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Visual symptoms and compliance with spectacle wear in myopic children: double-masked comparison between progressive addition lenses and single vision lenses.

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Abstract

The aim of this study is to clarify visual symptoms and compliance with spectacle wear in children kusing progressive addition lenses (PALs). Ninety-two children, participating in a randomized, doublemasked, crossover trial to determine whether PALs reduce myopia progression (mean+/-SD age: 11.0+/-1.6 years; refractive errors: 3.11+/-1.34 D), wore PALs (1.50 D near addition) or single vision lenses (SVLs) for 18 months, alternately. A questionnaire survey was performed 6 and 12 months after the beginning of the use of the lenses (6-month survey), and the results were compared between PAL- and SVL-wearing periods. In the PAL-wearing period, the children reported difficulty in adapting to newly provided spectacles (36%), disturbances in distance vision (22%), vertigo in the lateral gaze (11%), and difficulty in ascending and descending stairs (9%). However, the frequency of these symptoms was not significantly different from that reported in the SVL-wearing period. There was no difference in compliance with spectacle wear between the PAL- and SVL-wearing periods, and 98% of the children wearing PALs reported excellent compliance. The results of this study indicate that, compared with SVLs, the PALs provide a similar level of comfort and compliance with spectacle wear for myopic children.

KEYWORDS: questionnaire survey, myopic children, progressive addition lenses, double-masked study

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Original Article

Visual Symptoms and Compliance with Spectacle Wear in Myopic Children: Double-Masked Comparison between Progressive Addition Lenses and Single Vision Lenses

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The aim of this study is to clarify visual symptoms and compliance with spectacle wear in children using progressive addition lenses (PALs). Ninety-two children, participating in a randomized, double-masked, crossover trial to determine whether PALs reduce myopia progression (mean ± SD age: 11.0 ± 1.6 years; refractive errors: −3.11 ± 1.34 D), wore PALs (+1.50 D near addition) or single vision lenses (SVLs) for 18 months, alternately. A questionnaire survey was performed 6 and 12 months after the beginning of the use of the lenses (6-month survey), and the results were compared between PAL- and SVL-wearing periods. In the PAL-wearing period, the children reported difficulty in adapting to newly provided spectacles (36%), disturbances in distance vision (22%), vertigo in the lateral gaze (11%), and difficulty in ascending and descending stairs (9%). However, the frequency of these symptoms was not significantly different from that reported in the SVL-wearing period. There was no difference in compliance with spectacle wear between the PAL- and SVL-wearing periods, and 98% of the children wearing PALs reported excellent compliance. The results of this study indicate that, compared with SVLs, the PALs provide a similar level of comfort and compliance with spectacle wear for myopic children.

Key words: questionnaire survey, myopic children, progressive addition lenses, double-masked study

Progressive addition lenses (PALs) or bifocal spectacles are usually prescribed to compensate for age-related deterioration of accommodative function in presbyopic adults, but PALs are sometimes also prescribed to children under different circumstances. For example, PALs have been used for refractive correction in patients with accommodative esotropia showing a high accommodative convergence to accommodation (AC/A) ratio [1, 2], pseudophakic eyes after surgery for congenital cataract [3], and pathologic or iatrogenic accommodative insufficiency [4–9]. In addition, several clinical trials recently reported evidence that PALs slow myopia progression in children [10–13].

On the other hand, there are several problems with the use of PALs. First, in order to obtain a clear image, patients need to use the appropriate part of the lens depending on the distance to the visual object. For example, blurred vision in the downward gaze due to the near addition may pose a problem in ascending or descending stairs. Second, prismatic effects of the lateral sides of the progressive corridor may induce

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transient drift of spatial localization. Consequently, some patients complain of vertigo or dizziness when changing their gaze horizontally [14]. Third, lens frames are likely to be deformed and displaced in the downward direction, especially in children [15]. Misalignment of the lenses would be more problematic with PALs than with SVLs. It is unclear how children can cope with these problems associated with the use of PALs in daily activities. These problems may reduce compliance with spectacle wear.

However, clinical studies on how children deal with these problems have been limited [14, 16]. In this study, we performed questionnaire surveys in children participating in a randomized, double-masked, crossover trial to determine whether PALs slow myopia progression. By comparing the results of the questionnaires between PAL- and SVL-wearing periods, we tried to determine whether children can use PALs comfortably and how the difference in the lens design affects compliance with spectacle wear.

Subjects and Methods

Subjects. Ninety-two children (mean ± SD age: 11.0 ± 1.6 years; mean spherical equivalent refractive errors: −3.11 ± 1.34 D, 43 girls) were recruited from participants in the Myopia Control Trial with PALs in Japanese Children [13]. This trial was designed as a crossover trial, wherein the children were randomly allocated to wearing PALs (n = 46) or SVLs (n = 46) at the initial visit, and each child switched from PALs to SVLs or vice versa in the middle of the trial period of 3 years.

The inclusion criteria of this trial were: 1) the spherical equivalent refractive error was from −6.00 D to −1.25 D in either eye; 2) astigmatism was equal to or less than 1.50 D in both eyes; 3) anisometropia was equal to or less than 1.50 D; 4) best-corrected visual acuity was equal to or better than 1.0 (corresponds to 20/20); 5) no manifest strabismus; 6) age was from 6 to 12 years; 7) birth weight was equal to or more than 1250 g; 8) no eye disease except for refractive error; 9) no experience of wearing PALs or contact lenses; and 10) wearing SVLs before entry into this trial.

This study and protocols conformed to the tenets of the Declaration of Helsinki. Informed consent (parents) and assent (children) were obtained after verbal and written explanations of the nature and possible consequences of the study. The participants also agreed to use the study glasses provided at all times if possible.

Spectacle prescribing protocol. MC lenses (Sola International, San Diego, CA, USA), which had a near addition power of +1.50 D with a progressive corridor of 10 mm, were provided to the children. The near addition power of +1.50 D was chosen because it reduces accommodative demand in daily activities to the level of tonic accommodation (approximately 1.5 D), where a lag of accommodation does not occur in theory [13]. The distant prescription (or lens power in the far part of PALs) was similarly determined at the minimum spherical power that provided a distant visual acuity of 1.0 (corresponding to 20/20) after complete correction of astigmatism, which was shown by non-cycloplegic autorefraction, with a cylindrical lens. At the follow-up visits scheduled every 6 months and non-scheduled visits when children reported problems, distant visual acuity through the study glasses was measured. When the visual acuity was less than 0.7 (approximately corresponding to 20/30) in at least 1 eye, new lenses were prescribed using the same procedure mentioned above. All of the study glasses were provided to the children free of charge.

The spectacle frames were made of shape-memory alloys and carefully adjusted so that the fitting point of the lens was in alignment with the center of the entrance pupil (the back vertex distance: 12 mm, pantoscopic angle: 6 degrees). However, a considerable downward deviation of the lenses was observed at the 6-month visit [15]. Thereafter, we used a modified fitting protocol in which the fitting point was set 3–4 mm above the pupil center.

Questionnaire surveys. Questionnaire surveys were administered at the 6-, 12-, 24-, and 30-month visits. The questionnaire was made up of simple questions so that young children might be able to answer easily. They consisted of 5 questions to be answered by selecting 1 of 2 possible answers, and 1 question to be answered by selecting 1 of 3 possible answers. Question (Q) 1 evaluated the adaptability at the beginning of the spectacle use, and Qs 2 and 3 evaluated disturbances in distance vision and in near vision, respectively. Qs 4 and 5 evaluated problems expected to occur due to the optical characteristics of the PALs, *i.e.* difficulty in ascending or descending stairs and dizziness or vertigo in the lateral vision, respectively. Q 6 evaluated compliance with spectacle wear (time of use). The answers were collected by a questioner, who orally asked questions while presenting a document indicating the questions and possible answers. The parents were not present during this procedure.

The allocation of the spectacle type (PALs or SVLs) was carefully masked from the children, their parents, and the questioners throughout this study. At the final (36-month) visit, an additional questionnaire (Q 7) was performed to evaluate the degree of the masking against spectacle allocation. Here, the children were requested to select 1 of 3 possible answers: 1) Used PALs in the first half of the trial, 2) Used PALs in the second half of the trial, and 3) Unclear.

Assessment of clinical characteristics. Details of the measurement of refractive errors, lag of accommodation, and heterophoria have been reported [13, 17] and are briefly summarized herein. Refractive errors were measured with cycloplegic autorefraction (Nidek ARK2000, Gamagori, Japan). Lags of accommodation were measured with an open-view autorefractor WV-500 (Grand Seiko, Fukuyama, Japan) under full refractive correction with spectacle lenses while the subject was binocularly looking at a high contrast Maltase cross located 16.0, 20.9, 32.5 and 50.5 cm in front of the eyes (corresponding to an accommodative demand of 1.96–6.24 D). The mean of the differences between the accommodative response and the effective accommodation demand was regarded as a representative lag of accommodation. Heterophoria at near (33 cm) and distance (5 m) was measured under the refractive correction using the prism and alternating cover test.

Statistical analyses. The lens power and degree of anisometropia of the spectacles at the beginning of their use were compared between the PAL- and SVL-wearing periods after the refractive values were converted to M (spherical equivalent), J_0 (dioptric power of a Jackson cross cylinder at axis 0 degrees), and J_{45} (dioptric power of a Jackson cross cylinder at axis 45 degrees) by dioptric power matrix [18]. Since the lens type was switched at the middle of the trial (*i.e.*, at the 18-month visit), the questionnaire results from the 6- and 24-month visits were combined for evaluation 6 months after the beginning of the spectacle use (6-month survey), and those from the 12- and 30-month visits were combined for evaluation 12 months after the beginning of the spectacle use (12-month survey). The results were then compared between PAL- and SVL-wearing periods at the 6-month survey and between the 6- and 12-month surveys in the PAL-wearing period by the chi-square or Fisher's exact probability test. The relationships between the questionnaire results and the baseline clinical characteristics were analyzed using a categorical logistic regression model. The relationship between compliance with spectacle wear and refractive errors was analyzed using a continuous logistic regression model. The statistics were calculated using JMP version 5.01a (SAS International, Reading, Berkshire, UK).

Results

Complete results of the questionnaires were obtained from 89 children; 6 were lost to follow up. The mean ($\pm$ SD) age at baseline was 11.0 ± 1.6 years in the PAL-starting children and 11.0 ± 1.7 years in the SVL-starting children, with no significant difference between the groups. There was no significant difference in the lens power and degree of anisometropia of the study glasses between the PAL- and SVL-wearing periods (Table 1).

The children easily answered the questionnaires, and the questionnaire procedure was usually completed in 3 min. Table 2 (left and center columns) compares the results of the questionnaires between the PAL- and SVL-wearing periods at the 6-month survey. In the PAL-wearing period, difficulty in adaptation to the new glasses (Q1) was the most frequently reported answer (36%), followed by disturbance in distance vision (Q2) and dizziness or vertigo in the lateral vision (Q5). The frequencies of disturbance in near vision (Q3) and difficulty in ascending or descending stairs (Q4) were both less than 10%. No significant difference was found between in the PAL- and SVL-wearing periods in any of these questions. Table 2 (right column) compares the results in the PAL-wearing period between the 6- and 12-month surveys. The difficulty in ascending or descending stairs (Q4) decreased significantly at the 12-month survey.

The compliance with the spectacle use was not sig-

Table 1 Comparison of lens power and degree of anisometropia of the study glasses between PAL- and SVL-wearing periods at baseline (mean ± SD)

	PALs (n = 92)	SVLs (n = 95)	*P*-value*
Means of the right and left lens power (distance prescription)			
M	− 3.18 ± 1.47 D	− 3.01 ± 1.18 D	0.39
J_0	0.13 ± 0.31 D	0.11 ± 0.31 D	0.86
J_{45}	− 0.02 ± 0.08 D	− 0.02 ± 0.08 D	0.83
Difference between the right and left lens power (anisometropia)			
M	0.12 ± 0.48 D	0.10 ± 0.49 D	0.81
J_0	− 0.03 ± 0.18 D	− 0.07 ± 0.23 D	0.16
J_{45}	− 0.04 ± 0.22 D	− 0.04 ± 0.22 D	0.89

The spherical and cylindrical power of the spectacle lenses were converted to M (spherical equivalent), J_0 (dioptric power of a Jackson cross cylinder at axis 0 degrees), and J_{45} (dioptric power of a Jackson cross cylinder at axis 45 degrees) using a dioptric power matrix [18]. PALs, progressive addition lenses; SVLs, single vision lenses. *: unpaired *t*-test.

nificantly different between PAL- and SVL-wearing periods. In the PAL-wearing period, 79% of the children answered that they always used the glasses. When combined with the 19% who answered that they usually used them, 98% of the children were satisfactorily compliant with the PALs (Table 2). The relationship between the compliance and refractive errors is shown in Fig. 1. In both treatment periods, the compliance improved with an increase in the degree of myopia. Approximately 15% of the children with low myopia reported poor compliance (*i.e.*, wearing them only at class) in the SVL-wearing period

Table 3 shows the relationship between the questionnaire results obtained at the 6-month survey and baseline clinical characteristics such as age, refractive error, near heterophoria, and lag of accommodation. There was no significant correlation between any of these combinations in the PAL-wearing period.

Table 2 Comparisons of the questionnaire results between PAL- and SVL-wearing periods at the 6-month survey and between the 6- and 12-month surveys in the PAL-wearing period

Type of spectacles	6-month survey		*P*-value †	12-month survey	
	PALs (n = 87)	SVLs (n = 91)		PALs (n = 89)	*P*-value §
Q1: Was it difficult to adapt to the new spectacles?					
Yes	31 (36%)	27 (31%)	0.45	N/A	N/A
No	55 (64%)	61 (69%)			
Q2: Is there any difficulty when looking at the blackboard?					
Yes	19 (22%)	14 (15%)	0.27	15 (17%)	0.40
No	68 (78%)	77 (85%)		74 (83%)	
Q3: It there any difficulty when reading or writing?					
Yes	5 (6%)	6 (7%)	0.82	1 (1%)	0.12
No	82 (94%)	85 (93%)		88 (99%)	
Q4: Is there any difficulty when ascending or descending the stairs?					
Yes	8 (9%)	4 (4%)	0.20	0 (0%)	0.00*
No	79 (91%)	87 (96%)		89 (10%)	
Q5: Do you feel vertigo or dizziness in lateral vision?					
Yes	10 (11%)	6 (6%)	0.25	3 (3%)	0.05
No	77 (89%)	85 (93%)		86 (96%)	
Q6: I use the spectacles:					
1) at class only	2 (2%)	5 (5%)	0.50	3 (3%)	0.18
2) usually	16 (18%)	14 (15%)		8 (9%)	
3) always	69 (79%)	72 (79%)		78 (88%)	

* $p < 0.01$, † *P*-value for a comparison between PAL- and SVL-wearing periods, §: *P*-value for a comparison between the 6- and 12-month surveys in the PAL-wearing period, N/A: not available, The total sample number for each question differed due to unavailable data.

However, in the SVL-wearing period, significant correlations were found between disturbance in near vision (Q3) and age and between compliance with spectacle wear (Q6) and refractive errors.

In the questionnaire regarding the spectacle allocation (Q7), the answers were correct in 35 (54%), incorrect in 16 (24%), and unclear in 12 (22%) (data were not available for 25 children). Significantly more children answered correctly than incorrectly (Pearson test, $p = 0.019$).

Discussion

In this questionnaire survey, the myopic children wearing PALs frequently reported visual symptoms such as disturbance in distance vision, disturbance in near vision, difficulty in ascending or descending stairs, and vertigo or dizziness in lateral vision. However, the frequency of these symptoms was not significantly different from that reported by the children wearing SVLs. Most (98%) of the children were compliant with the use of PALs, and there was no need to discontinue the use of PALs or to change to SVLs in any of the children during the 18-month treatment period. These results indicate that children can use PALs without significant visual problems in their daily activities.

Visual symptoms associated with the use of PALs. The frequency of difficulties adapting to the newly prescribed spectacles did not differ significantly between the PAL- and SVL-wearing periods. In the Correction of Myopia Evaluation Trial (COMET) [14], the problem was observed more frequently in PAL-wearing children than in SVL-wearing children 1 week after the beginning of the use of the spectacles, but the differences spontaneously disappeared 1 month later. In the face of an optical disturbance such as newly prescribed glasses, different oculomotor and sensory systems show adaptive responses to maintain visual performance. Reportedly, an adaptive response in tonic vergence [19], AC/A ratio [20], and a sensory mechanism that establishes spatial localization [21, 22] takes several hours to weeks to complete. These experimental findings well explain the results obtained in COMET children. However, because our questionnaire was performed 6 months after the children started to use PALs, their memory concerning this symptom in this early adaptation period may have been unclear.

The disturbance in distance vision (Q2) is mainly explained by the individual progression of myopia during the 6-month interval between the surveys. In this

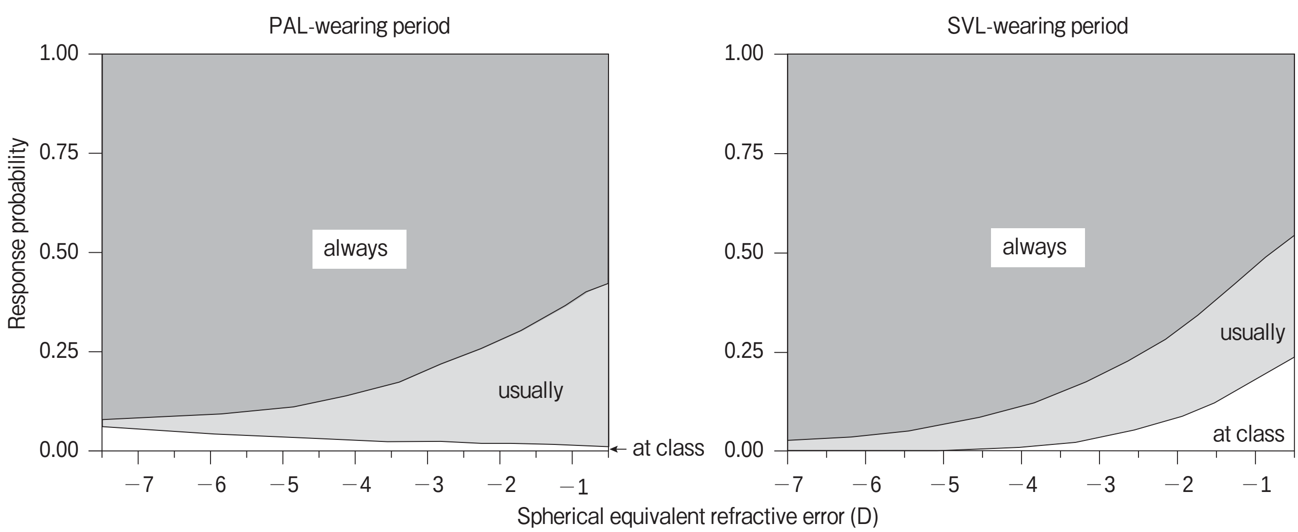

Fig. 1 Cumulative probability plot of compliance with spectacle wearing as a function of refractive errors determined at the 6-month survey.
Using a logistic regression model, the graph is divided into 3 response categories: at class only, usually, and always. The vertical distance between the curves represents the probability for each category. The correlation was significant in SVL-wearing children ($P = 0.01$, $R^2 = 0.06$).

Table 3 Results obtained at the 6-month survey and the clinical characteristics at baseline

clinical characteristics	levels	PAL-wearing period n	PAL-wearing period odds ratio	PAL-wearing period *P*-value	SVL-wearing period n	SVL-wearing period odds ratio	SVL-wearing period *P*-value
Q1: Was it difficult to adapt to the new spectacles? - Yes							
age	< 10 yrs	27	1.00	0.25	23	1.00	0.06
	10 ≦ , < 12 yrs	41	1.37		41	2.23	
	12 yrs ≦	24	0.38		26	0.31	
refractive error	−3 D <	50	1.00	0.28	47	1.00	0.23
	≦ − 3 D	37	0.60		42	0.89	
near heterophoria	< − 2 PD	31	1.00	0.46	35	1.00	0.03
	− 2 PD ≦	50	1.43		50	1.20	
lag of accommodation	< 1.75 D	28	1.00	0.93	28	1.00	0.63
	1.75 D ≦	28	1.05		27	0.91	
Q2: Is there any difficulty when looking at the blackboard? - Yes							
age	< 10 yrs	27	1.00	0.08	23	1.00	0.46
	10 ≦ , < 12 yrs	41	3.53		41	0.44	
	12 yrs ≦	24	0.33		26	1.07	
refractive error	< − 3 D	50	1.00	0.02	47	1.00	0.41
	≦ − 3 D	37	0.38		42	1.41	
near heterophoria	< − 2 PD	31	1.00	0.17	35	1.00	0.02
	− 2 PD ≦	78	2.15		50	4.23	
lag of accommodation	< 1.75 D	28	1.00	0.27	28	1.00	0.28
	1.75 D ≦	28	0.49		27	0.63	
Q3: Is there any difficulty when reading or writing? - Yes							
age	< 10 yrs	27	1.00	0.22	23	1.00	0.01*
	10 ≦ , < 12 yrs	41	0.93		41	0.00	
	12 yrs ≦	24	0.00		26	N/A	
refractive error	− 3 D <	50	1.00	0.87	47	1.00	0.09
	≦ − 3 D	37	0.86		42	0.28	
near heterophoria	< − 2 PD	31	1.00	0.63	35	1.00	0.08
	− 2 PD ≦	50	1.66		50	3.88	
lag of accommodation	< 1.75 D	28	1.00	0.51	28	1.00	0.28
	1.75 D ≦	28	0.44		27	1.70	
Q4: Is there any difficulty when ascending or descending the stairs? - Yes							
age	< 10 yrs	27	1.00	0.55	23	1.00	0.05
	10 ≦ , < 12 yrs	41	1.64		41	0.29	
	12 yrs ≦	24	0.33		26	0.00	
refractive error	− 3 D <	50	1.00	0.26	47	1.00	0.05
	≦ − 3 D	37	0.40		42	0.62	
near heterophoria	< − 2 PD	31	1.00	0.96	35	1.00	0.06
	− 2 PD ≦	50	0.96		50	0.58	
lag of accommodation	< 1.75 D	28	1.00	0.12	28	1.00	0.23
	1.75 D ≦	28	0.20		27	1.08	

Table 3

Q5: Have you ever felt vertigo or dizziness in lateral vision? - Yes							
age	< 10 yrs	27	1.00	0.41	23	1.00	0.03
	10 ≦ , < 12 yrs	41	1.29		41	1.83	
	12 yrs ≦	24	0.27		26	11.3	
refractive error	− 3 D <	50	1.00	0.35	47	1.00	0.19
	≦ −3 D	37	0.52		42	0.78	
near heterophoria	< −2 PD	31	1.00	0.56	35	1.00	0.08
	− 2 PD ≦	50	0.66		50	3.89	
lag of accommodation	< 1.75 D	28	1.00	0.26	28	1.00	0.99
	1.75 D ≦	28	2.61		27	1.04	
Q6: I use the spectacles: - at class only or usually							
age	< 10 yrs	27	1.00	0.34	23	1.00	0.39
	10 ≦ , < 12 yrs	41	1.99		41	0.57	
	12 yrs ≦	24	0.42		26	1.15	
refractive error	− 3 D <	50	1.00	0.12	47	1.00	0.01*
	≦ − 3 D	37	0.42		42	0.16	
near heterophoria	< − 2 PD	31	1.00	0.39	35	1.00	0.67
	− 2 PD ≦	50	0.40		50	1.25	
lag of accommodation	< 1.75 D	28	1.00	0.41	28	1.00	0.56
	1.75 D ≦	28	0.56		27	0.58	

* $p < 0.01$, † minus sign indicates exo-deviation. The total sample numbers for each question differed due to missing data.

study, the modified fitting protocol was used in the PAL-wearing period as described above. The upward transposition of PALs from the level of the entrance pupil would reduce their negative dioptric effect and also induce blurred images at distance. However, the frequency of this symptom was not significantly different between the PAL- and SVL-wearing periods, indicating that the fitting protocol was not problematic in distance vision.

Disturbance in near vision (Q3) was much less frequent (< 7%). Wright *et al.* [23] reported that even children with no objective abnormality often complained of problems with near vision when they were requested to answer questionnaires. In our study, the odds ratios for this symptom decreased with age (Table 3). Therefore, this symptom may be attributed to such a psychological tendency associated with young children.

The frequency of the difficulty in ascending or descending stairs (Q4) in the PAL-wearing period was 2 times higher than that in the SVL-wearing period at the 6-month survey (although the difference was not statistically significant). However, this symptom completely disappeared at the 12-month survey. When the children look through the near addition part of PALs, the distant limit of clear vision becomes closer by the amount of the near addition. Therefore, blurred images in the down gaze may produce a risk of accidental falls when ascending or descending stairs. As mentioned above, we determined the distant prescription with a slight undercorrection: 0.74 D on average [13]. Taking the depth of focus of the eye (usually, ± 0.5 D [24]) into account, the distant limit of clear vision through the near addition part was 57 cm: 100 cm/(1.50 + 0.74–0.5 D). This calculation well explains why some children wearing PALs reported this problem. In the COMET children, the frequency of this symptom in PAL-wearing children was significantly higher than that in SVL-wearing children 1 week after the spectacle wearing began, but this difference disappeared after 1 month [14]. The different results between their study and ours are partly explained by the difference in lens design. However, the longer-term (12-month) improvement of this symptom that we found in this study suggests that the children required a longer period to learn optimal eye-head coordination in ascending or descending stairs in addition to the above-mentioned oculomotor and sensory adaptations.

Smith *et al.* prescribed PALs with a greater near addition (+3.00 or +3.50 D) to a small number of hyperopic children, and they reported no problem derived from their use [2]. A near addition in PALs has both dioptric and prismatic effects of different degrees depending on the amount of the addition, but children's sensory and motor adaptation abilities seem to be powerful enough to compensate for these disturbances. When we newly prescribe PALs to children in clinics, however, the children should be warned of the risk of accidental fall when ascending or descending stairs, as when presbyopic adults are prescribed them.

Compliance with spectacle wear. The compliance with spectacle wear in the PAL-wearing period was as high as in the SVL-wearing period. This result reflects the finding that PALs did not cause a significant problem in daily activities as shown by the results of Qs 1-5. In addition, it is plausible that the absence of a difference in appearance between PALs and SVLs contributed to the high compliance. Prescription of executive-type bifocal spectacles was recommended for children [1, 25] because the horizontal line separating the near and far vision parts of the lenses helps children identify the proper part of the lenses and helps clinicians find misalignment of the lenses. However, school children usually do not like to wear bifocal spectacles simply because the appearance is clearly different from that of SVLs.

Interestingly, in children with low-grade myopia, the compliance with spectacle wear was better in the PAL-wearing period than the SVL-wearing period (Table 3 and Fig. 1). SVLs (negative spherical lenses) increase the accommodative demand for a visual object located at a near distance, whereas this effect is reduced with PALs. It may follow that SVL-wearing children tended to take off their glasses when looking at close objects. This consideration was partly supported by the result from Q3 (Table 3): the odds ratio for difficulty in reading or writing in SVL-wearing children with low myopia (>-3 D) was 3-times higher than in those with moderate to high myopia ($\leqq -3$ D), although the difference was not statistically significant.

Evaluation of masking. PALs made a clear contribution to the maintenance of the masking when compared with bifocal spectacles [26], but our results indicated that the masking for the spectacle allocation was not always maintained. It is probable that alternations in perceptual images through the spectacles that were perceived when the children switched lens type from PALs to SVLs or vice versa at the crossover point have served as clues to the spectacle allocation. However, the result of Q6 indicates that this extent of unmasking did not influence the compliance with spectacle wear as a whole.

In conclusion, the results of this questionnaire survey performed as part of a double-masked clinical trial demonstrated that there was no significant difference in visual symptoms or in compliance with spectacle wear between the PAL- and SVL-wearing periods. Children can easily adapt to and use PALs (at least those with a +1.50 D near addition) without significant visual problems during daily activities.

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