

Abstract Title Page

Title

Less is more? An application of propensity score stratification to first-grade retention

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Abstract Body

Background

The transition from kindergarten into first grade marks a period in which children's life profoundly changes: not only do children's cognitive and psycho-social skills gain momentum (e.g., Entwisle & Alexander, 1998), but also their learning environment undergoes major changes (e.g., Entwisle & Alexander, 1998; Pianta, La Paro, Payne, Cox, & Bradley, 2002; Sink, Edwards, & Weir, 2007). Unfortunately, not all students succeed equally well in passing through these early years of elementary education: some children show slower academic and/or psycho-social growth than expected and the question often raised by parents, educators, and policy makers is what to do with these children.

An internationally frequently applied measure for dealing with these early problems in school is first-grade retention. Yet, despite its popularity, first-grade retention remains a controversial practice with proponents on the one hand (e.g., "Grade retention allows children more time to acquire the knowledge and skills necessary for the next grade"), and opponents on the other hand (e.g., "Retainees might look upon themselves as 'failures' and experience feelings of frustration, humiliation, shame, and confusion, with negative implications for their self-image and self-confidence"). Previous international studies on the effects of first-grade retention (e.g., Alexander, Entwisle, & Dauber, 2003; Cadieux, 2003; Jimerson, Carlson, Rotert, Egeland, & Sroufe, 1997; Karweit, 1999; Pagani, Tremblay, Vitaro, Boulerice, & McDuff, 2001) have yielded mixed results and, as a consequence, have reinforced this controversy. However, the fact that most studies so far show methodological shortcomings - following children in the short run only, comparing first-grade repeaters with either their younger grade-mates (i.e., same-grade comparisons) or their age-mates who got promoted to a higher grade (i.e., same-age comparisons), not accounting for selection bias and dependence among observations - might partly explain these inconsistencies.

Purpose of this study

Since in Flanders (i.e., the Dutch-speaking part of Belgium) first-grade repetition is widely used and more or less socially approved by parents, educators, as well as policy makers, we would like to investigate this practice in more detail, while particularly paying attention to the methodology used. More specifically, the current study investigates the effects of repeating first grade on children's further psycho-social growth, by tracking the experience of a cohort of Flemish first-graders until the end of elementary school. Two research questions are at stake:

- (1) How do first-grade repeaters, at the cost of one extra year of education, develop in comparison to younger children, with whom they will eventually finish elementary school, taking into account their propensity of repeating first grade (i.e., same-grade comparison)?
- (2) How would first-grade retainees have developed, had they been promoted to second grade instead (i.e., same-age comparisons)?

Accordingly, we aim to provide some promising solutions to the methodological problems that were faced before in international research on the effectiveness of first-grade retention. In addition, we attempt to contribute to the improvement of the Flemish educational policy and practice.

Setting

The data used in this research were collected as part of the large-scale longitudinal SiBO-project (i.e., the Dutch acronym for School Careers in Elementary Education). This project's main goal is to describe and explain interindividual differences in Flemish children's development and school trajectory throughout elementary education (Maes, Ghesquière, Onghena, & Van Damme, 2002). To this purpose, a random sample of 122 Flemish elementary schools was selected, stratified based on educational system* and school size (Verhaeghe, Maes, Gombeir, & Peeters, 2002). This school sample was indeed found to be representative for the entire Flemish school population in terms of the applied stratification criteria, as well as in terms of geographical location and the number of disadvantaged children targeted by the Equal Educational Opportunities Act (Verhaeghe et al., 2002). A cohort of approximately 4,000 children (219 classrooms) was recruited and was (is being) followed for the whole duration of the project, from the beginning of first grade (school year 2003-2004) until the end of sixth grade.

Participants

In the present study, all first-time first-graders ($N = 3,707$) were examined. Of all children, 50.6% were boys. Parents' nationality was used as an indicator of ethnical background. Children were classified into one of two categories: (1) both parents having the Belgian nationality (78%), or (2) at least one parent having a foreign nationality (22%). 26% of the children were targeted by the Equal Educational Opportunities Act. In school year 2004-2005, 3,326 children (90%) were promoted to second grade, while 298 pupils (8%) repeated first grade. The remaining students (2%), moving to third grade or special education, were excluded from our analyses.

Practice

In Flanders, about 7% of the children repeat first grade (Vlaams Ministerie van Onderwijs en Vorming, 2006). Elementary schools have the final word in this decision (Vlaams Ministerie van Onderwijs en Vorming, 2005). But, what makes our Flemish school system rather unique internationally is that no formal rules exist regarding grade promotion: each school can decide for itself how to measure children's mastery of the curriculum. Besides, as already mentioned, the practice of repeating first grade is more or less accepted. As for children's psycho-social functioning, this might yield different results than, for example, the situation in the United States where first-grade retention has a rather negative overtone.

* In Flanders, three educational systems can be distinguished: (1) public schools, providing education under the authority of the Flemish Community; (2) subsidized public schools, functioning under the authority of a municipality or province; and (3) subsidized private schools, providing education organized under the authority of a private person or organization (Tielemans, 2005).

Research Design

Since our data are observational in nature, we made use of propensity score stratification to balance retained and promoted children with respect to their distribution of prior characteristics (e.g., D’Agostino, 1998; Rosenbaum, 1984, 1991, 2002a, 2002b; Rosenbaum & Rubin, 1983, 1984, 1985; Rubin, 1979; 1997; Rubin & Thomas, 1996), thereby creating a quasi-randomized experiment. More specifically, we had 171 pre-retention covariates to our disposal: 68 prior child characteristics, 59 prior classroom characteristics, and 44 prior school characteristics. Only those covariates related to both treatment (i.e., first-grade retention) and outcome (i.e., children’s individual growth in psycho-social functioning) were included in the propensity score model (Austin, Grootendorst, Normand, & Anderson, 2006; Brookhart, Schneeweiss, Rothman, Glynn, Avorn, & Sturmer, 2006; Judkins, Morganstein, Zador, Piesse, Barrett, & Mukhopadhyay, 2007; Newgard, Hedges, Arthur, Mullins, 2004; Steiner, Cook, & Shadish, 2009; Rubin, 1997), a three-level logistic regression model. Stratification was based on the deciles of the propensity score.

Data Collection and Analysis

Children’s psycho-social functioning throughout elementary education was assessed by means of teacher questionnaires administered in February[†] on a yearly basis (Maes & Van Damme, 2004; Maes, Van Damme, & Verschueren, 2005, 2007, 2008a, 2008b; Cortois, Van Damme, & Verschueren, 2009). Subscales included in our analyses measure children’s cooperative participation in the classroom (4 items; e.g., “Listens carefully to the teacher’s instructions and directions”), independent participation in the classroom (4 items; e.g., “Seeks challenges”), attitude towards work (3 items; e.g., “Works accurately”), popularity among classmates (4 items; e.g., “Has little friends in the classroom”), prosocial behavior (4 items; e.g., “Offers help to other children”), aggressive behavior (4 items; e.g., “Fights”), hyperactive behavior (4 items; e.g., “Is restless, doesn’t keep still”), asocial behavior (4 items; e.g., “Prefers to play alone”), school well-being (4 items; e.g., “Dislikes school”), and self-confidence (1 item; “Is very self-confident”). Table 1 gives an overview of the timing of measurement of these subscales. All items are rated on a 6-point Likert scale. The subscales were derived from existing and validated instruments (i.e., Child Behavior Scale (Ladd & Profilet, 1996), Teacher Rating Scale of School Adjustment (Ladd, 1992), and Leerlingenprofiel[‡] (Jungbluth, Roede, & Roeleveld, 2001)) and yielded good to high internal consistency (Cronbach’s alpha ranging from .78 to .94).

[Insert Table 1 here]

The pre-retention characteristics, used to model children’s propensity of repeating first grade, were obtained from official records, achievement tests (Dudal, 2004, 2005; Moelands & Rymenans, 2003; Ponjaert-Kristoffersen, Andries, Célestin-Westreich, & Samaey, 2000), the intelligence test Standard Progressive Matrices (Raven, Raven, & Court, 2000), a teacher questionnaire about the child (Maes & Van Damme, 2004), extensive parent questionnaires (Reynders, Nicaise, & Van Damme, 2006; Reynders, Van Heddegem, Nicaise, & Van Damme,

[†] As for first-grade retainees, the teacher questionnaire about the child is administered at the end of the school year.

[‡] Translation: Student Profile

2004), a teacher questionnaire about teacher didactics (Gadeyne, Van Damme, & Verschueren, 2005), and a school staff questionnaire (Vandenberghe, Maes, & Van Damme, 2006).

Our analyses involved four steps, to a large extent in line with the procedure Hong and colleagues (Hong & Raudenbush, 2005, 2006; Hong & Yu, 2007, 2008) used[§]. In step 1, we identified the ‘true’ confounders of first-grade retention: those observed pre-retention variables that are related to both the treatment and the outcome. This yielded 61 student characteristics and 3 classroom characteristics. Step 2 included the estimation of each child’s conditional propensity to repeat first grade as a function of these confounders. For that purpose, we constructed a three-level logistic regression model, with students nested within classrooms, nested within schools. The results can be found in Figure 1. In step 3, all pupils were stratified based on the logit of their estimated propensity score. Ten strata of equal size were created, of which the results are shown in Table 2. Within-stratum balance was achieved in the propensity score, as well as in at least 95% of the observed pre-retention covariates. Finally, in step 4, we estimated the average psycho-social effects of first-grade retention. To that end, we constructed a number of three-level growth curve models, with the repeated measures of psycho-social functioning at level 1, students at level 2, and schools at level 3.

[Insert Figure 1 here]
[Insert Table 2 here]

As it was our intention to compare first-grade retainees with both same-grade-mates and same-age-mates, we carried out two sets of analyses. In the first set of analyses (same-grade approach), we compared the psycho-social functioning of first-grade retainees with those of their former classmates a school year earlier (i.e., point B versus the ‘to-be-promoted’ subset in point A and so on in Figure 2), taking into account children’s propensity to repeat first grade. Thus, psycho-social functioning was compared within a certain grade, irrespective of the children’s age. In the second set of analyses (same-age approach), the psycho-social functioning of retained and promoted first-graders was compared when the children were the same age (i.e., point B versus C and so on in Figure 3), irrespective of the grade they were in.

[Insert Figure 2 here]
[Insert Figure 3 here]

Findings

The graphical representations of retained and promoted children’s psycho-social growth trajectories based on the same-grade approach are displayed in Figure 4. Our results, on average, reveal that, during the retention year, first-grade repeaters show a significant better psycho-social functioning in comparison to younger grade-mates who are at similar risk of being retained, or at least no worse (i.e., cooperating more, working more independently, showing more prosocial

[§] Hong and colleagues (Hong & Raudenbush, 2005, 2006; Hong & Yu, 2007, 2008) utilized this procedure to make same-age comparisons of retained and promoted kindergartners and first-graders. We, on the other hand, apply this methodology to both same-age and same-grade comparisons, and only focus on first-grade retention. Moreover, our propensity score model is more restricted, in the sense that only covariates that relate to both treatment and outcome are included.

behavior, etc.). However, over time they grow significantly slower, making them even end up with a relative disadvantage (i.e., cooperating less in the classroom, having a worse attitude towards work, showing more hyperactive behavior, etc.). Children's popularity among classmates constitutes an important exception: first-grade retainees are well behind during their retention year, but make up these arrears throughout elementary school, (probably) by getting to know their grade-mates in a better way.

[Insert Figure 4 here]

Same-age comparisons, on the other hand, consistently show that first-grade repeaters would have developed a similar or even better psycho-social functioning, had they been promoted to second grade instead, both in the short and long run. They would have worked more independently, would have been more popular among classmates, would have liked school more, etc. The graphical representations of these growth curve models can be found in Figure 5.

[Insert Figure 5 here]

Conclusions

The main contribution of our study to the field of education is twofold. First, we provide some promising solutions to the methodological problems that were faced before in international research on the effectiveness of first-grade retention. Secondly, our results have practical implications. Our findings seem to suggest that first-grade retention is only effective for retainees' psycho-social functioning in the short run, and only if we compare repeaters with their grade-mates. In the long run, retainees overall do not seem to benefit much from their retention year, neither from a same-grade nor from a same-age perspective. Thus, making children who are not keeping up repeat first grade, on average, seems not helpful for their psycho-social functioning, but harmful instead, calling this practice into question.

Appendices

Appendix A. References

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