Eye tests, Eyeglasses and Improving Education Performance in Rural China

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The Gansu Vision Intervention Project

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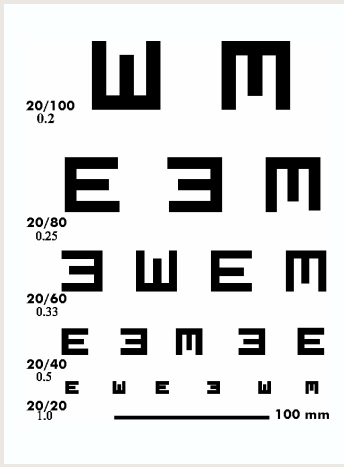
Students with uncorrected vision: an uncorrected problem

Can eyeglasses improve educational outcomes among children in poorer parts of the world? World Bank studies suggest that approximately 10% of all children in developing countries have problems with their eyesight. About 97% of child eye problems are caused by refraction errors, nearly all of which can be corrected with properly fitted eyeglasses. However, most children with refraction problems in low-income countries do not have glasses.



There is very little, if any, reliable data on the extent to which academic performance may be improved by providing eyeglasses to poor children who need them. Given the high incidence of uncorrected vision among children in developing countries, it is important to better understand the correlation between imperfect vision and educational outcomes. This is particularly true if the effects of addressing vision problems are comparable to other, more common (and more costly) educational interventions such as teacher training, scholarships, or reduced class sizes.

Due to the lack of rigorous studies on this issue, a team of Chinese and international researchers recently implemented a randomized control trial in rural northwest China to examine the impact of providing eyeglasses to primary school students with poor vision. The study had two goals:

1.Measure the incidence of uncorrected vision among students in two poor counties in China.

2.Assess the educational impact of providing eyeglasses to students with vision problems.

Uncorrected vision among poor students in China

Although China has achieved nearly universal primary school enrollment and high rates of education through the 9th grade, studies within China suggest most eye problems in children remain uncorrected. A study in one district in Beijing found that 12.8% of children age five to fifteen years had vision problems, of which 90% were due to refraction errors. Only one in five of the children with vision problems had glasses. And Beijing is one of the most well off places in China. In rural areas, children with vision problems are even less likely to wear glasses, as will be seen below. A commonly held (but mistaken) view in China is that wearing eyeglasses causes children's vision to deteriorate faster. There may also be other economic and cultural constraints that keep children from being tested for eyesight problems and fitted for glasses.

None of these children has glasses, though at least two or more of them probably need a pair.

Vision tests are important, but most poor rural schools don't have the resources to conduct them regularly

Each county in China has a Center for Disease Control (CDC) office, which conducts regular physical exams of all students, including eye exams. If possible, health exams are conducted every year Because of budgetary and staff constraints, however, many schools—especially in poor rural areas—conduct physical exams far less frequently (e.g. once every three years). The results of the physical exams are given to the school's teachers, who relay information to parents as they feel appropriate. Parents of primary school age children rarely take any action based on this information.

The selection of study sites

Researchers selected Yongdeng and Tianzhu counties in the poor, northwestern province of Gansu to serve as the study sites. They were selected as study sites because they are typical rural counties in Gansu, are located within several hours drive of the provincial capital (enabling the project to be closely monitored by the provincial CDC under the Ministry of Health), and have capable county CDC staff to implement the project effectively. The project encompassed all students in grades 3 through 5 in almost all primary schools in these two counties, a total of 18,915 students.

In the year 2000, Gansu had a population of 25.6 million, 76 percent of whom resided in rural areas. The most recent available estimates of rural per capita disposable income place Gansu at a rank of 30 out of 31 provinces, with only Tibet having a lower income. Using per capita income data and official poverty lines, a recent World Bank report found that 23 percent of the rural population in Gansu is poor, compared to 6.5 percent for China as a whole.

Yongdeng County is divided into 23 townships, of which 18 participated in the program (the other 5 townships were dropped due to lack of funds to supply eyeglasses). These 18 townships have 155 primary schools. Of the 18 townships in Yongdeng, nine townships were randomly chosen to participate in the eyeglasses intervention and the remaining nine were assigned to the control group.

Tianzhu County is divided into 19 townships, all of which participated in the program. These 19 townships have 101 primary schools. Ten of Tianzhu's 19 townships were randomly chosen to participate in the program in 2004, and the remaining nine were assigned to the control group.

The random assignment was done as follows. In each county, all townships in the county were ranked by rural income per capita in 2003,

and starting with the first two townships, one township was randomly assigned to be a treatment township while the other was assigned to the control group. For the case of Tianzhu, the 19th township, the poorest, was not paired with any other township; a random draw assigned it to the group that received eyeglasses. The primary schools within each township were either all assigned to the treatment group or all assigned to the control group.

Baseline Data

The baseline data used in the analysis are from three sources:

1.School records on basic student characteristics and academic grades before the intervention.

2.Results of health exams, including vision tests, conducted by the county Center for Disease Control in each primary school before eyeglasses were provided.

3.Information from optometrists' records on students who were fitted for glasses.

School records

The basic information in the school records include the grade of the student, the students' sex, ethnicity and birth date, and the occupation and education level of the head of the household (usually the father) in which the student lives. The school academic performance data include scores on exams given at the end of each semester in each grade since the student enrolled at that school (usually grade 1). Separate scores were available for three subjects: Chinese, mathematics and science.

Health exams

The school health data include whether the student wore glasses at the time of the baseline survey (and if so, the grade the student was in when he or she started to wear glasses), the student's height, weight and hemoglobin count, and a measurement of vision for each eye.

Optometrist records

The information from the optometrists include whether the child was fitted for eyeglasses and, if not, the reason eyeglasses were not provided (some students had eye conditions that could not be corrected with eyeglasses, and others declined the offer to receive with eyeglasses).

Implementation

Optometrists from the Center for Disease Control conducted vision tests at each participating primary school in the two sample counties. If a child from an intervention school was diagnosed with a vision problem, he or she was given a voucher. The voucher stated in clear, concise language that if the student visited the township hospital, the doctor in the vision clinic would fit the child glasses. A second visit would be required to pick up the eyeglasses. The eyeglasses themselves were purchased in bulk from a factory in eastern China, and batches were delivered to each township hospital to be cut as necessary in the vision clinic.

Table 1 presents information gathered while implementing the Gansu Vision Intervention Project. Of the 2,069 students with vision problems, 1,319 were in the intervention schools and thus were offered eyeglasses, while 750 were in the control group and were not offered glasses. Of the 1,319 students who were offered glasses, 928 (70.4%) accepted them and the remaining 391 declined.

Can they see the chalkboard clearly?

Table 1. Implementation of Gansu Vision Project

	Tianzhu	Yongdeng	Both Counties
Number of children in grades 3-5 in 2004-05	6,132	12,783	18,915
Students in grades 3-5 in 2004-05 with vision problems	657(10.7%)	1,412(11.0%)	2,069(10.9%)
Of which:			
In control schools	124	626	750
In program schools	533	786	1319
Students in program schools who:			
Accepted the offer toReceive glasses	309	619	928(70.4%)
Did not accept the offerto receive glasses:	224	167	391(29.6%)

Results

Virtually all children of primary school age in Gansu province are enrolled in school. Thus provision of eyeglasses cannot lead to increased school enrollment; the sole impact is on academic performance. The random assignment of schools to participate or not participate in the Gansu Vision Intervention Project allows for straightforward analysis of the impact of the project on students' scores on academic tests. Because the intervention affected only students who were enrolled in grades 3, 4 and 5 in the 2004-2005 school year and were diagnosed as having poor vision in August of 2004, only students in those grades who were so diagnosed are used in the analysis.

Because not all students who were offered glasses accepted them, the impact of the program can be

For many students, wearing glasses could mean the difference between a C and a B.

looked upon in two different ways. First, what was the impact of the program on test schools for students with poor vision as a group? This is, in fact, a measure of the effectiveness of the program overall. Second, we can look at how much did the Gansu Vision Intervention Project help the group of students with poor vision who accepted the glasses? The importance of this result is that it is an estimate of what the program effect would have been if we could have persuaded all of the students with poor vision to participate.

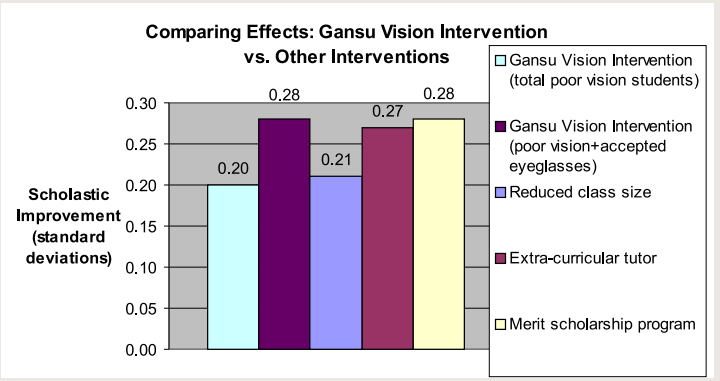
On average, the group of poor vision students increased their average test performance across Chinese, math and science by a statistically significant 0.20 standard deviations after they were offered eyeglasses to correct their vision problems. Again, this amount of improvement relative to that of the poor vision students in control schools was achieved despite the fact that 30% of those students offered glasses did not accept them.

Is 0.20 standard deviations a lot? Perhaps the best way to illustrate this is to consider what would happen to the near-sighted students in the program (whether or not they were fitted with glasses). According to simulations used to measure these types of impacts, our findings suggest that providing eyeglasses to a student with poor vision can improve his or her average grades by half a letter grade or more, so long as the student wears them in the classroom.

The second way to look at the impact of the program is at the individual level of those poor vision students who were offered glasses and who accepted them. Measuring from before eyeglasses were made available until one year after they were provided, poor vision students in the treatment schools who were offered and who accepted eyeglasses scored 0.32 and 0.25 standard deviations higher in math and science, respectively, compared to poor vision students in the control group (that is, those students who had poor eyesight and did not get glasses). Across all subjects, the average academic scores were a statistically significant 0.28 standard deviations higher. Another way to interpret this higher effect: Had all the students who were offered glasses taken up the offer, the estimate of improved academic performance would have been nearly 0.30 standard deviations.

It is difficult to quantify the impact of the Gansu Vision Intervention in absolute terms. However, it is useful to compare the results of the experiment to those of other successful educational interventions. For instance, when compared with the results of three previous, more conventional interventions—reduced class size (STAR program, Tennessee), extra curricular tutoring (in Shanghai schools), and merit

scholarships (in Kenya)—it becomes clear that treated students in the Gansu Vision Intervention achieved a similar improvement. It is worth noting that the more typical interventions tend to be more costly and complex to implement.



Conclusion

There remain a number of questions that will be useful for guiding future research. What factors cause students—30% in this study—to refuse eyeglasses? How can one best mediate these factors? What incentives could best induce children and their families to accept eyeglasses? Such questions notwithstanding, the results of this experiment suggest that providing eyeglasses to needy students is a viable, cost-effective, and heretofore untapped means to improve student test scores in underserved communities. This is particularly true because many such communities are remote, starved of resources, or otherwise ill equipped to undertake other, more capacity-intensive interventions. Students from China's poor rural areas already face an array of educational challenges that their urban, well-off counterparts do not. Governments at the local level and beyond should be alerted to inexpensive and effective methods for improving their communities' capacity to learn basic skills and knowledge to better succeed in the local education system and, later, to better compete in China's increasingly modern economy. Our findings suggest that providing eyeglasses to students who need them is one such method.

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Rural Education Action Project

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