467-9450.1993.tb01100

*Ando, S., Usami, S., Matsubayashi, T., Ueda, M., Koike, S., Yamasaki, S., Fujikawa, S., Sasaki, T., Hiraiwa-Hasegawa, M., Patton, G., Kasai, K., & Nishida, A. (2019). Age relative to school class peers and emotional well-being in 10-year-olds. *PLoS One*, *14*, e0214359. https://doi.org/10.1371/journal.pone.0214359

*Auger, N., Lo, E., & O'Loughlin, J. (2012). Risk of gambling onset in youth who are younger than same-grade peers. *Annals of Epidemiology*, *22*(5), 372–375. https://doi.org/10.1016/j.annepidem.2012.02.003

*Bahrs, M., & Schumann, M. (2020). Unlucky to be young? The long-term effects of school starting age on smoking behavior and health. *Journal of Population Economics*, *33*, 555–600. https://doi.org/10.1007/s00148-019-00745-6/

Barnsley, R., Thompson, A., & Barnsley, P. E. (1985). Hockey success and birthdate: The relative age effect. *Canadian Association for Health, Physical Education, and Recreation*, *51*, 23–28.

Bedard, K., & Dhuey, E. (2006). The persistence of early childhood maturity: International evidence of long-run age effects. *The Quarterly Journal of Economics*, *121*, 1437–1472. https://doi.org/10.1093/qje/121.4.1437

*Berg, S., & Berg, E. (2014). The youngest children in each school cohort are overrepresented in referrals to mental health services. *Journal of Clinical Psychiatry*, *75*(5), 530–534. https://doi.org/10.4088/JCP.13m08594

*Biederman, J., Petty, C. R., Fried, R., Woodworth, K. Y., & Faraone, S. V. (2014). Is the diagnosis of ADHD influenced by time of entry to school? An examination of clinical, familial, and functional correlates in children at early and late entry points. *Journal of Attention Disorders*, *18*(3), 179–185. https://doi.org/10.1177/1087054712445061

*Black, S. E., Devereux, P. J., & Salvanes, K. G. (2011). Too young to leave the nest? The effects of school starting age. *Review of Economics and Statistics*, *93*(2), 455–467. https://doi.org/10.1162/REST_a_00081

Boardman, M. (2006). The impact of age and gender on prep children's academic achievements. *Australian Journal of Early Childhood*, *31*(4), 1–6. https://doi.org/10.1007/s10459-009-9198-7

*Broughton, T., Langley, K., Tilling, K., & Collishaw, S. (2022). Relative age in the school year and risk of mental health problems in childhood, adolescence and young adulthood. *Journal of Child Psychology and Psychiatry*, *64*(1), 185–196. https://doi.org/10.1111/jcpp.13684

*Carroll, H. C. M. (1992). Season of birth and school attendance. *British Journal of Educational Psychology*, *62*, 391–396. https://doi.org/10.1111/j.2044-8279.1992.tb01031.x

Carroll, H. C. M. (2011). The peer relationships of primary school pupils with poor attendance records. *Educational Studies*, *37*, 197–206. https://doi.org/10.1080/03055698.2010.510240

*Caudillo, M. L. (2019). Advanced school progression relative to age and early family formation in Mexico. *Demography*, *56*(3), 863–890. https://doi.org/10.1007/s13524-019-00782-6

*Caye, A., Petresco, S., de Barros, A. J. D., Bressan, R. A., Gadelha, A., Gonçalves, H., Manfro, A. G., Matijasevich, A., Menezes, A. M. B., Miguel, E. C., Munhoz, T. N., Pan, P. M., Salum, G. A., Santos, I. S., Kieling, C., & Rohde, L. A. (2020). Relative age and attention-deficit/hyperactivity disorder: Data from three epidemiological cohorts and a meta-analysis. *Journal of the American Academy of Child & Adolescent Psychiatry*, *59*(8), 990–997. https://doi.org/10.1016/j.jaac.2019.07.939

*Chen, M., Huang, K., Hsu, J., Tsai, S., Su, T., Chen, T., & Bai, Y. (2021). Effect of relative age on childhood mental health: A cohort of 9,548,393 children and adolescents. *Acta Psychiatrica Scandinavica*, *144*(2), 168–177. https://doi.org/10.1111/acps.13327

*Cobley, S., McKenna, J., Baker, J., & Wattie, N. (2009). How pervasive are relative age effects in secondary school education? *Journal of Educational Psychology*, *101*(2), 520–528. https://doi.org/10.1037/a0013845

*Cook, P. J., & Kang, S. (2016). Birthdays, schooling, and crime: Regression-discontinuity analysis of school performance, delinquency, dropout, and crime initiation. *American Economic Journal: Applied Economics*, *8*(1), 33–57. https://doi.org/10.1257/app.20140323

Crawford, C., Dearden, L., & Greaves, E. (2011). *Does when you are born matter? The impact of month of birth on children's cognitive and non-cognitive skills in England*. Briefing Note BN122. Institute for Fiscal Studies. https://ifs.org.uk/publications/does-when-you-are-born-matter-impact-month-birth-childrens-cognitive-and-non-cognitive

Crawford, C., Dearden, L., & Greaves, E. (2014). The drivers of month-of-birth differences in children's cognitive and non-cognitive skills. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, *177*, 829–860. https://doi.org/10.1111/rssa.12071

Crawford, C., Dearden, L., & Meghir, C. (2007). *When you are born matters: The impact of date of birth on child cognitive outcomes in England*. Institute for Fiscal Studies. https://ifs.org.uk/publications/when-you-are-born-matters-impact-date-birth-child-cognitive-outcomes-england

Daniels, S., Shorrocks-Taylor, D., & Redfern, E. (2000). Can starting summer-born children earlier at infant school improve their national curriculum results? *Oxford Review of Education*, *26*, 207–220. https://doi.org/10.1080/713688530

*DeMeis, J. L., & Stearns, E. S. (1992). Relationship of school entrance age to academic and social performance. *Journal of Educational Research*, *86*(1), 20–27. https://doi.org/10.1080/00220671.1992.9941823

Department for Education. (2010). *Month of Birth and Education: Schools Analysis and Research Division*, DfE Research Report no. RR017. Department for Education. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/182664/DFE-RR017.pdf

*DeVylder, J. E., Oh, H. Y., Pitts, S., & Schiffman, J. (2015). Young for one's grade: A risk factor for psychotic experiences among adults in the National Comorbidity Survey-Replication. *Psychiatry Research*, *226*(1), 352–356. https://doi.org/10.1016/j.psychres.2015.01.017

*Dhuey, E., & Lipscomb, S. (2010). Disabled or young? Relative age and special education diagnoses in schools. *Economics of Education Review*, *29*, 857–872. https://doi.org/10.1016/j.econedurev.2010.03.006

*Diefenbach, C., Schmidt, M. F., Huss, M., König, J., Urschitz, M. S., Hoffmann, D., Blettner, M., Queisser-Wahrendorf, A., Wiesel, A., Zepp, F., Faber, J., Gehring, S., Mildenberger, E., Letzel, S., Elflein, H., Schuster, A. K., Willershausen, B., Weusmann, J., Matthias, C., … Simon, P. (2021). Age at school entry and reported symptoms of attention-deficit/hyperactivity in first graders: Results of the prospective cohort study ikids. *European Child & Adolescent Psychiatry*, *31*, 1753–1764. https://doi.org/10.1007/s00787-021-01813-7

Dixon-Woods, M., Agarwal, S., Jones, D., Young, B., & Sutton, A. (2005). Synthesising qualitative and quantitative evidence: A review of possible methods. *Journal of Health Services Research & Policy*, *10*(1), 45–53. https://doi.org/10.1177/135581960501000110

*Du, Q., Gao, H., & Levi, M. D. (2012). The relative-age effect and career success: Evidence from corporate CEOs. *Economics Letters*, *117*(3), 660–662. https://doi.org/10.1016/j.econlet.2012.08.017

*Duncan, M. J., Leatherdale, S. T., & Patte, K. A. (2022). Do you really want to be forever young? Emotional health and psychosocial well-being by relative birth quarter in Canadian adolescents. *Journal of Adolescent Health*, *70*(4), 625–633. https://doi.org/10.1016/j.jadohealth.2021.10.034

Elder, T., & Lubotsky, D. (2009). Kindergarten entrance age and children's achievement: Impacts of state policies, family background and peers. *Journal of Human Resources*, *44*, 641–683. https://doi.org/10.1353/jhr.2009.0015

*Elder, T. E. (2010). The importance of relative standards in ADHD diagnoses: Evidence based on exact birth dates. *Journal of Health Economics*, *29*(5), 641–656. https://doi.org/10.1016/j.jhealeco.2010.06.003

*Fenzel, L. M. (1992). The effect of relative age on self-esteem, role strain, GPA, and anxiety. *The Journal of Early Adolescence*, *12*(3), 253–266. https://doi.org/10.1177/0272431692012003002

*Folgar, M. I., Rial Boubeta, A., Lamas, M. F., & Mociño, L. R. (2015). Evaluación del impacto del efecto relativo de la edad en el (evaluation of impact of relative age effect on school performance, bullying, self-esteem, ADHD diagnosis and consumption of tobacco in the transition from primary education to high school). *Revista Iberoamericana de Diagnóstico y Evaluación Psicologica*, *44*(2), 92–104. https://doi.org/10.21865/RIDEP44.2.08

*Fumarco, L., Baert, S., & Sarracino, F. (2019). Relative age effect on European adolescents' social network. *Journal of Economic Behavior and Organization*, *168*, 318–337. https://doi.org/10.1016/j.jebo.2019.10.014

*Fumarco, L., Baert, S., & Sarracino, F. (2020). Younger, dissatisfied, and unhealthy – Relative age in adolescence. *Economics and Human Biology*, *37*, 1–14. https://doi.org/10.1016/j.ehb.2020.100858

*Fumarco, L., & Schultze, G. (2020). Does relative age make Jack a dull student? Evidence from students' schoolwork and playtime. *Education Economics*, *28*(6), 647–670. https://doi.org/10.1080/09645292.2020.1832200

Gledhill, J., Ford, T., & Goodman, R. (2002). Does season of birth matter? The relationship between age within the school year (season of birth) and educational difficulties among a representative general population sample of children and adolescents (aged 5–15) in Great Britain. *Research in Education*, *68*(1), 41–47. https://doi.org/10.7227/RIE.68.4

Goodman, R. (1997). The strengths and difficulties questionnaire: A research note. *Journal of Child Psychology and Psychiatry*, *38*, 581–586. https://doi.org/10.1111/j.1469-7610.1997.tb01545.x

*Goodman, R., Gledhill, J., & Ford, T. (2003). Child psychiatric disorder and relative age within school year: Cross sectional survey of large population sample. *British Medical Journal*, *327*(7413), 472–475. https://doi.org/10.1136/bmj.327.7413.472

Grondin, S., Deshaies, P., & Nault, L. P. (1984). Trimestre de naissance et participation au hockey et au volleyball. *Le Revue Quebecoise de l'activite Physique*, *2*, 97–103.

*Halldner, L., Tillander, A., Lundholm, C., Boman, M., Långström, N., Larsson, H., & Lichtenstein, P. (2014). Relative immaturity and ADHD: Findings from nationwide registers, parent- and self-reports. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *55*(8), 897–904. https://doi.org/10.1111/jcpp.12229

Hancock, K. J., Lawrence, D., Shepherd, C. C. J., Mitrou, F., & Zubrick, S. R. (2017). Associations between school absence and academic achievement: Do socioeconomics matter? *British Eduction Research Journal*, *43*, 415–440. https://doi.org/10.1002/berj.3267

*Harvey, V. S. (1991). Characteristics of children referred to school psychologists: A discriminant analysis. *Psychology in the Schools*, *28*(3), 209–218. https://doi.org/10.1002/1520-6807(199107)28:3<209::AID-PITS2310280305>3.0.CO;2-Z

Higgins, J. P. T., & Green, S. (2011). Guide to the contents of a Cochrane protocol and review. In J. P. T. Higgins & S. Green (Eds.), *Cochrane handbook for systematic reviews of interventions version 5.1.0*. The Cochrane Collaboration.

*Hirvonen, R., Torppa, M., Nurmi, J.-E., Eklund, K., & Ahonen, T. (2016). Early temperament and age at school entry predict task avoidance in elementary school. *Learning and Individual Differences*, *47*, 1–10. https://doi.org/10.1016/j.lindif.2015.12.012

Holland, J., & Sayal, K. (2019). Relative age and ADHD symptoms, diagnosis and medication: A systematic review. *European Child and Adolescent Psychiatry*, *28*(11), 1417–1429. https://doi.org/10.1007/s00787-018-1229-6

Husk, K., Lovell, R., Cooper, C., Stahl-Timmins, W., & Garside, R. (2016). Participation in environmental enhancement and conservation activities for health and well-being in adults: A review of quantitative and qualitative evidence. *Cochrane Database of Systematic Reviews*, *5*, 1–201. https://doi.org/10.1002/14651858.CD010351.pub2

*Jeronimus, B. F., Stavrakakis, N., Veenstra, R., & Oldehinkel, A. J. (2015). Relative age effects in Dutch adolescents: Concurrent and prospective analyses. *PLoS One*, *10*(6), e0128856. https://doi.org/10.1371/journal.pone.0128856

*Kinard, E. M., Reinherz, H., Milling Kinard, E., & Reinherz, H. (1986). Birthdate effects on school performance and adjustment: A longitudinal study. *The Journal of Educational Research*, *79*(6), 366–372. https://doi.org/10.1080/00220671.1986.10885707

*Kretschmann, J., Westphal, A., & Vock, M. (2021). Does it pay to be one of the oldest in class? Relative age effects on academic self-concept, peer relations, and teacher judgments in German primary schools. *Learning and Instruction*, *74*, 101463. https://doi.org/10.1016/j.learninstruc.2021.101463

*Kuntsche, E., Gmel, G., Wicki, M., Rehm, J., & Grichting, E. (2006). Disentangling gender and age effects on risky single occasion drinking during adolescence. *European Journal of Public Health*, *16*(6), 670–675. https://doi.org/10.1093/eurpub/ckl060

Lawlor, D. A., Clark, H., Ronalds, G., & Leon, D. A. (2006). Season of birth and childhood intelligence: Findings from the Aberdeen children of the 1950s cohort study. *British Journal of Educational Psychology*, *76*(3), 481–499. https://doi.org/10.1348/000709905X49700

*Li, M. H., Sum, R. K. W., Sit, C. H. P., Wong, S. H. S., & Ha, A. S. C. (2020). Associations between perceived and actual physical literacy level in Chinese primary school children. *BMC Public Health*, *20*(207), 1–9. https://doi.org/10.1186/s12889-020-8318-4

*Lien, L., Tambs, K., Oppedal, B., Heyerdahl, S., & Bjertness, E. (2005). Is relatively young age within a school year a risk factor for mental health problems and poor school performance? A population-based cross-sectional study of adolescents in Oslo, Norway. *BMC Public Health*, *5*(102), 1–8. https://doi.org/10.1186/1471-2458-5-102

*Lincove, J. A., & Painter, G. (2006). Does the age that children start kindergarten matter? Evidence of long-term educational and social outcomes. *Educational Evaluation and Policy Analysis*, *28*(2), 153–179. https://www.jstor.org/stable/3699530

*Lubotsky, D., & Kaestner, R. (2016). Do "skills beget skills"? Evidence on the effect of kindergarten entrance age on the evolution of cognitive and non-cognitive skill gaps in childhood. *Economics of Education Review*, *53*, 194–206. https://doi.org/10.1016/j.econedurev.2016.04.001

Martin, R. P., Foels, P., Clanton, G., & Moon, K. (2004). Season of birth is related to child retention rates, achievement, and rate of diagnosis of specific LD. *Journal of Learning Disabilities*, *37*(4), 307–317. https://doi.org/10.1177/00222194040370040301

*Matsubayashi, T., & Ueda, M. (2015). Relative age in school and suicide among young individuals in Japan: A regression discontinuity approach. *PLoS One*, *10*(8), e0135349. https://doi.org/10.1371/journal.pone.0135349

McEwan, P., & Shapiro, J. (2008). The benefits of delayed primary school enrolment: Discontinuity estimates using exact birth dates. *Journal of Human Resources*, *43*, 1–29. https://doi.org/10.1353/jhr.2008.0021

*Menet, F., Eakin, J., Stuart, M., & Rafferty, H. (2000). Month of birth and effect on literacy, behaviour and referral to psychological service. *Educational Psychology in Practice*, *16*, 225–234. https://doi.org/10.1080/713666055

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *PLoS Medicine*, *6*(7), e1000097. https://doi.org/10.1371/journal.pmed1000097

*Mühlenweg, A., Blomeyer, D., Stichnoth, H., & Laucht, M. (2012). Effects of age at school entry (ASE) on the development of non-cognitive skills: Evidence from psychometric data. *Economics of Education Review*, *31*(3), 68–76. https://doi.org/10.1016/j.econedurev.2012.02.004

*Mühlenweg, A. M. (2010). Young and innocent. International evidence on age effects within grades on victimisation in elementary school. *Economics Letters*, *109*, 157–160. https://doi.org/10.1016/j.econlet.2010.08.032

*Muller, D., & Page, L. (2016). Born leaders: Political selection and the relative age effect in the US congress. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*, *179*(3), 809–829. https://doi.org/10.1111/rssa.12154

Musch, J., & Grondin, S. (2001). Unequal competition as an impediment to personal development: A review of the relative age effect in sport. *Developmental Review*, *21*, 147–167. https://doi.org/10.1006/drev.2000.0516

Norbury, C., Gooch, D., Baird, G., Charman, T., Simonoff, E., & Pickles, A. (2016). Younger children experience lower levels of language competence and academic progress in the first year of school: Evidence from a population study. *Journal of Child Psychology and Psychiatry*, *57*, 65–73. https://doi.org/10.1111/jcpp.12431

Oshima, T., & Domaleski, C. (2006). Academic performance gap between summer-birthday and fall-birthday children in grades K-8. *Journal of Educational Research*, *99*, 212–217. https://doi.org/10.3200/JOER.99.4.212-217

*Page, L., Sarkar, D., & Silva-Goncalves, J. (2017). The older the bolder: Does relative age among peers influence children's preference for competition? *Journal of Economic Psychology*, *63*, 43–81. https://doi.org/10.1016/j.joep.2017.10.002

*Page, L., Sarkar, D., & Silva-Goncalves, J. (2019). Long-lasting effects of relative age at school. *Journal of Economic Behavior and Organization*, *168*, 166–195. https://doi.org/10.1016/j.jebo.2019.10.005

*Parker, P. D., Marsh, H. W., Thoemmes, F., & Biddle, N. (2019). The negative year in school effect: Extending scope and strengthening causal claims. *Journal of Educational Psychology*, *111*(1), 118–130. https://doi.org/10.1037/edu0000270

*Patalay, P., Belsky, J., Fonagy, P., Vostanis, P., Humphrey, N., Deighton, J., & Wolpert, M. (2015). The extent and specificity of relative age effects on mental health and functioning in early adolescence. *Journal of Adolescent Health*, *57*(5), 475–481. https://doi.org/10.1016/j.jadohealth.2015.07.012

*Peña, P. A., & Duckworth, A. L. (2018). The effects of relative and absolute age in the measurement of grit from 9th to 12th grade. *Economics of Education Review*, *66*, 183–190. https://doi.org/10.1016/j.econedurev.2018.08.009

Peña, P. A., & Stephens-Davidowitz, S. (2021). Does relative age affect fame? Ask Wikipedia. *Education Economics*, *29*, 298–3111. https://doi.org/10.1080/09645292.2021.1880548

*Price, A., Allen, K., Ukoumunne, O. C., Hayes, R., & Ford, T. (2017). Examining the psychological and social impact of relative age in primary school children: A cross-sectional survey. *Child: Care, Health and Development*, *43*, 891–898. https://doi.org/10.1111/cch.12479

*Reijneveld, S. A., Wiefferink, C. H., Brugman, E., Verhulst, F. C., Verloove-Vanhorick, S. P., & Paulussen, T. G. W. (2006). Continuous admission to primary school and mental health problems. *BMC Public Health*, *6*, 1–5. https://doi.org/10.1186/1471-2458-6-145

*Root, A., Brown, J. P., Forbes, H. J., Bhaskaran, K., Hayes, J., Smeeth, L., & Douglas, I. J. (2019). Association of relative age in the school year with diagnosis of intellectual disability, attention-deficit/hyperactivity disorder, and depression. *JAMA Pediatrics*, *173*(11), 1068–1075. https://doi.org/10.1001/jamapediatrics.2019.3194

Routon, P. W., & Walker, J. K. (2022). (More) Party time in school? Relative age and alcohol consumption. *Applied Economics*, *55*, 5048–5064. https://doi.org/10.1080/00036846.2022.2135679

*Schmiedeler, S., Klauth, L., Segerer, R., & Schneider, W. (2015). Zusammenhang zwischen einschulungsalter und verhaltensauffälligkeiten. (Relationship between age of school entry and behaviour problems). *Praxis der Kinderpsychologie und Kinderpsychiatrie*, *64*(2), 104–116. https://doi.org/10.13109/prkk.2015.64.2.104

Sharp, C., George, N., Sargent, C., O'Donnell, S., & Heron, M. (2009). *The Influence of Relative Age on Learner Attainment and Development: International Thematic Probe for the National Foundation for Educational Research* (NFER). Buenos: INCA International Review of Curriculum and Assessment Frameworks Internet Archive.

*Stipek, D., & Byler, P. (2001). Academic achievement and social behaviors associated with age of entry into kindergarten. *Journal of Applied Developmental Psychology*, *22*(2), 175–189. https://doi.org/10.1016/S0193-3973(01)00075-2

Strom, B. (2004). *Student Achievement and Birthday Effects*. Unpublished Paper. Mimeo. Norwegian University of Science and Technology. https://sites.hks.harvard.edu/pepg/PDF/events/Munich/PEPG-04-24Strom.pdf

Sykes, E., Bell, J., & Rodeiro, C. (2009). Birthdate effects: A review of the literature from 1990-on. *Cambridge Assessment*, [online] pp. 1–40. https://www.cambridgeassessment.org.uk/Images/109784-birthdate-effects-a-review-of-the-literature-from-1990-on.pdf

*Thompson, A. H., Barnsley, R. H., & Battle, J. (2004). The relative age effect and the development of self-esteem. *Educational Research*, *46*, 313–320. https://doi.org/10.1080/0013188042000277368

*Thompson, A. H., Barnsley, R. H., & Dyck, R. J. (1999). A new factor in youth suicide: The relative age effect. *Canadian Journal of Psychiatry*, *44*, 82–85. https://doi.org/10.1080/0013188042000277368

*Tiiri, E., Lempinen, L., Chudal, R., Vuori, M., & Sourander, A. (2020). Relative age is associated with bullying victimisation and perpetration among children aged eight to nine. *Acta Paediatrica*, *109*(12), 2656–2663. https://doi.org/10.1111/apa.15392

Verachtert, P., De Fraine, B., Onghena, P., & Ghesquière, P. (2010). Season of birth and school success in the early years of primary education. *Oxford Review of Education*, *36*(3), 285–306. https://doi.org/10.1080/03054981003629896

Wallace, A., Croucher, K., Quilgars, D., & Baldwin, S. (2004). Meeting the challenge: Developing systematic reviewing in social policy. *Policy and Politics*, *32*(4), 455–470. https://doi.org/10.1332/0305573042009444

Wallingford, E. L., & Prout, H. T. (2000). The relationship of season of birth and special education referral. *Psychology in the Schools*, *37*(4), 379–387. https://doi.org/10.1002/1520-6807(200007)37:4<389::AID-PITS9>3.0.CO;2-K

*Wendt, J., Schmidt, M. F., König, J., Patzlaff, R., Huss, M., & Urschitz, M. S. (2018). Young age at school entry and attention-deficit hyperactivity disorder-related symptoms during primary school: Results of a prospective cohort study conducted at German Rudolf Steiner schools. *BMJ Open*, *8*(10), e020820. https://doi.org/10.1136/bmjopen-2017-020820

*Wienen, A. W., Batstra, L., Thoutenhoofd, E., de Jonge, P., & Bos, E. (2018). Teachers' perceptions of behavioral problems in Dutch primary education pupils: The role of relative age. *PLoS One*, *13*(10), e0204718. https://doi.org/10.1371/journal.pone.0204718

Wilson, G. (2000). The effects of season of birth, sex and cognitive abilities on the assessment of special educational needs. *Educational Psychology*, *20*(2), 153–166. https://doi.org/10.1080/713663714

*Wisniewski, J. J., Andrews, T. J., & Mulick, J. A. (1995). Objective and subjective factors in the disproportionate referral of children for academic problems. *Journal of Consulting and Clinical Psychology*, *63*(6), 1032–1036. https://doi.org/10.1037/0022-006X.63.6.1032

SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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