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A Randomized, Clinical Trial Evaluating Ready-Made and Custom Spectacles Delivered Via a School-Based Screening Program in China

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Abstract

Purpose—We sought to evaluate visual performance and satisfaction with ready-made spectacles (RMS) in Chinese school-aged children with uncorrected refractive error.

Design—Randomized, double-blind, clinical trial.

Participants—Junior high school students from urban Guangzhou, China, aged approximately 12 to 15 years with ≥1 diopter (D) of uncorrected spherical equivalent (SE) refractive error. Students were excluded with ≥2.00 D astigmatism, ≥2 D myopic anisometropia, and ≥1 D hyperopic anisometropia and ocular disease affecting vision.

Methods—Refractive error was determined by cycloplegic subjective refraction. Students were randomly assigned to receive RMS or custom spectacles (CS) and assessed after 1 month of use. We required 175 students to complete in each arm to be able to measure a 15% difference in compliance.

Main Outcome Measures—Compliance with spectacles lens wear, patterns of use, vision, symptoms, and perceived value.

Results—Screening identified 965 of 4607 (20.9%) students with reduced distance vision; 212 of the 965 (22.0%) refused evaluation and 187 of the 965 (20.8%) had <1 D of SE refractive error. Sixty-one (6.3%) were referred for further evaluation and the remaining 495 (51.3%) participated. Social, demographic, and ocular parameters were similar in the 2 groups. Average SE refractive

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error was −2.57±1.31 (mean value ± standard deviation [SD]). Spectacle vision (Snellen acuity, mean ± SD) was worse with RMS in the eye with lower SE ($20/25^{-0.5}$±0.9 lines vs $20/25^{+1}$±0.7 lines; $P = 0.004$) and higher SE ($20/25^{-2}$±1.2 lines vs $20/25^{+1}$±0.8; $P<0.001$). There were no differences ($P>0.05$) in the rate of use (94.3% vs 92.2%), wearing to the 1-month visit (46.9% vs 51.5%), planned use (93.3% vs 93.7%), value (89.5% vs 91.7% “moderate or high value or most valued possession”), or symptoms (blur, 21.1% vs 19.4% [$P = 0.8$] and other symptoms [$P>0.2$]).

Conclusions—Although visual acuity was better with CS, no difference was found in acceptability in this population of students with predominantly simple myopic refractive error. This study supports the use of RMS in a school-based refractive services program, saving costs and improving the logistics of service delivery.

Uncorrected refractive error is a leading cause of visual impairment and blindness internationally.[1] Although refractive error in children is an important public health problem throughout the world, extremely high rates of myopia make this a pressing issue in China,[2] where an estimated 6 million children have visual impairment owing to uncorrected refractive error.[1]

School screenings for refractive error and on-site spectacle provision are a possible solution outlined in the World Health Organization Vision 2020 targets for control of blindness in children.[3] However, dispensing spectacles remains problematic owing to logistics, expense, and reports of low compliance.[4–6]

Confronted with the magnitude of refractive error in China, efficient and cost-effective ways are needed to deliver spectacle correction including utilization of ready-made spectacles (RMS). The advantages of RMS are that they can be supplied on the same day and have substantially reduced unit cost. Population-based studies of refractive error estimate that the majority of those patients requiring spectacle correction could be provided with RMS.[7,8] We hypothesized that the acceptance of RMS is similar to custom spectacles (CS), but perhaps influenced by the level of astigmatism, anisometropia, and previous spectacle experience. Herein we have presented the results of a randomized clinical trial of RMS and CS delivered via a school screening program in China. We report on wearer retention and the success of these 2 approaches in meeting refractive needs.

Methods

At the time of the study, a school-based vision screening and spectacle delivery program (ChildSight, Helen Keller International) was in place in urban Guangzhou, China. The current study was attached to this screening program. The Johns Hopkins Medicine Institutional Review Board and the Zhongshan Ophthalmic Center Institutional Review Board approved the study protocol and this clinical trial was registered with the US National Institutes of Health Protocol Registration System (available at: https://register.clinicaltrials.gov NCT00657670).

All junior high school students at the 5 screened target schools aged approximately 12 to 15 years who were found to have vision ≤20/40 in either eye were invited to participate. All subjects signed an assent with informed consent provided by at least 1 parent. Parents also

provided information on their child's medical history, as well as social and demographic information.

The enrollment process and visit schedule are summarized in Figure 1. Eligibility for randomization was determined after refraction during the initial visit. Students were required to have ≥1.00 D of SE uncorrected refractive error in the better eye to maximize spectacle uptake.[4 – 6] Students already wearing spectacles were eligible if their current spectacles required a change of ≥1 D. Ineligible students were either not prescribed spectacles or, if indicated, prescribed spectacles as part of ChildSight. Further, students with high astigmatism (≥2 D), significant anisometropia (≥2 D myopic or ≥1 D hyperopic anisometropia), eye disease, or corrected vision <20/25 were referred for ophthalmologic evaluation (Table 1) and were ineligible for this study.

Randomization occurred at the study center after completion of the first visit. A randomization grid with 500 possible enrollments generated using a random number generator (available at: http://www.randomization.com; accessed March 21, 2008). Participants were assigned a position on the grid according to enrollment order. Both the participant and those involved in data collection were masked to the type of spectacles ordered. Masking was maintained during follow-up assessment because the spectacles were made at the optical facility, which was remote to the testing site and the RMS and CS were not different in appearance. Furthermore, those involved in data collection were not equipped to measure refractive power of the spectacles during assessment and thereby remained masked to the treatment allocation during all evaluations.

Spectacles were worn for 1 month before an unannounced on-site follow-up evaluation to allow sufficient time for adaptation and experience with the new spectacles. Symptoms of blurred or distorted vision, headache, disorientation, dizziness, eyestrain, or nausea were systematically collected at the dispensing visit and at the 1-month follow-up. The number of students who had their new spectacles with them at the follow-up visit was noted. Students were asked how often the spectacles were worn, the time required to adapt to the spectacles, and the perceived value of the spectacles on a 5-point Likert scale: most valued possession, high value, moderate value, some value, and no value. Need for remaking of spectacles was recorded.

Vision Testing

Habitual vision was assessed at the first visit, before cycloplegia (0.5% tropicamide), with either no correction or with the student's own spectacles. Corrected vision was measured with the study spectacles at the dispensing visit. All measurements were taken using tumbling E charts (Precision Vision, Villa Park, IL) with retroillumination in accordance with previous studies.[9] These 4-meter charts were used at 2 meters with a mirror to double the testing distance. Visual acuity was letter scored with 0.02 logarithm of the minimum angle of resolution (logMAR) assigned to each letter. The students were asked to continue reading smaller rows of letters until 4 out of 5 were incorrectly identified.

The cycloplegic objective refraction was measured with an autorefractor (KR8800, Topcon Corp, Tokyo, Japan) and the average of 3 measurements was used in the analysis. The

autorefraction was also used as the starting point for the subjective refraction, which was done using a standardized protocol.

A millimeter ruler was used to measure the pupillary distance for all students. Refractions were completed by 2 optometrists and visual acuity and pupillary distance measurements by ophthalmic nurses.

Spectacles

All study spectacles were made to order, produced by the Zhongshan optical laboratory and their quality verified according to standard parameters.[10] Any spectacles not meeting standards were remade. Because cosmetic acceptability of frames has been reported to influence spectacles compliance in the past,[4] we provided a choice of frames to all participants in metal (5 colors) and plastic (3 colors) in sizes ranging 42-16 to 52-16 mm (eye size) and temple length, 125 to 143 mm. The CS used the final, adjusted subjective refraction and the optical center distance was matched to the student's pupillary distance. For the RMS group, the smallest frames were made with 55 mm, the medium-sized frames 60 mm, and the largest frames, 65 mm optical center distances. The anticipated spectacle lenses in the RMS group were +1.00 to +4.00 D in 0.50 steps, +5.00 D, +6.00 D, and +8.00 D, −1.00 to −6.00 D in −0.50 steps, −7.00 D, −8.00 D, −9.00 D, and −10.00 D and had the same power in each eye to mimic an inventory of 25 stock keeping units. If there was a difference between the 2 eyes, for RMS, the spectacles were prescribed for the eye with lower refractive error. At the 1-month follow-up visit, children who were intolerant to their spectacles were issued new spectacles.

Data Analysis

The primary outcome variable was the proportion of the target population with compliance to spectacle lens wear as measured by having spectacles on hand at the 1-month visit. We also compared previous and planned use, perceived value, duration or wear (all day, part of day, only for distance or near vision), adaptation time, spectacle remakes, and symptoms using an intent-to-treat analysis. There were no errors in randomization in the CS group, whereas 7 in the RMS group were inadvertently given their full spectacle correction. We also analyzed the data based on a "treatment received" approach (findings were similar to the intent-to-treat analysis and are not presented).

Binary outcomes were compared between groups using logistic regression adjusting for baseline differences as appropriate. Ordinal logistic regression was used for categorical data. All vision data were converted to logMAR acuity and analyzed for the eye with lower SE refractive error and higher SE refractive error. Vision with study spectacles and improvement in vision were compared between the groups using a grouped *t*-test and pre- versus postintervention using a paired *t*-test. Presence of symptoms when spectacles were first received and after 1 month was compared using the McNemars test. We required a sample size of 175 in each group to be able to detect a difference in proportions of 15% (α = 0.05; power 80%) assuming a base rate of spectacle compliance of 70%. We planned to recruit 200 participants into each arm to allow for loss to follow-up. Additional recruitment was permitted to complete refractive services delivery at all 5 schools. Differences in visual

acuity of approximately 0.1 logMAR between groups can be detected with 80% power and significance level of 0.05 for this sample size.

Results

The school screening program evaluated 88% of the 5211 students enrolled in junior high school in the 5 target schools (Fig 1). Of the 965 identified as possible candidates through this process, 743 (77%) were interested in participating. Enrollment visits were conducted between May 21 and June 6 and final visits concluded by July 11, 2008. After refraction, it was determined that 248 of these students were ineligible to participate: 187 students did not have ≥1 D of uncorrected refractive error and 61 students (8%) were referred for ophthalmologic care for corrected vision <20/25 (n = 6), eye disease (n = 2), significant anisometropia (n = 25), astigmatism (n = 22), and combined anisometropia and astigmatism (n = 6). The remaining 495 were randomized. There were 34 participants in the RMS and 33 participants in the CS group who were inadvertently enrolled with habitual vision of ≥20/40 and these were excluded from the analysis. There were 2 students who left school before receiving their spectacles, 10 students who did not complete the follow-up visit owing to absences from school, and 1 student who did not complete follow-up because he broke his spectacles soon after dispensing. A total of 13 students were therefore lost to follow-up (3% of those randomized).

With the exception of having slightly more boys in the CS group, there were no differences in age or socioeconomic parameters between the 2 groups (Table 2). The median household monthly income was between 1000 and 2000 yuan (US$147–293) and most households contained on average 2 to 3 adults and 2 children. The majority of parents had a high school education and approximately half were manual workers.

The average refractive error in the study population was −2.57±1.31 D and habitual vision ranged from 20/40 to 20/200 with an average habitual acuity in the better seeing eye of 20/63. There were no differences in the refractive characteristics between the 2 groups (Table 3). Astigmatism of ≥0.75 D in at least 1 eye was present in 36% of the sample and in both eyes in 15% of the study population. There were a smaller number of students with ≥ 1 D anisometropia (22/428, 5.1%).

The SE subjective refraction was less myopic than the objective refraction by 0.25 D (median difference). There were 8 cases (1.8%) where the prescription was adjusted after the student wore the subjective refraction in a trial frame. No hyperopic corrections were required in the RMS group, and the maximum myopic correction was −7 D. Twelve of the total proposed 25 inventory units were required and >60% were between −1.00 and −2.00 D.

Table 4 shows the comparison of the usage of spectacles in the 2 groups for the 415 students who completed follow-up. Although a high proportion had used the spectacles in the last 4 weeks, <50% had them in hand at the follow-up visit. The majority of students wore their spectacles for part of the day or for distance only. Those with higher myopia were more likely to be wearing spectacles “all day” (11.5% of those with ≤−2 D vs 2.0% of those with >−2 D SE; $P<0.001$). Most of the students reported needing to adapt to the study spectacles,

which took ≤1 week for 73% of these students. The need for and rate of adaptation did not differ between the RMS and CS. Furthermore, the perceived value of the spectacles was similar between the 2 groups: 89.5% in the RMS and 91.2% in the CS group perceived the value of their spectacles as being of moderate value, high value, or their most valued possession.

There were no differences in the rate of symptoms at either time point (Table 5). The presence of symptoms was similar when the students first received the study spectacles and at the follow-up visit (Table 5; McNemars test $P>0.05$) except for complaints of headache and dizziness, which were less common at the 1-month visit ($P = 0.03$ and $P<0.0001$). The likelihood of a decrease in symptoms was not different between the RMS and CS groups ($P>0.3$).

Vision improved by 4.5 lines of Snellen acuity on average with the study spectacles to an average acuity of 20/25. The corrected vision with the study spectacles is shown separately for the eye with higher spherical refractive error and the eye with lower refractive error in Figure 2. The visual acuity expressed as logMAR in the eye with the lower amount of spherical refractive error was slightly worse in the RMS compared with the CS (0.11±0.09 vs 0.08±0.07; $P = 0.004$), but the amount of improvement from baseline was similar between groups ($P = 0.45$). These averages expressed as Snellen acuities were $20/25^{-0.5}$ for RMS and $20/25^{+1}$ for CS for the eye with lower SE refractive error. As expected, the more myopic eye was more accurately corrected in the CS group and had corresponding better visual acuity scores (because the RMS were dispensed based on the less myopic eye). Vision in the eye with higher spherical refractive error was 0.14±0.12 logMAR in the RMS and 0.08±0.08 logMAR in the CS group ($P<0.001$, average Snellen acuity, $20/25^{-2}$ for RMS and $20/25^{-1}$ for CS).

These differences were more pronounced in the subgroup of 11 participants wearing RMS who had ≥1 D anisometropia. Average vision was 0.36±0.19 ($20/40^{-3}$±1.9 lines) in the eye with higher and 0.04±0.09 ($20/20^{-2}$±0.9 lines) in the eye with lower spherical refractive error, respectively. Although a small group of individuals, there were no trends suggesting a difference in the rate of symptoms in this subgroup.

For those participants with astigmatism of ≥0.75 D in at least 1 eye, the RMS provided vision that was approximately 1 line of Snellen acuity worse than that provided by the CS. For this subgroup, the average difference between RMS and CS was 0.05±0.08 (2.5 Snellen letters; $P = 0.005$) in the better seeing eye and 0.09±0.11 (4.5 letters) in the worse seeing eye ($P<0.001$). Blur was reported more often in these astigmatic patients when they first received their spectacles, but this did not reach statistical significance (RMS, 23/74 [31%] vs CS, 12/67 [18%]; $P=0.08$) and by 1 month the trend had reversed (RMS, 11/78 [14%] vs CS, 19/73 [26%], $P = 0.10$).

Subgroup analyses were conducted for those students with previous experience in spectacles, those with ≥1 D anisometropia and those with ≥0.75 D astigmatism in 1 or both eyes for the key outcome measures. Although the power was limited in these explorations,

the trends observed in the full dataset remained consistent and there were no new differences between the RMS and CS groups.

Discussion

In this analysis we compared RMS with CS in a group of Chinese high school students with predominantly myopic refractive error. The study was designed to be able to detect a 15% difference in compliance rate, which was considered clinically significant. However, we found that compliance to spectacle wear was close to 50% for both groups. This result was supported by the equivalence of other outcome measures, namely: perceived value, rate of remakes, symptoms, and patterns of use. Ready-made spectacles have the advantages of delivery of refractive care in 1 encounter, lower cost, and lower requirements for technical skills for refrac-tionists. These findings support the use of RMS in settings where feasibility or cost limitations dictate that CS would not be a sustainable option.

To the best of our knowledge, this is the first controlled clinical trial comparing RMS with CS. The efficacy of RMS depends on the characteristics of the population requiring refractive correction. Others have postulated that RMS would meet the needs of 66% to 89%[7,8,11] of those needing refractive correction. In our study, we excluded only those with high amounts of astigmatism and anisometropia (8% of students with refractive error) as not suitable for RMS and still found no clinically important differences in the visual outcomes in the RMS arm. Furthermore, in subgroup analyses, there were no trends evident for lower success for those with astigmatism or anisometropia. Therefore, RMS seems to work as well as CS in this population where simple myopic refractive error predominates. These findings imply that, in this population, ≥90% of students with uncorrected refractive error could be dispensed with RMS on the same day from an available inventory; the remainder may still require CS services either through referral or return visits to dispense spectacles.

We expected and were able to measure slightly worse visual acuity in children wearing RMS when compared with those using CS. The RMS have the same power in each eye, so if 1 eye had higher refractive error, it was undercorrected. Similarly, astigmats were not given their cylindrical correction in the RMS group. Although there were statistically significant differences in corrected visual acuity, the amount of blur (<1 line of Snellen acuity), did not translate into a difference in acceptability or value given to the spectacles. It is probable that this small amount of blur, in many cases affecting 1 eye, is not clinically significant.

At an unannounced visit 1 month after receiving new spectacles, just under half of the students in our study were found to have their spectacles on hand when examined. Lower rates of compliance in school-aged children have been reported elsewhere,[4,5] although these studies included students with lower refractive errors. Although it is disappointing in our study that only half of the students had their spectacles with them at the visit, many of the students reported using their spectacles part time (92%). Those wearing their spectacles full time had higher refractive error and therefore derived a greater benefit from their correction. The other measures of benefit, such as perceived value of the spectacles (91% moderate value to most valued possession) and planned continued use (93%) suggest that, although not worn all the time, the spectacles were useful to the students. Importantly, the rates of

symptoms and time to adapt to the spectacles did not differ between the students receiving RMS and those receiving CS.

All refractions were conducted with cycloplegia and spectacles were prescribed conservatively with a philosophy of prescribing the lowest powered lens that could provide acceptable acuity. Indeed, the final correction was on average 0.25 lower than the cycloplegic autorefraction and corrected vision was 20/25 on average. Although the benefits of undercorrecting myopia to limit progression are uncertain,[12] the practices described here adhere to best standards of care. Furthermore, the refraction technique used and the philosophy of prescribing were unlikely to have impacted the study findings.

The aim of this study was to investigate the short-term acceptability of RMS and CS. Furthers studies are needed to investigate compliance in the longer term. In addition, the study population was confined to a small age range and further testing would be required on younger students to explore feasibility in other age ranges.

Unlike the available reports on other RMS programs in developing countries,[13–15] this study had detailed longitudinal data on the acceptability of spectacle correction. The acceptability of RMS has been assessed for the first time in school-aged children in comparison with CS using a randomized trial design, with minimal crossover and few participants lost to follow-up (3%). Both students and investigators were unaware of treatment assignment, reducing potential bias in the subjective responses of the participants during follow-up visits. Furthermore, the baseline demographic and socioeconomic characteristics of the 2 groups were comparable, suggesting that randomization was successful. These strengths lend confidence to the study findings.

Screening for refractive error in schools and provision of spectacles is a key global strategy to reduce avoidable blindness and visual impairment[3] and is highly cost effective, particularly in teenage groups and in countries with high rates of refractive error.[16] At the outset of the study, the parents were asked how much they would pay for spectacles for their child and 79% indicated they would pay >100 yuan (US$15). This contribution to cost would make a RMS scheme sustainable. This study supports the use of RMS in school-based refractive services programs, reducing costs and improving the logistics of service delivery.

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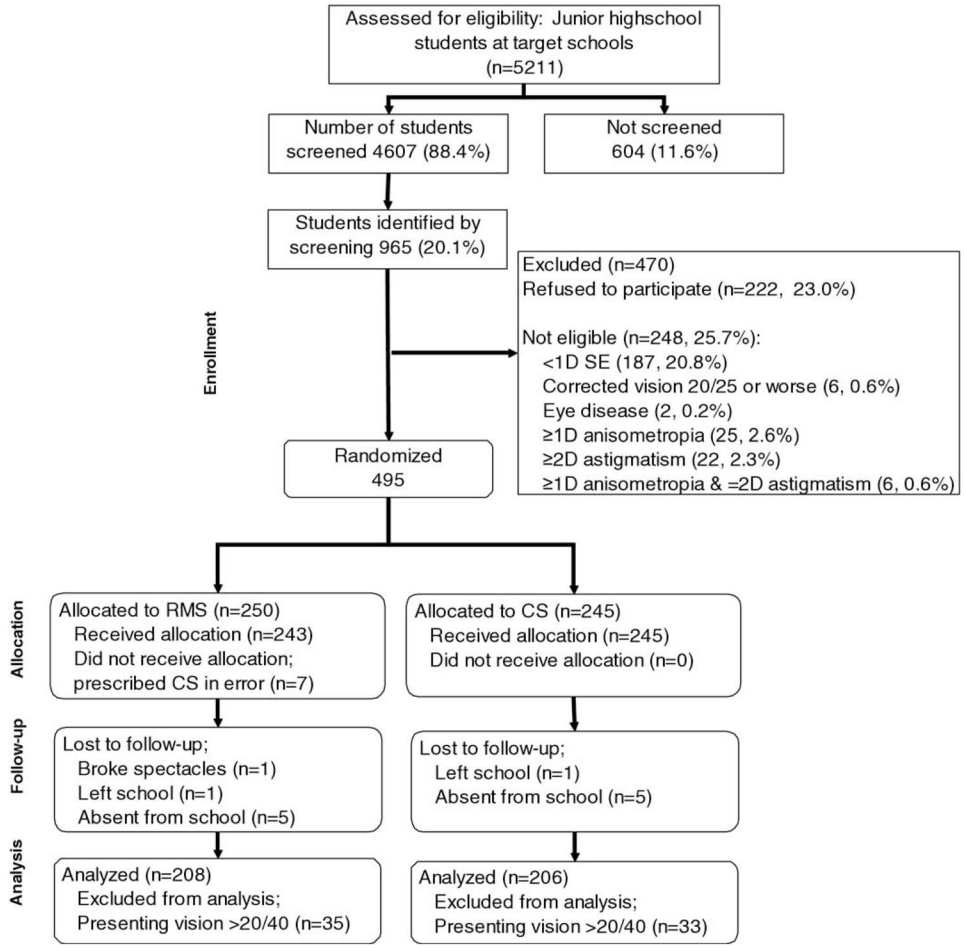

Figure 1.

Flow chart of screening and recruitment at 5 junior high schools and progress through the clinical trial. D = diopter; CS = custom spectacles; RMS = ready-made spectacles; SE = spherical equivalent refractive error.

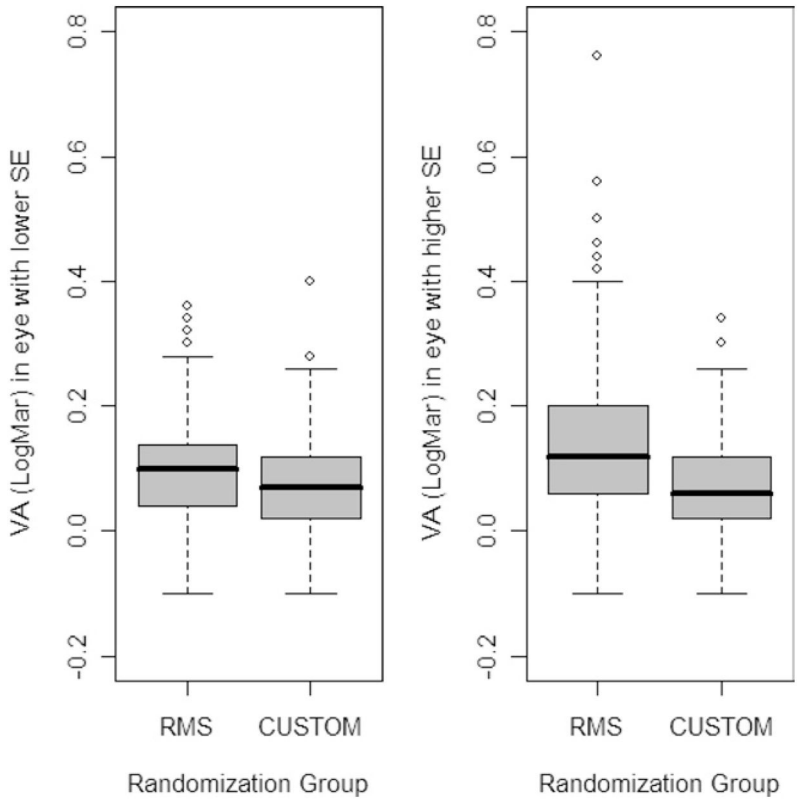

Figure 2.

Visual acuity (VA) with the study spectacles for the eye with lower spherical refractive error and the eye with higher spherical refractive error. LogMar = logarithm of the minimum angle of resolution; RMS = ready-made spectacles; SE = spherical equivalent refractive error.

Table 1

Eligibility Criteria for Participation in Ready-Made Spectacles Trial

Eligibility Criteria	Action
Presenting vision 20/40 or worse in better eye	Prescribed spectacles if required through ChildSight (Helen Keller International, New York, NY)
Minimum uncorrected spherical refractive error of ±1 diopter	
Best corrected distance acuity < 20/25*	Referred for further ophthalmologic evaluation
Cylinder power ≥2 D*	
Anisometropia (for myopia, sphere difference ≥2 D, for hyperopia, sphere difference ≥1 D*	
Other eye disease affecting vision*	

D = diopters.

* Exclusion criteria were based on the protocol of the Childsight screening program where refractive services for complicated cases were not provided directly at schools.

Table 2

Demographics of the Study Participants and Their Families

	Ready-Made Spectacles (n = 216)	Custom Spectacles (n = 212)	*P*
Age, yrs (mean ± SD)	14.1±1.0	14.1±0.8	0.57
Gender, n (% male)	93 (43)	114 (54)	0.03
Household monthly income in RMB, n (%)			
<1000	55 (26)	61 (29)	0.40
1001–2000	94 (44)	95 (45)	
2001–5000	59 (28)	49 (23)	
5001–10 000	3 (1)	2 (1)	
>10 000	3 (1)	4 (2)	
People in household			
Adults	2.4±0.9	2.4±0.8	0.93
Children	2.0±0.9	2.0±0.9	0.87
Married parents, n (%)	208 (97)	207 (98)	0.45
Mother education, n (%)			
Illiterate	0 (0)	3 (1)	0.94
Primary school	39 (18)	41 (19)	
Junior high school	121 (57)	106 (50)	
Senior high school	42 (20)	50 (24)	
Technical college	3 (1)	2 (1)	
University	9 (4)	9 (4)	
Father education, n (%)			
Illiterate	1 (0)	2 (1)	0.30
Primary school	21 (10)	35 (17)	
Junior high school	108 (50)	81 (39)	
Senior high school	64 (30)	80 (38)	
Technical college	6 (3)	4 (2)	
University	14 (7)	8 (4)	
Mother occupation, n (%)			
Unemployed	60 (28)	66 (31)	0.76
Manual worker	92 (43)	80 (38)	
Nonmanual worker	60 (28)	63 (30)	
N/A	1 (0)	1 (0)	
Father occupation, n (%)			
Unemployed	29 (14)	31 (15)	0.73
Manual worker	119 (56)	111 (53)	
Nonmanual worker	65 (30)	67 (32)	
N/A	1 (0)	0 (0)	

N/A = not applicable; RMB = renminbi; SD = standard deviation.

Table 3

Habitual Visual Acuity and Refractive Errors Measured by Cycloplegic Autorefraction (n = 428)

	Uncorrected Habitual Vision in the Better Eye,* mean ± SD (range)		Spherical Refractive Error†		Astigmatism		Anisometropia
			Average of Both Eyes	*Better Eye*			
Spectacle Group	***logMAR***	***Snellen***	***D, mean ± SD (range)***		***≥0.75 DC in Both Eyes, n (%)***	***≥0.75 DC in Either Eye, n (%)***	***1–2 D Difference, n (%)***
Ready made	0.51±0.15 (0.3–1.0)	$20/63^{-1}$±8 letters (20/40–20/200)	−2.55±1.24 (−7.38 to −1.00)	−2.40±1.22 (−7.25 to −0.88)	33 (15)	81 (38)	11 (5)
Custom	0.50±0.15 (0.3–0.9)	$20/63^{+1}$±8 letters (20/40–20/160)	−2.62±1.34 (−8.75 to +2.88)	−2.44±1.36	33 (16)	74 (35)	11 (5)
P value		0.47	0.77	0.86	1.00	0.62	1.00

DC = diopters cylinder; logMAR = logarithm of the minimum angle of resolution; SD = standard deviation.

*Before dilation.

†The spherical equivalent refractive error is an estimate of the best vision sphere (sphere + half of the cylindrical correction).

Table 4

Compliance to Spectacle Wear, Duration of Wear, Adaptation, and Value of Spectacles after 1 Month of Wear

Factor	Ready-Made Spectacles (n = 209)	Custom Spectacles (n = 206)	P*
Worn glasses in last 4 weeks?	197 (94.3)	190 (92.2)	0.48
Worn to visit?			
Yes	98 (46.9)	106 (51.5)	0.23
No	111 (53.1)	100 (48.5)	
How often worn?			
All day	15 (7.6)	15 (7.9)	0.88
Part of day	65 (33.0)	65 (34.2)	
Only for distance vision	116 (58.9)	107 (56.3)	
Only for near vision	1 (0.5)	3 (1.6)	
Did you need to adapt to spectacles?	164 (78.5)	162 (78.6)	0.81
Time to adapt			
<1 day	47 (28.7)	59 (37.0)	0.26
1–7 days	75 (45.7)	57 (35.2)	
1–2 weeks	20 (12.2)	22 (13.6)	
2–4 weeks	13 (7.9)	13 (8.0)	
Still not adapted	9 (5.5)	10 (6.2)	
Helping see better			
Dispensing visit†	198 (97.1)	199 (99.5)	0.10
Follow-up visit	203 (97.1)	204 (99.0)	0.22
Plan to continue to wear (at 1 month)?‡	195 (93.3)	193 (93.7)	0.80
Value of spectacles			
Most valued possession	25 (12.0)	25 (12.1)	0.75
High value	89 (42.6)	88 (42.7)	
Moderate value	73 (34.9)	76 (36.9)	
Some value	20 (9.6)	15 (7.2)	
No value or use	2 (1.0)	2 (1.0)	
Rate of remakes§	5 (2.3)	1 (0.5)	0.16

OD = right eye; OS = left eye; OU = both eyes.

*Adjusted for gender.

†Questionnaires not completed on those who were dispensed at a later date (n = 404).

‡Those not planning to continue to wear reported in ready-made spectacles (RMS): poor vision (n = 1; wearing −1.00 OU; subjective refraction OD, −1.75/−1.00 × 180; OS, −1.00/−0.75 × 165), frame not comfortable (n = 2), did not like how they looked in spectacles (n = 4), and other reasons (n = 1). In custom spectacles, lost (n = 1), broken (n = 1), did not like how they looked in spectacles (n = 3), and other reasons (n = 2).

§Four of 6 of those who had remakes were previous spectacle wearers. Reasons for remakes were broken frames (1 RMS), 0.25-diopter change owing to dizziness and headache (1 RMS, 1 Custom Spectacles), poor vision (3 RMS).

Table 5

Symptoms with New Spectacles and After 1 Month of Wear in the 2 Groups

Symptom	Ready-Made Spectacles	Custom Spectacles	*P*
Dispensing visit	n = 204	n = 200	
Blurred vision	50 (24.5)	44 (22.0)	0.57
Distorted vision	24 (11.8)	24 (12.0)	0.84
Headache	52 (25.5)	58 (29.0)	0.33
Disorientation	15 (7.3)	10 (5.0)	0.37
Dizziness	77 (37.7)	63 (31.5)	0.30
Eyestrain	105 (51.5)	92 (46.0)	0.41
Nausea	18 (8.8)	22 (11.0)	0.38
1-Month follow-up visit	n = 209	n = 205	
Blurred vision	44 (21.1)	40 (19.4)	0.77
Distorted vision	22 (10.5)	19 (9.2)	0.77
Headache	42 (20.1)	47 (22.8)	0.36
Disorientation	18 (8.6)	11 (5.3)	0.23
Dizziness	52 (24.9)	40 (19.4)	0.34
Eyestrain	110 (52.6)	91 (44.2)	0.17
Nausea	12 (5.7)	19 (9.2)	0.15

When spectacles were issued, there were 16 students who were absent from school and 6 students whose spectacles were not ready. These were issued at a later date, but symptom data were not collected at the dispensing visit. Two students never received their spectacles because they left the school. One student broke their spectacles soon after receiving them. Ten students were absent from school for the final visit.