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Predictors of Early Acceptance of Free Spectacles Provided to Junior High School Students in China

Lisa Keay, PhD, BOptom, **Yangfa Zeng, MD**, **Beatriz Munoz, MD**, **Mingguang He, MD, PhD**, and **David S. Friedman, MD, PhD**

Dana Center for Preventive Ophthalmology, Wilmer Eye Institute, The Johns Hopkins University, Baltimore, Maryland (Drs Keay, Munoz, and Friedman); The George Institute for Global Health, University of Sydney, Sydney, Australia (Dr Keay); State Key Laboratory of Ophthalmology, Zhongshan Ophthalmic Center, Sun Yat-sen University, Guangzhou, China (Drs Zeng and He); and Helen Keller International, New York, New York (Drs He and Friedman)

Abstract

Objective—To examine factors influencing adherence to spectacle wear and perceived value within a prospective 1-month trial of ready-made and custom spectacles in school-aged children with uncorrected refractive error in urban China.

Methods—A total of 428 students aged 12 to 15 years with at least 1 diopter of uncorrected refractive error were given free spectacles and evaluated 1 month later at an unannounced visit. Demographic factors, vision, optical effects, and perceptions were modeled as predictors of observed use and perceived value using logistic regression adjusted for spectacle allocation.

Results—Of 415 students, 388 (93.5%) planned to use their spectacles, 227 (54.7%) valued their spectacles highly, 204 (49.2%) had their spectacles on hand, and 13 (3.0%) were lost to follow-up. Female students were 1.72 times (95% confidence interval [CI], 1.10-2.68), students from lower income households were 1.78 times (1.32-2.39), and those not concerned over appearance were 2.04 times (1.25-3.36) more likely to have spectacles on hand. Students with a pupil size of 4 mm or greater were 2.55 times (95% CI, 1.61-4.03) and students with spectacle vision worse than 20/20 were 2.06 times (1.20-3.49) more likely to have spectacles on hand. Self-report of high perceived value was 2.23 times (95% CI, 1.30-3.80) more likely with 20/20 spectacle vision, 1.63 times (1.06-2.52) more likely with base-in prismatic effects of 0.5 prism diopters or more, 3.52 times (2.03-6.13) more likely when students would not tolerate blur to avoid wearing spectacles, and 2.16 times (1.24-3.76) more likely with disbelief that spectacles would make vision worse. Spectacle type had no effect.

Correspondence: Mingguang He, MD, PhD, State Key Laboratory of Ophthalmology, Zhongshan Ophthalmic Center, Sun Yat-sen University, Xianlie Road 54, Guangzhou, China (mingguang_he@yahoo.com.au).

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Conclusions—Although most students planned to use their spectacles, only half were observed using them. Day-to-day use might increase if students were less concerned over appearance. Optical factors and beliefs surrounding spectacles are also predictive of acceptance. These findings provide further understanding of spectacle acceptance in teenagers.

Uncorrected refractive error (URE) is one of 5 priority areas in the global initiative Vision 2020 and its efforts to reduce avoidable blindness[1] and is the primary cause of visual impairment in children in both developed[2,3] and developing[4-7] countries. Although screening services and spectacle provision through schools is an obvious solution,[8,9] the low rate of adherence to spectacle wear[10-14] raises concerns over the cost-effectiveness of spectacle provision programs in school-aged children.

Congdon and colleagues[11] found that the degree of refractive error did not predict whether school-aged children in South Africa would wear their new spectacles. Other surveys of spectacle usage found cultural disincentives to spectacle wear,[10,15-17] concerns over appearance with spectacles, [10,17] or other explanations such as lost or broken spectacles, lack of need, part-time use, or simply forgetting the spectacles the day of observation.[10]

Nonadherence may be explained by optical effects or spectacle intolerance.[10,18] We hypothesized that, in addition to optical effects, perceptions about spectacles and attitudes regarding spectacle use also influence the acceptance and perceived value of spectacles. In this research program, we collected extensive data on demographic factors, perceptions concerning spectacle wear, vision, optical effects, and refractive status to explore the acceptance of spectacles supplied through a school screening program in junior high school students with URE in urban China.

METHODS

We explored the determinants of spectacle acceptance within a prospective clinical trial of ready-made and custom spectacles.[13] The methods for recruitment and randomization have been reported in detail elsewhere.[13] In brief, 428 junior high school students from 5 schools in urban Guangzhou who had habitual vision of 20/40 or worse in either eye and at least 1 diopter (D) of URE were provided with new spectacles and evaluated after 1 month of use. The study population excluded 8.2% of students with URE who had high astigmatism, anisometropia, or eye disease. Informed assent from the participants and informed consent from at least 1 parent were gained after explanation of the nature and possible consequences of the study. The study was conducted in accordance with the Declaration of Helsinki. The Johns Hopkins Medicine and Zhongshan Ophthalmic Center institutional review boards approved the study protocol.

Demographic, socioeconomic, visual, optical, and perceptual characteristics of the students were investigated as determinants of spectacle adherence and perceived value (Table 1). Although results of the randomized clinical trial[13] indicated that ready-made and custom spectacles had equal acceptability, all analyses were adjusted for group allocation.

DEMOGRAPHIC VARIABLES

At enrollment, parents provided information on their child's medical and ocular history as well as social and demographic information about the family (Table 2 and Table 3). Income was grouped according to average monthly household income: less than 1000 ¥, 1001 to 2000 ¥, and 2001 ¥ or more.

VISION TESTING

Habitual vision was assessed at enrollment, before cycloplegia (achieved with administration of tropicamide, 0.5%), either with no correction or with the student's own spectacles. Corrected vision was measured with the study spectacles at issue. All measurements were taken using tumbling E charts (Precision Vision, Villa Park, Illinois) with retroillumination.[19] Because of space limitations, these charts were used at 2 m with a mirror to double the testing distance. Visual acuity was letter scored (0.02 logMAR per letter). The students were asked to continue reading rows of smaller letters until 4 of 5 letters were incorrectly identified.

The cycloplegic objective refraction was the average of 3 measurements (KR8800 autorefractor; Topcon Corp, Tokyo, Japan) and was the starting point for the subjective refraction. If the autorefraction indicated 0.75 D or less of astigmatism, the refraction was refined using spherical lenses only. If autorefraction indicated more than 0.75 D of astigmatism, spherical lenses and a Jackson cross cylinder (±0.25 D) were used to determine the spherocylindrical correction. The spectacle prescription was balanced by using binocular fogging and was the highest (most positive)–powered prescription that provided 20/20 vision. The prescription was adjusted after the student had worn the prescription for 10 minutes in a trial frame. Approximately half the participants were prescribed their full subjective prescription, whereas the remainder were prescribed from a limited range of spherical powers.[13] The students chose a frame from a large range with choices of metal (5 colors) or plastic (3 colors) frames with lenses that ranged from 42×16 mm to 52×16 mm, and temples that were 125 to 143 mm long.

Ocular dominance was determined with a test of preferential sighting. Participants were grouped into those with better or equivalent vision in the dominant eye and those who had better spectacle vision in the nondominant eye.

Refractions were determined by 2 optometrists, and measurements of visual acuity, pupil size, and pupillary distance and administration of the cover test were handled by ophthalmic nurses. The horizontal power was calculated using the combination of the spherical correction (D_S), cylindrical correction (D_C), and axis (α) according to the following formula:

$$D_{180}=D_s+D_c sin^2\alpha.$$

The horizontal prismatic effect at near was estimated using the Prentice rule:

$$P=c\times D,$$

where *c* indicates optical center decentration in centimeters and *D* is the horizontal power in diopters. By convention, a negative prismatic effect indicates base-in prism.

Pupil size was measured with a millimeter ruler in the ambient lighting of the room where all testing was conducted. Measurements were stratified into pupil sizes of 2 or 3 mm, 4 or 5 mm, and 6mmor larger. A cover test was conducted with fixation at 30 cm, and participants were classified as exophoric, orthophoric, or esophoric. *Heterophoria* was defined as any detectable movement when the eye was uncovered. The degree of heterophoria was not quantified. Students with strabismus were excluded from the study sample.

PERCEPTION OF SPECTACLES AND SATISFACTION

We selected items relating to attitudes toward spectacles from the Refractive Status and Visual Profile questionnaire[20] and developed new items (Table 1). The questionnaire was then translated into Mandarin. These items were formulated on the basis of a priori hypotheses about factors that could influence the use of spectacles. These specifically addressed tolerance of blur, aversion to spectacles, the belief that spectacles will increase myopia, trouble with frame comfort, and concern over appearance and were used to assess spectacle satisfaction. The items were pilot tested on a group of 52 students with URE. Questions were read aloud to groups of 2 or 3 students, understanding was confirmed, and the students were asked to give a written response at the 1-month visit.

ADHERENCE TO SPECTACLE WEAR

Spectacle adherence was assessed at an unannounced visit, 1 month after the new spectacles were dispensed. The students were asked to attend an eye examination session during a regular school day and to bring their spectacles to the testing room. *Adherence* was defined as students who were wearing their spectacles or had the spectacles on hand during the examination. The students were asked whether they planned to continue using the new spectacles.

PERCEIVED VALUE

A question was developed to assess the perceived value of the spectacles. Because most students in this age range do not purchase their own spectacles, a question on willingness to pay was not considered appropriate. The question we used was developed in consultation with investigators working with students in the ChildSight school screening program and was pilot tested on a group of 52 students. The question required students to rate the value of their spectacles on a 5-point Likert scale at the 1-month visit (Table 1).

STATISTICAL ANALYSES

Demographic data, a history of previous spectacle use, habitual and corrected vision, vision in the dominant eye, heterophoria and prismatic effects at near, and perception of spectacles were evaluated as predictors of adherence to spectacle wear and perceived value. The relationship between the 2 outcomes was evaluated with a Fisher exact test. Both outcomes were binary; 2-tailed *t* tests for continuous data and Fisher exact tests or χ^2 tests for categorical data were used as appropriate in univariate analysis. For categorical data that were ordinal, a Mantel-Haenszel χ^2 test for trend was used. The distribution of data for

continuous variables (habitual and spectacle vision) by the outcome measures was examined for nonlinearity. Continuous data were collapsed into categories according to quartiles before further analysis. Logistic regression was used to adjust for age, sex, and group allocation (ready-made or custom spectacles).

Variables were considered for the multiple regression models if they were significant at $P < .20$. These variables were added to the model individually. Colinearity and interactions were investigated.

RESULTS

Although 428 participants were enrolled in this clinical trial and given new spectacles free of charge, 13 students were lost to follow-up,[13] and data are available for 415 participants (97.0% of those eligible). The population was on average 14 years of age, and there were slightly more girls than boys (Table 2). The monthly household income was 2000 ¥ or less (≤$300) for 71.8% of this sample, the parental educational level was junior high school or less for most parents, and more than half the fathers were manual laborers.

In all, 193 of the 415 students (46.5%) wore their spectacles at the 1-month follow-up visit, and 11 students (2.7%) had their spectacles with them but were not wearing them. Thus, 204 students (49.2%) had their spectacles on hand. However, 388 students (93.5%) planned to continue to use their spectacles. When asked, 227 students (54.7%) stated that they valued their new spectacles highly or considered them their most valued possession. The students who were wearing their spectacles at the surprise visit were not necessarily those who attached high value to them (P=.08, Fisher exact test).

Several demographic factors were predictive of both spectacle adherence and perceived value (Table 4). Younger participants attached higher value to their study spectacles (P=.01) and tended to be more likely to wear their spectacles, but this did not reach statistical significance (P=.06). Although girls were more likely to be wearing their spectacles at the 1-month visit, sex did not affect perceived value. Students from lower-income households were also more likely to be wearing their spectacles ($P < .05$).

Before receiving their spectacles, the students had an average habitual Snellen acuity of 20/63 (mean [SD], 0.50[0.15] logMAR) and mean (SD) myopic refractive error of 2.60(1.29) D. Vision improved to $20/20^{-3.5}$ (0.07 [0.07] logMAR) with the study spectacles, and residual refractive error was estimated to be 0.46 (0.28) D. The relationship between acuity data and the outcomes studied was nonlinear, with inflection at the median value for habitual vision (20/63) and after the first quartile (20/20 or better) for spectacle acuity. Acuity data were therefore analyzed as dichotomous data defined by these cutoff values.

Whether the students had previous spectacle wearing experience was not predictive of either outcome measure. However, students with habitual vision that was worse than 20/63 placed higher value on their new spectacles (P=.04). Habitual vision did not affect whether the students were wearing their spectacles at the 1-month visit. Spectacle acuity was predictive of both outcomes. Those who achieved 20/20 vision in the better seeing eye reported higher perceived value compared with those with spectacle vision of 20/30 or worse. Unexpectedly,

those with worse spectacle vision were more likely to have their spectacles on hand at the follow-up visit. Slightly more than half the students (235 of 428 [54.9%]) had equivalent or clearer vision in their dominant eye, but these students were no more likely to be wearing their spectacles or to report high value. Students with larger pupil size (≥4 mm) were more likely to be wearing their spectacles ($P < .001$).

The amount of prismatic effect at near was on average 0.6 prism diopters (**Δ**) of base-in prism (range, 0.7 **Δ** base-out to 2.5 **Δ** base-in). At near, 95 of the 428 students given spectacles (22.2%) were exophoric and 37 (8.6%) were esophoric. The students with exophoria at near were more likely to attach high value to their study spectacles at the 1-month visit (P=.03). The presence of at least 0.5 **Δ** of base-in prism (which provides convergence relief) was associated with attaching high value to the spectacles (P=.02). A similar association was observed for spectacle adherence, but this association was not statistically significant (P=.10).

Ninety of 415 students (21.7%) had a neutral response to or agreed with the statement “I could accept less than perfect vision so long as I don’t have to wear spectacles.” This opinion was negatively associated with the perceived value of the spectacles ($P < .001$). Approximately one-third (133 of 415 [32.0%]) were ambivalent or agreed that wearing spectacles will make vision worse. This belief was more common among those who placed lower value on their spectacles (P=.02). Although a similar finding was present for spectacle nonadherence, this association was not statistically significant (P=.14). Report of problems with comfort or appearance was associated with both nonadherence and low perceived value (P <.05 for all).

In multivariate analysis, demographic factors were independently predictive of spectacle adherence (Table 5). Girls and students from lower-income households were nearly twice as likely to have their spectacles on hand. Unlike spectacle adherence, the perceived value was not influenced by age, sex, or income once other factors were considered.

The optical factors identified in univariate analysis remained independent predictors of spectacle adherence: students with spectacle vision worse than 20/20 and those with a larger pupil size were at least twice as likely to be wearing their spectacles. The direction and strengths of these associations were not altered when we adjusted for habitual visual acuity. As seen in univariate analysis, students with at least 20/20 vision and 0.5 **Δ** or more base-in prism with the spectacles were more likely to report high value. After adjustment for other factors, habitual vision was no longer predictive of perceived value (odds ratio, 1.4; 95% confidence interval, 0.95-2.2). Although significant in univariate analysis, exophoria as an independent factor and as an interactive term with base-in prism was not predictive of perceived value in multivariate analysis.

The 2 questions on an aversion to spectacle wear and the belief that wearing spectacles would make vision worse were independently associated with perceived value but did not predict spectacle adherence in multivariate analysis. Although statements of satisfaction with the appearance and comfort of spectacles were predictive factors in univariate analyses of perceived value, once other factors were considered neither was associated. However,

students who were not concerned over appearance while wearing spectacles were twice as likely to have their spectacles on hand after adjustment for other factors.

COMMENT

In this analysis, we explored adherence to spectacle wear and the perceived value of spectacles provided free of charge to junior high school students with URE in urban Guangzhou, China. Although most students (93.5%) intended to continue to use their new spectacles, observed use was closer to 50% 1 month after distribution. Despite a large range of frames being made available to these students, appearance with spectacles was one of the major determinants of observed use. In support of this finding, low rates of adherence have been attributed, in part, to poor cosmetic acceptability of Harry Potter–style frames provided free to students in Mexico.[10] Qualitative research in Tanzania found that children prescribed spectacles were concerned about being teased.[17] Addressing concerns about cosmetic acceptability is critical to deriving maximum benefit from spectacle provision programs.

As others have reported,[11] observed use is influenced, but cannot be fully explained, by the degree of refractive error. Previous investigations prescribed spectacles to individuals with less than1Dof refractive error and found that acceptance was particularly low in this subgroup.[10]

We investigated a number of other aspects of the optical performance of spectacles. The finding that students with worse than 20/20 spectacle acuity were more likely to have their spectacles on hand is possibly spurious. It is unlikely that those with worse than 20/20 vision had their spectacles with them so that they could complain about them because the school visits were unannounced. Unlike adherence, those with 20/20 vision or better valued their spectacles more, presumably in appreciation of clear distance vision.

To our knowledge, this is the first time pupil size has been examined in a study of spectacle adherence, and it proved to be an important predictor of spectacle use. Students with larger pupil size were more likely to have their spectacles on hand at the 1-month visit. The eye's depth of focus is inversely proportional to pupil size. This means that smaller pupils have greater depth of focus—also known as a "pinhole effect." Perhaps the students who had pupil sizes of 2 or 3 mm had a degree of natural pinhole effect, could see more clearly despite their refractive error, and therefore were less likely to be wearing their spectacles.

Another aspect of the performance of spectacles relates to the comfort with which the 2 eyes work together. It has been theorized that spectacle intolerance may result from horizontal prismatic effects. Short-term tolerance to prismatic effects were evaluated by du Toit and colleagues,[21] who recommended that up to 1 **Δ** of horizontal prism could be tolerated. In the present study, those fitted with ready-made spectacles had horizontal prismatic effects if the pupillary distance did not match the optical center distance. We found no evidence of problems with increasing amounts of prism, and the results suggested some preference for base-in prism. This might be explained by convergence relief with base-in prism and by improved comfort for close work.

Parental awareness of vision problems[16] and lack of trust of those involved in vision testing[17,22] have been reported as barriers to seeking eye care for school-aged children. In rural China, Li and colleagues[23] reported that 13% of those who did not purchase spectacles for their child were concerned that spectacles would weaken the eyes. In the present study, one-third of children were uncertain whether or believed that the use of spectacles will make their vision worse. In our sample, 87.7% of the parents were not spectacle wearers; this is in sharp contrast to the rate of myopia among children in urban southern China, which reaches 79% in 15-year-old children.[24] As others have recommended,[17] exploration of the beliefs surrounding spectacle use among students and parents is warranted in programs delivering refractive services. Education about the care taken in cycloplegic refractive correction, demonstration of the benefits of spectacle use, and lack of evidence that spectacle correction will increase myopia[25] should accompany spectacle delivery programs.

An association between low income and URE has been shown in urban Guangzhou[16] and also in the United States.[2] We suspect that some of our participants had not acquired spectacles because of cost. The association between low household income and observed use may be because these students were prevented from acquiring spectacles owing to the cost but were otherwise motivated to wear spectacles.

A strength of this study is that a large group was followed up longitudinally—although only for 1month—to investigate the determinants of spectacle acceptance. Furthermore, this population was derived from a school screening program and should be representative of children with URE in urban China. Assessing the perceived value through self-report is vulnerable to bias, particularly because the students may seek to please the study staff. Perceived value may also be affected by the fact that spectacles were provided free of charge. Despite these limitations, the relative perceived value is of merit, and the fact that it was associated with certain objective measures of optical performance lends credence to this outcome measure.

We have investigated 2 measures of spectacle acceptance: actual use at the time of a surprise visit and self-reported perceived value. Both of these measures provide important direction for refractive services in school-aged children. The common themes, such as concern over appearance in spectacles,[10,17] suggest that the study findings are generalizable to programs in other countries. There was tolerance to small amounts of horizontal prismatic effect and some preference for base-in prism. Regardless of vision improvement, concerns over appearance influence whether spectacles are worn. However, the perceived value of the study spectacles confirmed the importance of clear vision and improvement from habitual vision. Approximately 1 in 5 students had an aversion to spectacles, and one-third were uncertain whether or believed that wearing their spectacles would make their vision worse. Initiatives to alleviate these concerns may help students use spectacles more readily and thereby benefit from refractive correction when needed.

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Table 1

Analysis of Predictors of Spectacle Acceptance in Students With Habitual Vision of 20/40 or Worse

Type of Variable	Variable	Method of Data Collection
	Independent Variables	
Demographic Optical	Age, sex, and household income level	Parent interview/baseline visit
	Previous spectacle use	Parent interview/baseline visit
	Habitual visual acuity worse than 20/63	Eye examination/baseline visit
	Pupil size (2 or 3 mm, 4 or 5 mm, ≥6 mm)	
	Cover test at near (exophoria, orthophoria, or esophoria)	
	Spectacle vision at least 20/20	Eye examination/dispensing visit
	Better vision in dominant eye	
	Base-in prism at near with spectacles (≥0.5 prism diopters)	
Perceptual	"I could accept less than perfect vision so long as I don't have to wear spectacles"[a]	Student interview/1-mo visit
	"I believe that if I wear spectacles my vision will get worse"[a]	
Satisfaction	"The sensation of having spectacles on your face"[b]	
	"I do not like how I look with spectacles"[b]	
	Outcome Variables	
Spectacle acceptance	Observed to be wearing spectacles or have them in their possession	Eye examination/1-mo visit
	"How valuable are these new spectacles to you?"[c]	Student interview/1-mo visit

[a] Scored on a Likert scale. Possible responses were strongly disagree, disagree, neither agree nor disagree, agree, and strongly agree.

[b] Scored on a Likert scale. Possible responses were no trouble at all, a little trouble, moderate trouble, severe trouble, and so much trouble I have not used spectacles.

[c] Scored on a Likert scale. Possible responses were most valued possession, high value, moderate value, some value, and no value or use.

Table 2

Demographic Characteristics of the Study Participants and Their Families

Characteristic	Students Given Spectacles (n=427)[a]
Age, mean (SD), y	14.1 (0.9)
Male sex	207 (48.5)
Monthly household income, ¥ (n=425)	
≤1000	116 (27.3)
1001-2000	189 (44.5)
≥2001	120 (28.2)
People in household, median (range), No.	
Children	2 (1-6)
Adults	2 (1-10)
Married parents	415 (97.2)
Mother's education (n=425)	
Illiterate	3 (0.7)
Primary school	80 (18.8)
Junior high school	227 (53.4)
Senior high school	92 (21.6)
Technical college	5 (1.2)
University	18 (4.2)
Father's education (n=424)	
Illiterate	3 (0.7)
Primary school	56 (13.2)
Junior high school	189 (44.6)
Senior high school	144 (34.0)
Technical college	10 (2.4)
University	22 (5.2)
Mother's occupation (n=421)	
Unemployed	126 (29.9)
Manual laborer	172 (40.9)
Nonmanual laborer	123 (29.2)
Father's occupation (n=422)	
Unemployed	60 (14.2)
Manual laborer	230 (54.5)
Nonmanual laborer	132 (31.3)

[a] One survey was missing; data were available for 427 students except as noted. Unless otherwise indicated, data are given as number (percentage) of students. Percentages are based on section totals and, because of rounding, may not total 100.

Table 3

Ocular History and Characteristics of the Study Participants

Characteristic	Students Given Spectacles (N=428)[a]
Parents wearing spectacles (n=424)	
Mother	16 (3.8)
Father	30 (7.1)
Both	6 (1.4)
Neither	372 (87.7)
Child's spectacles experience	
Parent or student report	167 (39.0)
If reported by parent, location where data collected (n=159)	
Hospital clinic	56 (35.2)
Optical shop	101 (63.5)
Other	2 (1.3)
Child visited ophthalmologist (n=427)	94 (22.0)
Parent reports child has problems with eyes (n=427)	310 (72.6)
Parent-reported eye condition (n=427)	
Lazy eye	30 (7.0)
Eye turn/squint	12 (2.8)
Eye injury	8 (1.9)
Eye surgery or other condition	4 (0.9)
Vision in better-seeing eye at first examination, mean (SD), logMAR	0.46 (0.18)
Average refractive error, mean (SD), D[b]	2.60 (1.29)
Average residual refractive blur with study spectacles, mean (SD), D	0.46 (0.28)
Dominant eye better or equivalent spectacle vision[c]	235 (54.9)
Prismatic effect at near, median (IQR), Δ[d]	−0.56 (−0.35 to −0.83)
Cover test at near	
Exophoria	95 (22.2)
Orthophoria	296 (69.2)
Esophoria	37 (8.6)

Abbreviations: **Δ**, prism diopters; D, diopters; IQR, interquartile range.

[a] Unless otherwise indicated, data are given as number (percentage) of students.

[b] Average refractive error is the mean of the length of the power vector (which combines spherical and cylindrical refractive error) for the right and left eyes.

[c] Proportion of participants whose vision in the dominant eye was better than or equivalent to vision in the nondominant eye.

[d] Negative values indicate base-in prism.

Table 4

Univariate Analysis of Predictors of Spectacle Adherence and Perceived Spectacle Value in 415 Students

Characteristic	1-mo Visit				Spectacle Value			
	Spectacles Not Worn (n=211)	Spectacles on Hand (n=204)	*P* Value[a]	*P* Value[a,b]	Moderate Value or Less (n=188)	Highly to Most Valued Item (n=227)	*P* Value[a]	*P* Value[a,b]
Demographic								
Age, mean (SD), y	14.2 (0.8)	14.0 (1.0)	.09	.06	14.2 (0.9)	14.0 (0.9)	**.01**	**.01**
Female sex	99 (46.9)	119 (58.3)	**.02**	**.01**	100 (53.2)	118 (52.0)	.84	.86
Monthly household income, ¥[c]			**<.001**[d]	**<.001**			.19	.17
<1000	44 (21.0)	71 (34.8)			46 (24.5)	69 (30.5)		
1001-2000	90 (42.9)	94 (46.1)			86 (45.7)	98 (43.4)		
≥2001	76 (36.2)	39 (19.1)			56 (29.8)	59 (26.1)		
Custom spectacles	103 (48.8)	108 (52.9)	.43	.21	95 (50.5)	116 (51.1)	.92	.79
Vision and optical								
Previous spectacle wearer	88 (41.7)	72 (35.3)	.19	.29	70 (37.2)	90 (39.7)	.69	.41
Habitual vision worse than 20/63	100 (47.4)	108 (52.9)	.28	.30	84 (44.7)	124 (54.6)	**.048**	**.04**
Spectacle VA 20/20 or better (≤0.0 logMAR)	59 (28.0)	30 (14.7)	**<.001**	**<.001**	28 (14.9)	61 (26.9)	**.005**	**.005**
Better vision in dominant eye[e]	118 (55.9)	108 (52.9)	.56	.56	104 (55.3)	122 (53.7)	.77	.77
Pupil size, mm			**<.001**	**<.001**			.83	.73
2 or 3	101 (47.9)	51 (25.0)			65 (42.8)	87 (38.3)		
4 or 5	103 (48.8)	141 (69.1)			117 (62.2)	127 (55.9)		
≥6	7 (3.3)	12 (5.9)			6 (3.2)	13 (5.7)		
Near exophoria[f]	41 (19.4)	51 (25.0)	.19	.23	50 (26.6)	42 (18.5)	.06	**.03**
Near esophoria[f]	18 (8.5)	19 (9.3)	.86	.58	15 (8.0)	22 (9.7)	.61	.43
≥0.5 Δ base-in prism at near	112 (53.1)	125 (61.3)	.11	.10	95 (50.5)	142 (62.6)	**.02**	**.02**
Perceptual[g]								
I could accept less than perfect vision so long as I don't have to wear spectacles	50 (23.7)	40 (19.6)	.34	.46	59 (31.4)	31 (13.7)	**<.001**	**<.001**
I believe that if I wear spectacles my vision will get worse	75 (35.5)	63 (30.9)	.35	.14	73 (38.8)	65 (28.6)	**.03**	**.02**
Satisfaction[h]								

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Characteristic	1-mo Visit				Spectacle Value			
	Spectacles Not Worn (n=211)	Spectacles on Hand (n=204)	*P* Value[a]	*P* Value[a,b]	Moderate Value or Less (n=188)	Highly to Most Valued Item (n=227)	*P* Value[a]	*P* Value[a,b]
Trouble with comfort	51 (24.2)	33 (16.2)	.05	**.045**	54 (28.7)	30 (13.2)	**<.001**	**<.001**
Trouble with appearance	70 (33.2)	46 (22.5)	**.02**	**.009**	67 (35.6)	49 (21.6)	**.002**	**.004**

Abbreviations: **Δ**, prism diopters; VA, visual acuity.

[a] Boldface values are statistically significant.

[b] Adjusted for age, sex, and group assignment.

[c] Data were available for 187 students who placed moderate value or less on their spectacles and for 226 students who considered the spectacles a highly or most valued item.

[d] Mantel-Haenszel χ^2.

[e] Vision better than or equivalent to vision in the nondominant eye.

[f] *Heterophoria* was defined as any movement when the eye was uncovered during the cover test assessment.

[g] Scored on a Likert scale. Possible responses were neither agree nor disagree, agree, and strongly agree.

[h] Scored on a Likert scale. Possible responses were moderate trouble, severe trouble, and so much trouble I had to remove spectacles.

Table 5

Multivariate Analyses of Predictors of Adherence to Spectacle Wear and High Perceived Value in 415 Students

Characteristic	OR (95 % CI)[a]	
	Spectacles on Hand at 1-mo Visit	Spectacles Are Highly to Most Valued Item
Demographic		
Younger age, per 1-y decrease	1.19 (0.94-1.51)	1.21 (0.96-1.53)
Female sex	**1.72 (1.10-2.68)**	0.94 (0.61-1.45)
Lower income	**1.78 (1.32-2.39)**	…
Custom spectacles, yes vs no	1.25 (0.80-1.93)	1.03 (0.67-1.59)
Optical		
Previous spectacle wear, yes vs no	…	…
Worse than 20/63 habitual vision, yes vs no		…
Worse than 20/20 vision, yes vs no	**2.06 (1.20-3.49)**	…
Better than 20/20 vision, yes vs no	…	**2.23 (1.30-3.80)**
Pupil size ≥4 mm, yes vs no	**2.55 (1.61-4.03)**	…
Exophoria at near, yes vs no[b]	…	…
≥0.5 prism diopters base-in prism at near, yes vs no	…	**1.63 (1.06-2.52)**
Perceptual		
Will not accept less than perfect vision	…	**3.52 (2.03-6.13)**
Disagree that spectacles make vision worse	…	**2.16 (1.24-3.76)**
Satisfaction		
Less trouble with spectacle comfort[c]	…	1.21 (0.96-1.53)
Less trouble with appearance[c]	**2.04 (1.25-3.36)**	0.94 (0.61-1.45)

Abbreviations: CI, confidence interval; OR, odds ratio; ellipses, not included in the model.

[a] Boldface data are statistically significant.

[b] Defined as any movement of the visual axis of one eye away from that of the other eye when the eye was uncovered during the cover test assessment.

[c] Scored on a Likert scale. Possible responses were moderate trouble, severe trouble, and so much trouble I had to remove spectacles.