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Birthdate Effects and Gifted Program Participation in Kindergarten

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Abstract

Research has suggested that relatively older children are more likely to be identified as gifted and talented students compared with their younger peers. Such a phenomenon disadvantages the youngest students while at the same time confers additional advantages to the older students as a result of receiving specialized and/or extra instruction. The current study investigated the presence of this phenomenon on a national level using the Early Childhood Longitudinal Study-Kindergarten Cohort. Data were analyzed using multiple logistic regression analyses that accounted for the nested structure of the data and included student demographic variables as well as academic achievement skills as controls. Findings showed that even though a weak correlation indicated that relatively older students, on average, were more likely to be in a gifted and talented program, the association disappeared once academic achievement skills were accounted for.

Keywords

birthdate effects, gifted identification, kindergarten entry age

The relationship between kindergarten entry age and various educational outcomes has been shown to have a small but consistent association over the years (Shepard & Smith, 1986; Stipek, 2002; Uphoff & Gilmore, 1985). Within a grade level, on average, relatively older children have more favorable grades, score higher on standardized exams, and perform better on achievement tests compared with the youngest students (Langer, Kalk, & Searls, 1984; Stipek, 2002). The study of the association of outcomes (e.g., standardized tests, likelihood of college enrollment, athletic ability) with a child's relative age has been referred to as *birthdate effects* studies, also known as relative age effect or season-of-birth research (Allen & Barnsley, 1993; Martin, Foels, Clanton, & Moon, 2004).

The premise of birthdate effects is that as a result of age cutoff requirements (e.g., in general, a child entering kindergarten must be 5 years old by a certain date to be eligible to enroll), the oldest students, on average, will have a small, but slight advantage over their younger peers (West, Denton, & Germino-Hausken, 2000). In public school kindergarten classrooms, due to the natural variation in birth dates, there will always be an oldest and a youngest student. In a synthesis of birthdate effect studies, Shepard and Smith (1986) stated that "regardless of the entrance age requirements . . . the youngest children are *always* at a slight disadvantage" (p. 80). Within the same grade level, younger students face higher risks of grade retention (Huang, 2014b) and a higher likelihood of being diagnosed with a learning disability (Dhuey & Lipscomb, 2010). On the other hand, older students have been shown to have better soft skills (i.e., team work, leadership skills, sociability) compared with younger students and were more likely to be student leaders, team captains, or club presidents in high school (Dhuey & Lipscomb, 2008). Even though early age effects may dissipate or lessen over the years (Huang & Invernizzi, 2012; Langer et al., 1984; Morrison, Griffith, & Alberts, 1997; Oshima & Domaleski, 2006), early advantages or disadvantages may compound over time, forming a virtuous or viscous cycle (Stanovich, 1986). As a result, small initial advantages may result in big differences over time (Heckman & Masterov, 2007).

One such early advantage that relatively older children may benefit from is having a higher likelihood of being identified as a gifted and talented (GT) student. Studies have shown that at an early age, relatively older pupils (within the same grade) were more likely to be enrolled in a GT program (Cobley, McKenna, Baker, & Wattie, 2009; Froman & Shneyderman, 2013) or referred by teachers for gifted evaluation (DeMeis & Stearns, 1992). Students identified as GT may receive additional instructional support, more challenging materials, or be grouped with peers of high ability levels, any of which may help develop a talent where small initial differences may become magnified in the long run. In addition, students who are told that they are GT may develop higher self-esteem, experience greater perceived competence, and result in a self-fulfilling prophecy where identified

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students perform better as a result of higher expectations or positive labeling (Cobley et al., 2009; Cornell, 1983; Rosenthal & Jacobson, 1968). Given a limited number of slots available for GT enrollment, younger children may be placed at a disadvantage and unidentified young but gifted students are less likely to be recognized later on, especially children from low-income and minority families (Moon & Brighton, 2008).

Birthdate Effects and Skill Development

As in school, children who participate in sports are usually placed into age groupings in order to equalize skills levels and to promote healthier competition (Barnsley & Thompson, 1988). Barnsley and Thompson investigated the relationship of the birth quarter of Canadian hockey players and the tier level of hockey league participation and found a statistically significant relationship between the two factors. Because of the presence of rigid age requirements to join the different leagues (eligibility cutoff dates are usually on January 1), in addition to the prerequisite ability levels, a higher proportion of players were found to be born in the first two quarters of the year compared with the last two quarters, suggesting the presence of a birthdate or relative age effect where relatively older individuals experienced an advantage over their younger peers (Baker & Logan, 2007; Nolan & Howell, 2010).

Even though selection into top sports tiers at a young age may seem like an inconsequential matter, players in the higher tiers receive better coaching, more practice time, and compete against stronger players who are also members of the top tiers (Barnsley & Thompson, 1988). The better coaching, increased practice, and more competitive environment are all factors that may help form a virtuous cycle that improves on the small, initial advantage and increases the chances that the players are again selected into the top tiers when they are older, forming a reinforcing cycle of skill development (Allen & Barnsley, 1993).

An analogous phenomenon of skill development in the realm of education is commonly referred to as a *Matthew effect*, first coined by sociologist Robert Merton (1968). The Matthew effect gets its name based on the Gospel of St. Matthew: "To anyone who has, more will be given and he will grow rich; from anyone who has not, even what he has will be taken away" (Matthew 13:12, *The New American Bible*). Matthew effect works on the same basis where a small advantage builds on itself and forms a virtuous cycle of continuous gain (Stanovich, 1986; Walberg, Strykowski, Rovai, & Hung, 1984; Walberg & Tsai, 1983). Heckman and Masterov (2007) have famously stated that "skill begets skill; learning begets learning . . . advantages accumulate" over time (p. 447).

Birthdate Effects and Gifted Identification

Schooling shares many of the same structural characteristics of children's sports programs where children are grouped based on age, rated according to achievement, and placed into programs with different curricula (O'Reilly & Matt, 2012). Even though several studies (e.g., Huang, 2014b; Stipek, 2002; Stipek & Byler, 2001) have investigated the association of birthdate effects with various academic outcomes (e.g., literacy, math, standardized tests, special education placements, retention rates), fewer studies have explored the higher prevalence of GT identification of older students. Of those studies, researchers have often resorted to simpler statistical analyses (e.g., pure descriptive statistics, comparison of the proportion of gifted students from the older or younger groups, χ^2 analysis, bivariate correlations) that do not account for other possible confounding factors.

Studies Supporting Birthdate Effects. In an early study of GT identification and birthdate effects, Maddux, Stacy, and Scott (1981) studied 188 children in Grades 5 through 8 who had been selected for a GT program in a large suburban school district in Texas. Using χ^2 tests, results indicated that older children had a higher representation in GT programs than could be expected by chance alone. The disproportionate representation of older GT students was still evident after subgroup analyses factored in family size and the child's birth order. In a later study with a similar sample size (n = 177), using the relative age distribution quartiles of students enrolled in GT programs in the United Kingdom, Cobley et al. (2009) showed that a higher proportion of gifted students were represented by relatively older students.

In a large study using the entire cohort of 67,366 third graders in Israel in 2011 (1.4% of whom were enrolled in a GT program), Segev and Cahan (2014) reported that the oldest students had a probability of being accepted into a GT program that was three times larger compared with the youngest students. In Israel, selection into GT programs relied mainly on raw achievement test scores, irrespective of age (Segev & Cahan, 2014). However, study results revealed an almost perfect correlation (r = .96) between age and the probability of being selected into a GT program.

Using another large data set from students in Grades K to 10 in the Miami-Dade County Public Schools in Florida (the fourth largest school district in the United States), Froman and Shneyderman (2013), using purely descriptive statistics, indicated that the oldest students had much higher prevalence rates of being enrolled in a GT program (12.6% vs. 8.5% for the youngest) and also had the lowest risk of having a specific learning disability (4.2% vs. 5.8% for the youngest). At the same time, the youngest students had the lowest likelihood of being in a GT program and had the highest chances of being identified with a specific learning disability.

Studies Showing Mixed Support for Birthdate Effects. Though several studies support the presence of birthdate effects and GT identification, a number of studies show mixed support for birthdate effects. In research focusing on 423 students in

Grades K through 4 from a small school district in upstate New York, DeMeis and Stearns (1992) showed that older students were more likely to be referred to gifted program evaluation by their classroom teachers. However, follow-up analyses showed that proportionally the same number of younger entrants qualified for the GT program, despite the higher referral rates of older students.

In a study that specifically looked at birthdate effects (referred to as the age-position effect) with a sample of 275 intellectually gifted elementary school students in Ohio, Sweeney (1995) used a three-way ANOVA (i.e., gender × grade level × age grouping) and indicated that there were statistically significant differences between younger and older gifted students based on a nationally standardized achievement test. However, Sweeney concluded that differences in scores were relatively small and negligible (i.e., on average, older students scored 2 percentile points higher vs. younger students). In addition, she reported that younger and older gifted students had no statistically significant differences in terms of motor skills or classroom behavior. Even though Sweeney's study did not specifically investigate birthdate effects and gifted identification rates, her study demonstrated that even within a more homogenous sample of intellectually gifted students, birthdate effects may have some small effect.

More recently, analyzing a large data set, O'Reilly and Matt (2012) challenged the notion that students who were relatively younger and may be gifted were not selected as a result of immaturity. O'Reilly and Matt (2012) hypothesized that "education systems unknowingly select students for increased success based on their date of birth relative to the cutoff date for entrance into school" (p. 125). Using data from 15 public school districts in Montana (1,692 students identified as GT out of a total of 29,643 students or an identification rate of 6.6%), findings, using correlation analysis and descriptive statistics, showed that relative age did not bias a student's likelihood of entering into a GT program. However, smaller school districts were found to support the relative age hypothesis and were more likely to be biased toward identifying older children. In addition, results showed that districts that used a greater number of selection criteria for GT identification reduced the relative age effect.

In summary, the limited research on the topic of gifted identification of older children, some of which comes from international samples that limits their generalizability to the U.S. population, generally supports the notion of the disproportionate representation of older students in GT programs. To our knowledge though, no other study has systematically looked at the disproportionality of GT identification of older kindergarteners using a nationally representative data set, while controlling for possible confounding variables.

The Current Study

The objective of the current study was to investigate the association of relative age with the likelihood of participating in a GT program using a cohort of first-time kindergarteners from the National Center for Education Statistics' Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K) of 1998-1999. In addition to being nationally representative, the current study also addresses some methodological limitations found in prior studies. A limitation with previous studies that have looked at birthdate effects and GT identification is that several of the studies have used relatively simpler statistical techniques that do not control for other important factors that may account for GT identification. For example, historically the identification of GT students has been linked to intelligence tests (Brown et al., 2005). Because intelligence tests and academic achievement are similar (Sattler, 2001), academic abilities are important to control for because older kindergarteners have shown to have higher academic abilities early on (Stipek, 2002). In other words, older children may be identified not because of their age alone but rather, as a result of better academic performance.

Ruling out or accounting for the association of other factors that may contribute to gifted identification is important to consider before making conclusions that GT identification may be due to the child's relative age alone. The current study asked the main question: on a national level, were older children more likely to be identified as GT compared with their younger peers, while controlling for academic achievement skills and demographic factors? Based on prior research, it was expected that a relationship between relative age and GT program participation would exist. The current study tested the hypothesis that the relationship would cease to exist once academic achievement skills were controlled.

Method

Data Set

The current study used the public-use ECLS-K of 1998-1999 data set.[1] The ECLS-K was conducted by the National Center for Education Statistics and used a multistage probability design to select a nationally representative sample of U.S. kindergarteners. The data set contains information about students, their families, teachers, and schools. Even though the entire ECLS-K data set contains information from over 15,000 public school kindergarteners, the current study focused on the smaller sample of first-time kindergarteners who attended public schools in the spring of 1999.

Analytic Sample

Participants included 7,441 first-time (i.e., not retained) kindergarteners (50% were female) who were enrolled on time (i.e., not held back or enrolled early) and attended a public school kindergarten that had at least one student who was identified as GT or participated in a GT program in school ($n_{schools}$ = 460).[2] By excluding students who were enrolled late, early, or retained, comparisons are not made between the performance of children who began on time with the children who were held back or enrolled late as they are systematically different from each

Table 1. Descriptive Statistics for Study Variables.

Variable	%	*M*	*SD*	Range
Participated in a GT program	3.6			
Relative age		6.51	3.62	1 to 12
Female	49.9			
Male	50.1			
White	60.3			
Black	13.9			
Hispanic	18.4			
Asian	2.6			
Other race/ethnicity	4.8			
With an identified disability	12.8			
Socioeconomic status		−0.10	0.79	−2.96 to 2.73
Reading score		50.22	10.25	17.04 to 86.91
Math score		50.36	10.23	14.01 to 84.55

Note. GT = gifted or talented. Based on teacher surveys. Relative age = age of the child in months where 1 refers to the youngest kindergartener and 12 refers to the oldest kindergartener. Based on the birthdate of the child and the school designated cutoff date.

other based on a number of characteristics (Burkam, LoGerfo, Ready, & Lee, 2007; Stipek, 2002). Data on whether the schools provided GT services was determined through the use of multiple questions in the ECLS-K: students were identified by their teacher as having attended a GT program, schools indicated whether or not they provided GT services, and teachers indicated what percent of their students had participated in a GT class. For the main analytic sample, students in schools that did not offer a GT program or schools that had no identified gifted students based on teacher surveys were excluded. Excluding students in schools without GT programs is important as students in those schools, regardless of relative age, socioeconomic status (SES), or achievement skills, would not be able to participate in a GT program at the school. Of the participants, 60% were White, 14% were Black, 18% were Hispanic, 3% were Asian, and 5% were of two or more race/ethnicities. The race/ethnicity breakdown closely approximated the distribution in the overall ECLS-K sample (West et al., 2000). Thirteen percent of the kindergarteners had an identified disability. All descriptive statistics are shown in Table 1.

Measures

Child Participated in a Gifted and Talented Program. The dependent variable of interest was based on the ECLS-K teacher survey that, in the spring, asked teachers of the kindergarteners if the child had received instruction in a GT program at the school (1 = yes, 0 = no).

Relative Age. The relative age of the child at the time of kindergarten entry was the main independent variable. Relative age (in months) was computed based on the school designated cutoff date compared with the child's birthdate as different schools or states may have varying cutoff dates. For example, if the cutoff date to be 5 years old was August 31, children born in August, 5 years earlier, would be the youngest (age = 1) and the children born in September, 5 years and 11 months earlier, would be the oldest (age = 12). In addition, a specification check was made against a variable in the ECLS-K that asked if a parent enrolled their child on time, delayed enrollment, or enrolled early.

In the United States, the majority of school systems require that students be 5 years old by September of the year in which they are enrolling for kindergarten (Bush, 2010), so the use of relative age is more precise and accounts for variations in eligibility dates. A 1-point change in relative age was represented by 1 month ($M = 6.51$, $SD = 3.62$).

Covariates. To account for other possible factors that may be associated with a student participating in a GT program, several student demographic variables were included. Gender (1 = female), race/ethnicity (White was the reference group), disability status (1 = with an identified disability), and a family measure of SES were accounted for. SES is important to control for because students from higher SES backgrounds are more likely to be referred to gifted programs (McBee, 2006, 2010). The SES variable in the ECLS-K was based on five variables measuring family income, father's education, mother's education, father's occupational prestige, and mother's occupational prestige. The five variables were standardized and then averaged to generate the SES composite ($M = -0.10$, $SD = 0.79$).

For many school systems, standardized tests play a large role in identifying gifted students (Sternberg, 1982). Because academic achievement and intelligence are closely linked (Brown et al., 2005) and relative age and cognitive skills are also correlated with each other (Huang, 2014b), accounting for cognitive abilities is critical. Covariates also included both the child's spring reading and math scaled scores (T scores; $M \approx 50$, $SD \approx 10$). The reading and math ECLS-K assessments were adaptive tests and were individually administered by trained assessors. In the spring, reading internal consistency coefficients ranged from .69 to .88 with a reliability of the item-response theory theta score of .95. For the math assessment, Cronbach's alpha coefficients ranged from .67 to .81 with a reliability of the item-response theory theta score of .94 (see Rock & Pollack, 2002, for complete details).

Analytic Strategy

The likelihood of a student participating in a GT program (1 = yes, 0 = no) was modeled using logistic regression with normalized sampling weights. To account for the clustered nature of the data, Taylor series linearization was used in the analyses (Huang, 2014a). Taylor series linearization is often considered the gold standard for variance estimation using complex sample data and is the most commonly used method used as well in the analysis of large, complex sample data (Mukhopadhyay, An, Tobias, & Watts, 2008). All analysis and data management were conducted using SAS 9.3 (e.g., PROC SURVEYFREQ, PROC SURVEYLOGISTIC).[3]

As a portion of data were missing, largely as a result of the SES measure (i.e., 15% were missing), multiply imputed data sets were created using PROC MI. Even though there is no universal cutoff criterion for what is deemed an acceptable percentage of missing data to yield valid estimates (Dong & Peng, 2013), we followed practical guidelines set by Allison (2012). Given the computing power available and to provide more stable estimates, 20 multiply imputed data sets were used in the analysis (Rubin, 1987; von Hippel, 2005). As the ECLK-K had a whole set of student-level measures, auxiliary variables were included in the imputation process (e.g., mother's educational attainment, fall reading and/or math scores, number of books at home) to improve imputation results. Results were then combined appropriately using PROC MIANALYZE to account for the variability between data sets.

The full logistic regression model was built using several steps. The first model included only relative age as the predictor. The second model added SES, gender, disability status, and race/ethnicity. Finally, the third model added the child's reading and math scores. If the relationship between relative age and GT program participation is reduced to 0, evidence suggests the presence of a dominant mediator (Baron & Kenny, 1986). Though more advanced mediation tests are available (see Hayes, 2009), if the basic association between relative age and gifted identification is weak and if introducing the mediator variable (i.e., academic achievement skills) reduces the association of relative age and gifted identification to nonsignificance, further tests may not be needed.

Results

Descriptive Analysis

Based on the weighted analytic sample of the students in the ECLS-K, approximately 65,000 first-time public school kindergarteners attended a GT program out of 1.8 million students. The participation rate in a GT program of the students in schools that had a GT program was 3.6%. In contrast, if the entire ECLS-K public school sample was used, participation rate in a GT program was lower at 2.5% since this included all the students who attended schools without a GT program.

Correlations between having attended a GT program and all the other variable used in the models are shown in Table 2. Relative age only showed a very weak but statistically significant correlation with GT participation (r = .02, p < .05). Reading and math scores both showed the largest, but still small, correlations with GT participation (both rs = .09, p < .001). The relative age variable was also not statistically significant with all the other variables used in the study, with the exception of reading and math scores, rs = .15 and .21, respectively. Based on bivariate correlations, relatively older kindergarteners were slightly more likely to be in a GT program and have higher reading and math scores, as evidenced by the small but statistically significant positive correlations. Figure 1 shows this relationship graphically. Of the students born in the first relative age quarter, 3.23% participated in a GT program. In contrast, of the students born in the fourth relative age quarter, 4.17% of kindergarteners participated in a GT program. Using basic descriptive statistics, the youngest students have a 3.0% GT identification rate compared with 4.5% for the relatively oldest students (see Figure 1). Even though small in absolute values, the relatively older students have a 50% higher probability of being in a GT program compared with the youngest students.

Logistic Regression Model Results

Logistic regression model results are presented in Table 3. Model 1, which included only relative age as a predictor, shows a very small association of relative age with GT program participation (b = .04, odds ratio [OR] = 1.04, p = .07). Interpreted using ORs, for every month older, the student's odds of participating in a GT program increases by a factor of 1.04. However, relative age was not a statistically significant predictor of GT program participation.

Model 2 adds gender, race/ethnicity, disability status, and SES to the model. However, with the addition of the covariates, the regression coefficient for age was relatively unchanged. SES showed a weak association with GT participation (OR = 1.27, p = .06) but was also not statistically significant by conventional standards.

In the final model, students' reading and math scores were included. Both reading and math scores were statistically significant (both ORs = 1.03, ps < .05), while controlling for all other variables in the model. In addition, the association of relative age with GT program participation was practically reduced to 0 (b = .005, p = .79) suggesting that the effect of relative age was fully mediated by the child's achievement scores (cf. Baron & Kenny, 1986). If the grand-mean centered math scores of the oldest students (relative age = 12) are compared with the math scores of the youngest students (relative age = 1), the differences in scores (Ms = 2.07 vs.

Table 2. Correlations Between Variables.

Variables	2	3	4	5	6	7	8
1. Participated in GT program	.02*	.01	.01	−.02*	.04**	.09***	.09***
2. Relative age		−.01	.02	−.01	.00	.15***	.21***
3. Female			.00	−.06***	.01	.12***	.03**
4. White				.07***	.30***	.17***	.29***
5. With an identified disability					−.01	−.12***	−.09***
6. Socioeconomic status						.36***	.39***
7. Reading score							.75***
8. Math score							

Note. GT = gifted or talented. Relative age = age of the child in months where 1 refers to the youngest kindergartener and 12 refers to the oldest kindergartener. Based on the birthdate of the child and the school designated cutoff date.
*p < .05. **p < .01. ***p < .001.

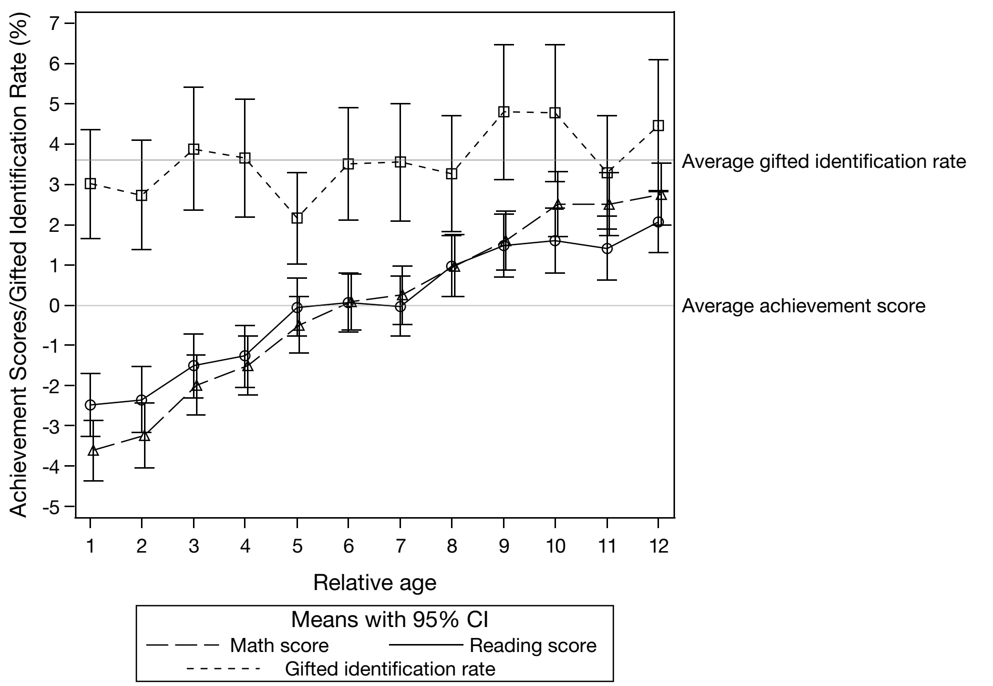

Figure 1. Graphical depiction of the relationship between relative age with gifted and talented program participation, and average reading and mathematics scores.
Note. Both reading and math scores were grand-mean centered ($M = 0$, $SD = 10$). Relative age in months with 1 = youngest and 12 = oldest.

−2.48) are statistically significant, $t(1,228) = 11.04$, $p < .001$, with a moderate to large effect size, $d = 0.64$ (reading had a slightly smaller effect, $d = 0.46$). In other words, it is not that older students are disproportionately more likely to be in gifted program on average, but older students have slightly higher achievement scores, which then is associated with an increased likelihood of being in a GT program.

Discussion

The current study investigated the association of relative age with a student's participation in a GT program at school. Although previous studies have shown that older students are more likely to be in a GT program (Froman & Shneyderman, 2013; Maddux et al., 1981) or have increased probabilities of being referred by teachers for gifted evaluation (DeMeis & Stearns, 1992), earlier investigations used simpler forms of statistical analysis that did not control for other confounding factors (e.g., SES or achievement scores) that may account for noted disproportionalities. The present study used the nationally representative ECLS-K in exploring the relationship using a sample of first-time kindergarteners who attended public schools in the United States that specifically had GT programs.

Findings of the current study caution against overinterpreting results based on the use of simple statistics or descriptive

Table 3. Logistic Regression Model Results Predicting Gifted and Talented Program Participation (n = 7,441).

	Model 1		Model 2		Model 3		
	b	*SE*	*b*	*SE*	*b*	*SE*	*OR*
Intercept	−3.50***	0.25	−3.52***	0.27	−3.51***	0.28	
Relative age	0.04†	0.02	0.04†	0.02	0.01	0.02	1.01
Female			0.13	0.15	0.05	0.16	1.05
Black			−0.60	0.60	−0.43	0.60	0.65
Hispanic			0.39	0.30	0.56†	0.31	1.76
Asian			−0.16	0.47	−0.24	0.46	0.78
Other race/ethnicity			−0.09	0.32	0.07	0.33	1.07
With an identified disability			−0.43	0.30	−0.26	0.31	0.77
Socioeconomic status			0.24†	0.13	−0.01	0.12	0.99
Reading score					0.03*	0.01	1.03
Math score					0.03*	0.01	1.03

Note. OR = odds ratio. Regression models used Taylor series linearization to account for the clustering effect. Models used normalized weights and 20 multiply imputed data sets. Relative age = age of the child in months where 1 refers to the youngest kindergartener and 12 refers to the oldest kindergartener. Based on the birthdate of the child and the school designated cutoff date.
†p < .10. *p < .05. ***p < .001.

analysis alone that may produce possibly misleading results when discussing disproportional identification rates among children of differing ages. Multiple regression accounts for the possible "multiplicity of influences" (Cohen, Cohen, West, & Aiken, 2003, p. 6), and in the current study, we find that older kindergarteners may not be identified as GT based simply on their relative age, but because older kindergarteners have generally higher academic achievement scores. If we presented basic descriptive findings alone, we might also conclude that older students are identified at higher prevalence rates compared with younger students as a result of a negligible but positive correlation. However, if we rely solely on pure descriptive statistics, we may be missing the bigger picture.

Ability, Relative Age, and Gifted Program Participation

Even though relative age showed a weak correlation with GT program participation, the relationship was fully accounted for by a child's reading and math achievement skills. Logistic regression models indicated that, on average, students with higher reading and/or mathematics achievement scores, while controlling for student demographic variables, had a higher likelihood of participating in a GT program. Although using academic achievement tests may not be the only way to identify gifted students (Brown et al., 2005), the use of standardized tests has had a long history of use with gifted identification (Sternberg, 1982). Such may have been the case with the current sample of students as using achievement scores has been a common practice in identifying GT students (Pfeiffer, Petscher, & Kumtepe, 2008). If academic achievement skills alone play a large role in GT identification, relatively older students will continue to have an advantage over their younger peers. Many well-known assessments used in GT identification have grade-based standardized scores but ignore the relative age of the child within the grade (Segev & Cahan, 2014). However, given that we do not know the exact mechanism by which children in the sample were identified, it is possible that schools, as suggested by Maddux et al. (1981), used various screening procedures for early GT identification given that no state advocates the use of a single assessment for GT classification (McClain & Pfeiffer, 2012).

Limitations

The current study has several limitations that should be considered when interpreting results. First, even though a nationally representative data set was used, the study is cross-sectional and correlational in nature. However, the use of multiple logistic regression and the inclusion of covariates is an improvement over prior studies that have looked at birthdate effects and gifted identification using simpler analytic techniques. Second, although we used a large data set, the low prevalence rate, small initial effect size (OR = 1.04), and the distribution of the predictor variable reduced the current study's power to detect an effect and post hoc power analysis indicated that the actual power to detect an effect (i.e., .72) was slightly below the conventional standard of .80. However, large data sets with gifted populations are not common and results can still be interpreted as power does not bias the regression coefficient estimates. Third, the current study relied mainly on teacher reports if students had participated in a GT program. Even though other studies have operationalized gifted status differently (e.g., top 2% or 3% of the ability distribution; see Konstantopoulos, Modi, & Hedges, 2001), we wanted to have a measure that was somewhat independent of achievement skills. In addition, there are no specific national criteria for identifying GT students that varies from state to state (Coil, 2012; McClain & Pfeiffer, 2012). Fourth, although it is of interest, we do not know how gifted identification was operationalized within our sample of students. Finally, our current study focused only on kindergarteners and results cannot be generalized to the higher grade levels. Nevertheless, the current study provides important information that students in GT programs may not be identified merely as a matter of being relatively older but rather because older children have a slight advantage academically over their younger peers.

Conclusions

Even though prior studies using simpler descriptive statistics or statistical tests have pointed to the presence of a relative age effect with regard to GT identification or referrals, the current study suggests that relative age alone is not the main factor for consideration. Simple logistic regression results (i.e., a model with only one predictor) showed that relative age had a very small and statistically nonsignificant association with GT identification. Findings showed that as relatively older children performed better on achievement tests, their likelihood of being in a GT program also increased, while controlling for student demographic variables. Such a finding is not novel in itself as a majority of states indicate that intelligence/ability/aptitude assessments are mandated as part of the GT identification process (Brown et al., 2005; McClain & Pfeiffer, 2012). However, as indicated by DeMeis and Stearns (1992) over two decades ago, "Educational professionals, especially kindergarten teachers, need to be sensitive to the normal variability of children's development" (p. 26). Even though other researchers using the same data set have found that younger children are more likely to be referred for special education (Elder, 2010) or be held back in a grade (Huang, 2014b), the relative age effect does not appear to present a risk for younger students in relation to GT program participation.

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Notes

1. The data set is available at http://nces.ed.gov/edat/
2. There were 1,613 teachers in the analytic sample.
3. Other estimation techniques are possible such as using multilevel modeling (Huang, 2014a), but for the current study, the primary research question was focused on purely student-level outcomes with only Level 1 predictors of interest (i.e., relative age). As a specification check though, multilevel logistic regression was also used and results are comparable.

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