

Matthew Effects and Reading Interventions

by Tom Nicholson and Sue Dymock

Imagine you are unable to read in a grade 1 classroom and all your classmates can read. A specialist teacher takes you out of the classroom for Reading Recovery® (RR) for half an hour each day, for three months. If you do not respond, then you will proceed to a third wave of instruction. By this time, you are in a different program. Someone takes you out of the classroom for up to an hour for two or three days a week. By this time, you are way behind your classmates, and you spend most of your classroom time doing unproductive work because you are unable to do the same work as everyone else.

The ones who are not too far behind will progress well but the ones who are significantly behind in reading will stay that way.

Tier 2 and 3 programs like RR rightly claim some success because most children do improve from the extra instruction. The problem is that Tier 2 and Tier 3 interventions are replicating the same problem that occurs in the first year of instruction. Classroom teachers and specialists providing programs like RR have a wide range of pupils with widely different skill levels. The ones who are not too far behind will progress well but the ones who are significantly behind in reading will stay that way. What happens in the first year of school, recapitulates itself in Tier 2 and Tier 3 programs, where those who start with high levels of skills make good progress and those with low levels of skills do not. This is the Matthew effects phenomenon, where the rich get richer and the poor get poorer.

To explore this research question, “Are there Matthew effects in remedial reading interventions?” we re-examined data from struggling readers that we had collected in an after school reading clinic over several years, to see if our tuition was equally effective for all our pupils or whether there were rich get richer and poor get poorer effects. We looked at the pupils who benefited the most at the clinic, that is, those who reached the average range in reading, and compared them with the ones who did not. We wondered whether the ones who reached the average range experienced rich get richer effects compared with the ones who did not, and whether the ones who entered the clinic with better reading skills were the ones who benefited most.

Rationale

The rationale for the present study is that many interventions do not work completely because of “Matthew effects.” The concept of Matthew effects in reading made its first impact in the reading literature in the mid-1980s, in an article, “Matthew Effects in Reading.” Stanovich (1986) hypothesized

that “children who are reading well and who have good vocabularies will read more, learn more new word meanings, and hence read even better. Children with inadequate vocabularies—who read slowly and without enjoyment—read less and, as a result, have slower development of vocabulary knowledge which in turn inhibits further growth in reading ability” (p. 381). Stanovich, borrowing the term “Matthew effects” from previous articles on academic performance (Merton, 1968; Walberg & Tsai, 1983), suggested that similar “Matthew effects” occurred in reading.

Matthew effects in education implies that individuals who start their educational development with advantages are able to exploit instruction more effectively than those who lack these advantages, and this leads to a faster rate of development. The concept is illustrated in the Bible’s Gospel according to Matthew, “For unto every one that hath shall be given, and he shall have abundance: but from him that hath not shall be taken away even that which he hath” (XXV: 29). The Matthew effects principle suggests that good readers get better at reading and poor readers get relatively worse. When Stanovich published his paper, there was only correlational evidence to support this possibility. As Stanovich pointed out, “correlational evidence is much more plentiful than experimental evidence” (p. 379). Support was soon to come, however, when Juel (1988) reported Matthew effects in a longitudinal study of 54 children from 1st through 4th grade. By fourth grade, she found “a steadily widening gulf between the good and poor readers, both in and out of school” (p 445).

The Matthew effects principle is relevant to the present study because it may explain the lack of progress of students who start an intervention with low levels of reading skill. A Matthew effects explanation is that they are less able to benefit from instruction than are pupils who start with higher levels of reading skill. Those pupils who start with higher levels of skill can bootstrap themselves into reading more easily. Researchers have noted for many years that students who start an intervention or a school class with higher reading skills will continue to have higher reading skills than those who start with lower skills (Clay, 1979; Torgesen, Rashotte, & Alexander, 2001). It may be that, whatever instructional approach we use, whether code-based or meaning-based, there will still be students who do not respond as well because they do not have a sufficient skill base to benefit from instruction to the same extent.

A research study relevant to the present study was an analysis of the lack of effectiveness of RR for students who started the program with low levels of reading skill. Chapman, Tunmer, & Prochnow (2001) wondered whether there was a relationship between the development of phonological processing skills and the effectiveness of RR. To answer this question, they examined differences in phonological processing skills and other aspects of reading performance between pupils who “partially benefited” from the program and those who had “minimal

benefit" (p. 164). To do the analysis, they formed two groups of pupils based on their word reading scores after they had completed RR. One group was the "partial benefits" group and the other the "minimal benefits" group.

Data presented in their study showed that pupils who partially benefited started with significantly higher reading and reading-related scores than pupils who had minimal benefit and finished RR with significantly higher reading scores than did those who gained minimal benefit. The researchers associated the lack of effectiveness of RR with a failure to develop the phonological processing skills of pupils who started the program with low skill levels. The researchers wrote, "The failure of the RR program to eliminate the phonological processing difficulties of the discontinued children is not surprising because systematic instruction in word level strategies is not a central component of RR programs" (p. 171). The conclusion was that RR failed to help the "minimal benefits" group because it did not teach word-reading skills.

This suggestion may be correct but we think negative Matthew effects might be another possible explanation. Matthew effects would make it impossible for RR to help pupils gain as much from the same amount of instruction (RR only gives a certain number of lessons) if those pupils have low skill levels because they cannot respond as well as those pupils who start with higher levels of skills.

This was our hypothesis and to see if it was correct we decided to look at data from our own reading tuition program. The point of difference of our program from RR is that it does have a strong word-reading focus. The data for this study consisted of case study records of students who had received weekly reading tuition at the Waikato University Children's Reading Center over a five-year period.

We hypothesized that if pupils in RR needed word-level instruction, then we should not find the same pattern of results in our data as for RR. On the other hand, if results from our program showed the same pattern of results as for RR then it would suggest that a failure to bring up to average students who start an intervention with low levels of phonological processing ability might be due to other factors than the method of instruction. In particular, it might be due to the Matthew effects principle.

The intervention that we carried out had more focus on phonological processing than RR but it was not purely code-based since it included reading of text. This is a positive thing. Research indicates that the teaching of phonological recoding skills combined with reading practice helps less-skilled readers (Denton & Vaughn, 2010; Iversen & Tunmer, 1993; Ryder, Tunmer, & Greaney, 2008; Greaney, Tunmer, & Chapman, 1997; Torgesen et al., 2001; Mathes et al., 2005). Researchers achieve better outcomes when there is a mix of skills and reading of text. A code-emphasis works better when students have opportunities to practice and get feedback about their skills through reading. A meaning emphasis that has opportunities to discuss the cipher in the context of reading is better than when the student has to induce the cipher with no discussion at all (Brady, in press; Tunmer & Arrow, submitted).

The research question for the present study asked, "Are there Matthew effects in remedial reading interventions?" We

predicted that we would find the same results as Chapman and colleagues (2001) found for RR but the results would be due, not to the inappropriateness of the intervention for pupils with low levels of reading skills, but because of Matthew effects, where the pupils with better skill levels gain more from the instruction because their higher levels of skill enable them to benefit more from the instruction. We predicted that the students at the end of our program who were in the average range of reading achievement will have started the program with higher skill levels than those who did not come up to average at the end of the program. The reason is that the pupils with higher skill levels did not have to go as far to get to the average range and they were in a better position, skills-wise, to profit from instruction because they had a more solid skill base than did those in the program with a lower skill base.

Method

Participants

There were 190 participants in the study. The pupils had completed a one-year program of reading tuition in an after-school reading center operated by the University in a large city in New Zealand. The reading center had been operating for 5 years and some of the children in the sample had attended reading lessons for more than just the 1 year. The ages of the pupils ranged from 5 to 15 years but nearly 80% were between 7 and 12 years of age. The median age was 9 years. There were 127 boys and 63 girls. The students were mostly European (85%) and Maori (10%). Parent occupations ranged widely but the median occupation was someone with skills, such as a salesperson, supervisor, farmer, or skilled tradesperson, such as a carpenter.

Tutors

The tutors were University education students who were completing teacher qualifications. Tutors completed four 2-hour training sessions during the year and received ongoing supervision and coaching during the year. The Reading Center had a manager who supervised the work of the tutors. One of the authors also attended tutoring sessions to observe progress and give assistance.

Measures

The Neale Analysis of Reading Ability 3rd edition (Neale, McKay, & Barnard, 1999) assessed passage reading accuracy and reading comprehension. The test has parallel forms. Test-retest reliabilities for each form of the test were all above 0.90. Students completed Form 1 of the test at the beginning of the year and Form 2 of the test at the end of the year.

Design

The design of the study was to form two groups, "skilled" and "less skilled" and compare their reading and reading-related scores at the beginning and end of the tuition program and to compare the relative gains they made during the year. To do this, we divided the two groups in terms of their stanine scores at the end of the year. [The term stanine is an abbreviation for "standard nine." It is a scale that breaks the normal

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curve into nine categories, where stanine 5 is average achievement, stanine 1 is low achievement, and stanine 9 is excellent achievement.] A score between stanines 1 and 3 is below average. Students in the average range achieve stanines between 4 and 6. Students in the above average achievement range achieve stanines between 7 and 9.

The end-of-year stanines for Reading Comprehension became the criterion for deciding if pupils had benefited from the reading tuition. The students who had stanine scores in the average range or better, that is, stanines of 4 or above, became the “skilled” group. The students who had stanine scores below the average range, that is, between stanines 1 and 3, became the “less skilled” group. This was not an arbitrary division. It is taking the pupils at the end of the program who had come up to average and comparing them with the pupils who had not come up to average to see why one group had reached the average range or better and the other had not. It was the same principle as used by Chapman et al. (2001) in their analysis of RR.

Procedure

The participants applied for entry to the tuition program through their parents or through referrals from schools. Parents completed an application form and signed a consent form for their child to participate in the research. The research had University ethics approvals. Pupils attended the center for a 1-hour lesson once a week during the school year.

Each lesson had the same components with fixed times allocated (see Table 1):

TABLE 1. Time Allocated Per Component	
Teaching Focus	Minutes
Phonological	25
Reading high frequency words	5
Reading connected text	15
Comprehension strategy instruction	5
Spelling strategies	5

The lessons combined a mix of code-based teaching of skills, some spelling practice, reading of extended text, and a focus on comprehension (see Table 2). The phonological part of the lesson took 25 minutes, about 40% of the lesson, followed by 15 minutes of reading practice on text that was of suitable reading difficulty, and finishing with 5 minutes of comprehension discussion. Each tutor had a reading plan of skills to teach. The Test of Basic Decoding Skills (Bryant, 1975, reproduced in Nicholson, 2006) was the diagnostic instrument used to decide which skills to teach. For example, the student might start with consonant digraphs or long vowel sounds, and move to other vowel combinations. A more advanced plan started with syllable breaking skills and moved to more advanced skills of breaking words

into prefixes, root words, and suffixes (Calfee & Patrick, 1995; Henry, 2003). The teaching of syllable breaking skills helps less-skilled readers to improve word reading skills, comprehension, and fluency (Diliberto, Beattie, Flowers, & Algozzine, 2009).

For a small part of the lesson, 5 minutes, students practiced reading high frequency words (e.g., Fry, 2000; Dolch, 1936; Elley, Croft, & Cowie, 1977). Research indicates that less-skilled readers are better able to read high frequency words in sentence context than in isolation; whereas, skilled readers are equally able to read high frequency words in either condition (Allington & Fleming, 1978). Tutors timed their speed and recorded the time on their lesson plan each week. Iversen, Tunmer, and Chapman (2005) included teaching high frequency words as part of a modified RR program that achieved successful results. They argued that practice with high frequency words was “cementing them into lexical memory (Share, 1995)” (p. 459).

Spelling was a small part of the lesson, about 5 minutes. Tutors selected high frequency words, pupil spelled them, and then the pupil self-corrected the spelling miscues if there were any.

In the comprehension discussion part of the lesson, about 5 minutes, tutors focused on the structure of the text, such as narrative structure (characters, plot, setting, theme) and expository text structure (descriptive and sequential) (Dymock & Nicholson, 2011; Calfee & Patrick, 1995). At the end of each lesson, tutors assigned pupils some text reading for home.

Results

The research question asked, “Are there Matthew effects in remedial reading interventions?” We predicted that there would be a significant difference between the skilled and less skilled groups at the beginning and at the end of the year. We also predicted that the skilled group would show rich get richer effects and the less skilled group would show poor get poorer effects.

Table 3 shows the means and standard deviations of the start of year and end of year stanine scores for reading accuracy and reading comprehension for both the less skilled and more skilled groups. The results in Table 2 show that the more skilled group had higher stanine levels at the start of the year than did the less skilled group. The skilled group, as can be seen in Figures 1 and 2 (see page 32), also made greater stanine gains during the year in reading accuracy and reading comprehension than did the less skilled group. The greater gains occurred for reading accuracy and comprehension. At the start of the year, the chronological age of less skilled pupils was 9.61 years. The chronological age of more skilled pupils was 10.33 years. To take account of this age difference, we carried out analyses of covariance but the pattern of results was almost identical, that is, the more skilled group still made greater gains during the year than did the less skilled group.

We carried out separate analyses for each of the five years that the program had been operating to take account of the fact that some children had attended multiple years, and the results were the same each year. The more skilled poor readers made more progress than the less skilled.

TABLE 2. Basic Lesson Structure

Lesson Plan # _____ Date: _____		
<p>Word reading practice Use a list of high frequency words (e.g., Nicholson, 2006)</p> <p>Time in seconds: _____</p> <p>Miscues _____</p>	<p>Spelling practice Select a spelling rule and use 5 regular words to illustrate. Write below the words you are assessing.</p> <ol style="list-style-type: none"> 1. 2. 3. 4. 5. 	<p>Or – Turtletalk Select 6 words from the story for today and ask a pupil to tell you out loud</p> <ol style="list-style-type: none"> 1) how many phonemes in the word, 2) to say each phoneme slowly, and 3) spell the words
<p>Phonological recoding (Based on Calfee & Patrick, 1995; Moats, 2010)</p> <p>What rule are you teaching? (circle one)</p> <p>Single consonants, e.g., fun, fat</p> <p>Consonant digraphs, e.g., ship, chip</p> <p>Silent e rule (or “split digraph”), e.g., mat, mate</p> <p>r and l affected vowels, e.g., bird, her, car, for, fur, all</p> <p>Vowel digraphs, e.g., rain, ray; toy, toil</p> <p>Simple prefixes (e.g., re-, un-) and suffixes (e.g., -er, -ing, ed, s)</p> <p>c and g followed by e, e.g., race, stage</p> <p>6 types of syllable, e.g., rab-bit, ro-bot, gar-den, pi-rate, fif-teen, can-dle</p> <p>Greek (e.g., atmo-sphere, agora-phobia) and Latin (e.g., magic-ian, offic-ial)</p>	<p>Reading practice Title: Reading Level:</p> <ol style="list-style-type: none"> 1. Story Comprehension <ol style="list-style-type: none"> a. Characters b. Setting c. Plot d. Message <p>OR</p> <ol style="list-style-type: none"> 2. Non-Fiction Comprehension <ol style="list-style-type: none"> a. Structure (web, weave, sequence) 	<p>OR</p> <p>Questions to answer</p> <p>OR</p> <ol style="list-style-type: none"> 1. Select 12 hard words from the story 2. Write 12 sentence flashcards, one for each word 3. Pupil reads each sentence quickly 4. Pupils reads the text aloud to tutor 5. Write 12 questions about the story – pupil has to answer the questions

TABLE 3. Stanine Means and Standard deviations (in brackets) for Less Skilled and More Skilled Poor Readers for Reading Accuracy and Reading Comprehension

Measures	Less skilled poor readers N = 108	More skilled poor readers N = 82
Start of Year		
Reading Accuracy	1.30 (.55)	2.46 (1.03)
Reading Comprehension	1.29 (.61)	2.41 (1.20)
End of Year		
Reading Accuracy	2.12 (1.05)	4.28 (1.11)
Reading Comprehension	2.06 (.85)	4.83 (.94)

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As shown in Figures 1 and 2 the more skilled group made greater gains in reading accuracy and reading comprehension during the year than did the less skilled group. This pattern of results indicates the operation of rich get richer Matthew effects for those who started the year with higher initial reading status, and poor get poorer Matthew effects for those who started with lower initial reading status.

Discussion

The research question asked, “Are there Matthew effects in remedial reading interventions?” The results of the present study suggest that differences in initial reading status of unskilled readers when starting an intervention will benefit those pupils who start with higher levels of reading skill. They are able to gain more from the instruction because they have a stronger base of reading skills. The initial differences will cause rich get richer and poor get poorer Matthew effects.

The criticism of RR that it does not help these relatively low-skilled pupils because it does not teach word-level reading skills may not be correct. The present study taught word-level reading skills and the same problem occurred that students with low levels of reading skill did not respond as well to the intervention as pupils with higher levels of reading skill.

It may be that other studies that have found a lack of response to instruction from some pupils need to consider the possibility of negative Matthew effects for those pupils who started the intervention with scores lower than the majority of the poor readers who received the intervention. They may not need a different approach so much as a higher dosage of instruction (Blachman, 1997; Torgesen, 2000; Vellutino, Scanlon & Lyon, 2000; Al Otaiba & Fuchs, 2006). We may be on the wrong path if we argue too much about the relative merits of code-based and meaning-based instruction because research indicates that whatever approach we use, some students will not benefit as much as will others (Nicholson & Tunmer, 2011; Tunmer & Nicholson, 2011).

Matthew effects do not have to happen but we tend to let them happen because we assume that all students will respond to our interventions. Seltzer, Choi, and Thum (2003) found evidence of Matthew effects in an analysis of longitudinal data from several schools. In one school, rates of progress of students with low initial levels of achievement were “minimal” (p. 273) whereas average students progressed at much faster rates. These researchers argued it does not have to be this way and they gave as an example a school where rates of growth were similar for students with high, average, and low initial status levels of achievement. They argued that schools need to look at their programs and figure out what they are doing (e.g., tracking, which is a kind of high-dosage instructional experience for the top students who are given more challenging teaching, compared with negative Matthew effects for the lower ability students who get less challenging teaching) that is enabling some students to experience positive Matthew effects while others experience negative Matthew effects.

Figure 1. Reading accuracy rate of progress as measured in stanines for more responsive (more skilled) poor readers compared with less responsive (less skilled) poor readers

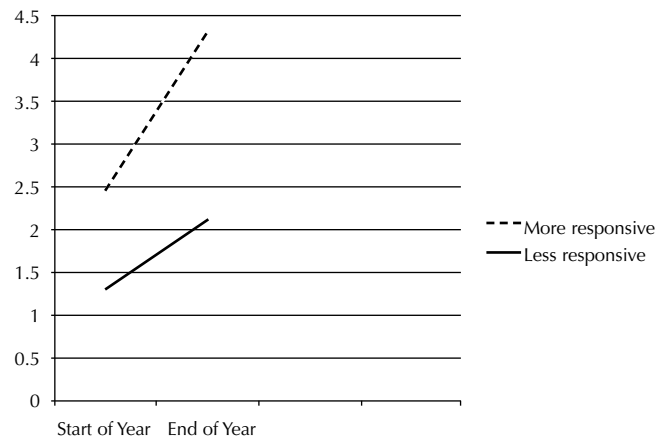
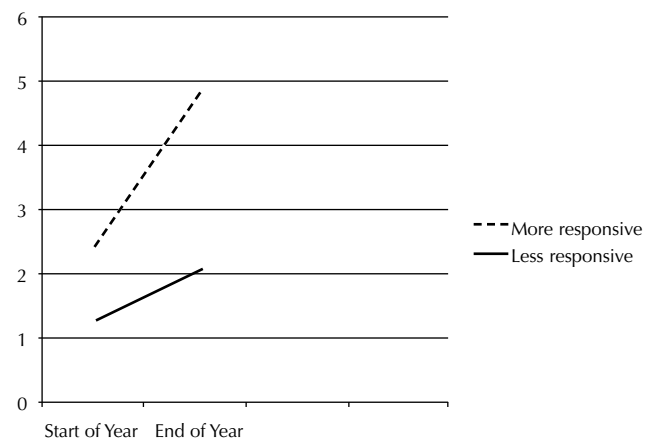


Figure 2. Reading comprehension rate of progress as measured in stanines for more responsive (more skilled) poor readers compared with less responsive (less skilled) poor readers



Conclusion

The only way to stop negative Matthew effects is to differentiate in terms of dosage. Children who start school with few prereading skills are at risk. They have to acquire essential prereading skills as quickly as possible. The best way to do this is to give them much more instruction than is provided to regular pupils, and to do it as soon as possible.

The impact of Matthew effects on treatment is very important and we think our study adds a new perspective. The results raise the issue of whether “response to intervention” has anything at all to do with the kind of instruction, as is suggested in other research. We are questioning whether the lack of response of some poor readers is really due to initial differences in reading skills among pupils, as suggested in the Matthew effects literature. We are also questioning the view that lack of response to intervention is due to poor instruction. We are saying instead that it is due to the fact that those who begin instruction with higher levels of skill will gain more from the instruction—whatever it is—as explained in the Matthew effects literature. Those who do not gain so much are experiencing

poor get poorer effects but they can be turned around if they get a higher dosage of treatment. It is true that some programs may work faster than others, but most interventions work for most pupils. The ones who do not respond can benefit, too, but only if the dosage is more than for those who are skilled.

Rather than changing instruction, our results make a strong case for a higher dosage of instruction at the beginning of instruction for those who start with lower levels of skills than the average group of struggling readers. We may be headed down the wrong path when we ask which is better for less skilled, poor readers—focusing on meaning or skills. A more productive question is how can we provide a higher dosage of instruction (whatever it is) than that given to those pupils who enter intervention programs with the advantage, from the beginning, of higher level skills.

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