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Comparison of RGP fitting capabilities: MasterVue vs. EyeSys

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Twenty-nine subjects were initially fitted with one lens generated by the MasterVue System and one lens generated by the EyeSys Corneal Topography System. The authors graded the lens position, edge pattern, apical pattern, visual acuity, over-refraction and overall outcome. Subjects were asked to grade vision, lens comfort and preferred eye. The only areas where one system's lens statistically performed better was subjective comfort and preferred eye. In both cases the MasterVue did better than the EyeSys. The authors feel the difference in comfort was due to the fact that the MasterVue usually designed a larger lens than the EyeSys. However, neither system performed well overall. Only 12.5% of the patients who were followed at the dispense were allowed to keep and wear their lenses.

While there are some cases where a detailed topographical map of the cornea is very helpful in fitting certain patients, particularly those with irregular corneas, the study indicates both systems in their current form are not accurate enough to be used in the fitting of the average low myope to make their use cost effective.

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COMPARISON OF RGP FITTING CAPABILITIES:

MASTERVUE VS. EYESYS

By

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Todd H. Hnatko holds a Bachelor of Science degree in Natural Science and a minor in Psychology from the University of North Dakota. He will receive his Doctorate in Optometry from Pacific University College of Optometry in May 1995. While attending Pacific, he held the offices of Student Optometric Association Speaker Series Representative and SOA Vice-President. He is a member of Beta Kappa Sigma Honor Fraternity. He received the Health Professions Scholarship through the United States Army. Todd's first assignment after graduation is in Denver, Colorado.

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The advent of computer aided videokeratology has many practitioners hopeful that the fitting of rigid gas permeable contact lenses will become more efficient and successful than diagnostic and empirical methods; therefore making an RGP lens more often the lens of choice. This is especially important in a day when the growth of managed health care necessitates less doctor time per patient. The EyeSys Corneal Analysis System and the MasterVue System both claim to provide these benefits using somewhat different fitting strategies. This study assesses the success of each method of lens fitting according to patient satisfaction and on-eye lens performance.

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Key Words

Computer-aided videokeratology, corneal topography, EyeSys Corneal Topography System, MasterVue System, rigid gas permeable contact lenses

Introduction

As managed health care continues to grow, practitioners are faced with the need to see more patients for a lesser fee. In order to maintain income, health-care providers need to become more efficient in their delivery of health care.[2] How do we, as health care providers, increase efficiency without sacrificing quality? More than 60 percent of O.D.'s believe that the trend toward managed care is driving the demand for new diagnostic instruments. They also believe these instruments are very fast, highly accurate and consistent, and take human error out of the picture.[2,7,6,9] The advent of computer-aided videokeratology and corneal topography may be a valuable tool in the quest for increased efficiency, accuracy, and success in the area of RGP fitting.

Trends indicate that RGP fitting is on the rise. Some practitioners feel that trial lens fitting is the best approach to obtain an optimum lens to cornea fitting relationship.[1,8] It is known that the cornea is asymmetric and aspheric, progressively flattening in the periphery, and that the rate of flattening is highly variable from one patient to the next. Wasserman et. al. state that "the peripheral area beyond 7 mm may be particularly important in achieving an adequate cornea-lens fitting relationship." [4,6,7,8]

A standard keratometer measures only the central 3.2 mm of the cornea, but it's measurements are critical in empirical fitting.[6] Thus, it may be argued, that empirical fitting, while decreasing chair time, overhead, and foregoing the sometime traumatic trial fit experience, is not sufficient in providing knowledge of each patients' unique corneal topography.[1,3,5] Klyce feels that "better fitting, tolerance, and optical improvement of contact lenses could be achieved by a new generation of lenses fit by considering the actual shape of the individual cornea." [4] With the new computer-aided videokeratology systems, this can be achieved. Some feel the problems of empirical and trial fitting can be reduced or eliminated.[5]

The corneal topography units provide computer analysis of video keratoscopic images, generating a color-coded topographical map of a broader area of the corneal surface.[6] With a contact lens fitting module, this data is then utilized to design a best-fit rigid gas permeable contact lens. This knowledge of each patient's individual corneal topography combined with the lens fitting software, may help the practitioner develop a more successful approach to RGP fitting, thereby decreasing the patient chair time involved with trial fitting.[2,3,5]

The EyeSys Corneal Analysis System and the MasterVue System are just two of the many corneal topography units on the market today. The EyeSys measures the corneal surface from 1.5 mm to 8.0 mm from the cornea's center, while the MasterVue measures from 0.3 mm to 8.33 mm. The MasterVue is equipped with a "Dual Camera Optical System." The second camera gives four times the magnification of the other camera. According to the manufacturer, this second camera allows the operator to fine focus the instrument giving a more accurate image than is possible with one camera alone. The manufacturers of

each piece of equipment also offer a contact lens fitting module as part of the software.

This study will assess the success of each system's contact lens fitting program through the on-eye evaluation of lenses generated by each system. It is the investigators' hypothesis that the lenses generated by the MasterVue will out-perform those generated by the EyeSys. We feel the increased magnification by the second camera on the MasterVue will make focusing more reliable and accurate. This feature along with the greater corneal area used in generating a lens, will create a better fitting and optically superior lens.

Methods:

Twenty-nine subjects were selected from a pool of applicants to an advertisement for a rigid contact lens study. The subject's ages ranged from 15 to 40. Fourteen males and fifteen females participated in the study. A complete optometric exam was required prior to consideration in the study. Only subjects who were myopic with less than 3.00 D of refractive cylinder were allowed to participate. Subjects were required to be free of ocular or systemic disease contraindicating rigid contact lens wear. No consideration was given to current or previous lens wear except that subjects with past rigid or soft failures were excluded. A written informed consent form was filled out by each candidate prior to the study. The 29 subjects picked for the study were required to purchase a contact lens care agreement from Pacific University Family Vision Center or show proof of continued care outside the Family Vision Center.

The 29 subject's were asked to not wear any type of contact lens for twenty-four hours prior to the fitting. The 29 subjects were then randomly assigned to one of two groups. Fifteen subjects were initially mapped by both the EyeSys Corneal Topography System and the MasterVue System by one examiner. Fourteen subjects were mapped by the other examiner. The topographical maps generated by each computer were then utilized to provide lens design parameters and anticipated fluorescein patterns, using the alignment fitting philosophy. At this point, there were two possible lenses for each eye, one from each system. The examiners then exchanged subject files. Subjects were then assigned, by random drawing, a number which identified which eye was to wear the EyeSys generated lens. The other eye would wear the MasterVue lens. Neither the original examiner, nor the patient, knew which eye had on which systems' lens. For the purposes of this study, no alterations were made to the lens parameters furnished by each program. Two lenses were ordered for each patient, one fit with the MasterVue and one with the EyeSys. The material chosen for the lenses was Boston 7. The lens buttons were donated by Polymer Technologies. The lenses were cut to our specifications by Opticraft of Portland, Oregon.

Two new investigators were brought in to do the follow-up evaluations. These investigators verified the lenses to ensure they matched the parameters specified by the two systems. Twenty-four of the original twenty-nine subjects were dispensed lenses. The dispense followed standard clinical procedures for a RGP contact lens dispense including written instructions for care and handling of the lenses. Subjects, whose lenses met with patient and investigator approval, were given a Wet and Soak starter kit. Wearing time of the lenses

varied according to past RGP history, although all subjects were encouraged to wear their lenses for at least eight hours a day.

Evaluations by the investigators were conducted at dispense. The objective evaluation included visual acuity, lens position, over-refraction, edge pattern, apical pattern and over-all outcome. Subjects were asked to grade physical comfort and quality of vision of each lens separately. Subjects were then asked which lens they preferred, the lens on the right eye or left eye. A five-point grading scale was used in the subjective evaluation of vision and comfort. A five-point grading scale was also used in the objective evaluation of VA, lens position, over-refraction and outcome. A three-point scale was used for apical and edge patterns. (See appendix A.) Subjects whose lenses failed were referred to Pacific University Family Vision Center's Contact Lens Clinic to be trial fit with Boston 7 lenses at no cost to the subject.

Data was statistically analyzed using Wilcoxon sign-ranked statistics for paired, ordinal data. A p value of 0.05 was used to determine if data was significant.

Results

Five of the original 29 subjects were dropped from the study prior to lens dispensing. One other subject's data was unavailable for analysis, therefore, 23 subjects data was used for analysis.

The objective grading of the lenses showed that both systems received marks that stretched the gambit of our grading scale: 1 - 5 in VA, lens position, over-refraction and outcome and 1 - 3 in apical pattern and edge pattern. Both systems also received ratings from 1 - 5 in subjective vision and subjective

comfort. Graphical representation of both systems objective and subjective grades may be found in Graphs 1 through 8. An average of the objective scores shows that the EyeSys performed slightly better than the MasterVue in over-refraction and apical pattern while the MasterVue performed slightly better in the objective categories of VA, edge pattern, and outcome. Both systems performed the same on lens position. However, none of the differences in objective data are statistically significant. In the subjective categories of vision and comfort, the averaging of the scores shows the MasterVue slightly outperforming the EyeSys. Statistical analysis shows the difference in vision is insignificant ($p = 0.208$). It does, however, give comfort a p value of 0.028. This is significant. When subjects were asked to choose between eyes based on comfort and vision, 59% chose the eye with the MasterVue lens, 18% chose the EyeSys eye and 23% had no preference. Three out of the 24 subjects (12.5 %) were allowed to keep the lenses generated by the computers.

Discussion

There were only two areas out of nine graded where one lens statistically outperformed the other. These were subjective comfort and subjective preference. In both cases, the lens generated by the MasterVue scored higher than the lens generated by the EyeSys. In no other area did one lens statistically outperform the other. We believe that there is one difference in lens design that allowed the MasterVue to receive better marks than the EyeSys in these two areas. This difference is over-all lens diameter. The MasterVue, for almost every subject (24 out of the original 29), designed a lens that was larger than the EyeSys. In some cases, this difference was as much as 1.1 millimeter. It is well known that a larger lens is generally more comfortable than a smaller

one. This difference may also explain why more subjects chose the preferred eye as the one which was wearing the MasterVue lens. The statistics show that vision was the same between the two eyes. The only other subjective grade was comfort. Therefore, subjects may have based their choice of the preferred eye on comfort alone.

We do not feel that performing better in two statistically significant areas out of nine is enough to support our original working hypothesis of the MasterVue designing a better performing lens than the EyeSys. In fact, neither system performed well. Only three of the 24 subjects evaluated at the dispense were allowed to keep the lenses for daily wear. Even then, the fits were marginal at best.

In an attempt to discover why the EyeSys was not fitting satisfactorily, we reviewed a number of subjects' photokeratoscopic images at random with a representative from EyeSys. The representative concluded that a number of the images were slightly out of focus. The authors, however, do not feel that the images were enough out of focus that an average practitioner would notice. The MasterVue images were not evaluated for focusing problems. But, the authors feel the images were sharply focused at the initial visit when mapping of the cornea took place.

If computer-aided videokeratology and corneal topography is going to help the average practitioner save time and improve success in RGP fitting, more accurate software is needed, at least for the two systems tested. Our study shows that the lenses generated by the two systems had a combined first time success rate of less than 13 % (3 out of 24.) This fact, coupled with the time it would take to redesign, order and have the patient back for dispense would be counterproductive in the fitting of the average myope. It would be more time

efficient and cost effective to trial fit the patient than to use one of the two systems in their current form.

This study did not evaluate other uses of the computer generated corneal maps. It's only purpose was to evaluate the contact lens fitting modules of the two systems. Either system may be used quite effectively for the analysis of unusual or irregular corneas in their current form. The authors feel that both systems are relatively easy to use, however, the MasterVue did take more time than the EyeSys to analyze the data points immediately after the image was captured.

In summary, only 3 out of 24 patients were able to wear their lenses generated by the two systems. The MasterVue produced lenses that performed better than the EyeSys lenses in two areas out of nine. These results do not support the working hypothesis that the MasterVue designs superior lenses to the EyeSys because of the MasterVue's larger corneal coverage and its second camera designed to aid in focusing of the instrument.

Appendix A

Objective Grading Scales [1]

Visual Acuities:

1   Great: VA is one or more lines better than BVA with current 7a.

2   Good: VA is one to three letters improvement in BVA with current 7a.

3   Acceptable: VA is the same as BVA with current 7a.

4   Marginal: VA is one to three letters worse than BVA with current 7a.

5   Unacceptable: VA is one or more lines worse than BVA with current 7a.

Lens Position:

1   Optimal: Centers from 2 to 4 with no nasal or temporal decentration.

2   Good: Centers from 2 to 4 with slight nasal or temporal decentration.

3   Acceptable: Centers from 2 to 4 with moderate nasal or temporal decentration but full pupillary coverage.

4   Marginal: Centers from 1 to 2 or 4 to 5 with minimum pupillary coverage.

5   Not Acceptable: Lens decenters on eye to degree that edge bisects the pupil.

Edge Pattern:

3   Very narrow.

2   Slightly narrow.

1   Optimal.

2   Slightly wide.

3   Very wide.

Apical Pattern:

3   Significant pooling.

2   Slight pooling.

1   Apical alignment.

2   Slight bearing.

3   Significant bearing.

Over-refraction:

|		
1	Excellent:	Plano
2	Good:	+0.25
3	Fair:	-0.25 to +0.50
4	Marginal:	-0.50
5	Unacceptable:	$\geq$ +/-0.75

Outcome:

1   Very successful: The lens is superior subjectively and objectively. The patient should have no problems associated with lens wear.

2   Successful: The lens performs more than adequately. The patient should have no problems associated with lens wear.

3   Moderately successful: The lens is adequate subjectively and objectively. If any problems develop, they should be minimal.

4   Marginally successful: The lens is slightly less than adequate subjectively and/or objectively. This lens will be dispensed, however, the patient will be closely followed.

5   Unsuccessful: This lens is unacceptable to the patient, the clinician, or both. This lens will not be dispensed.
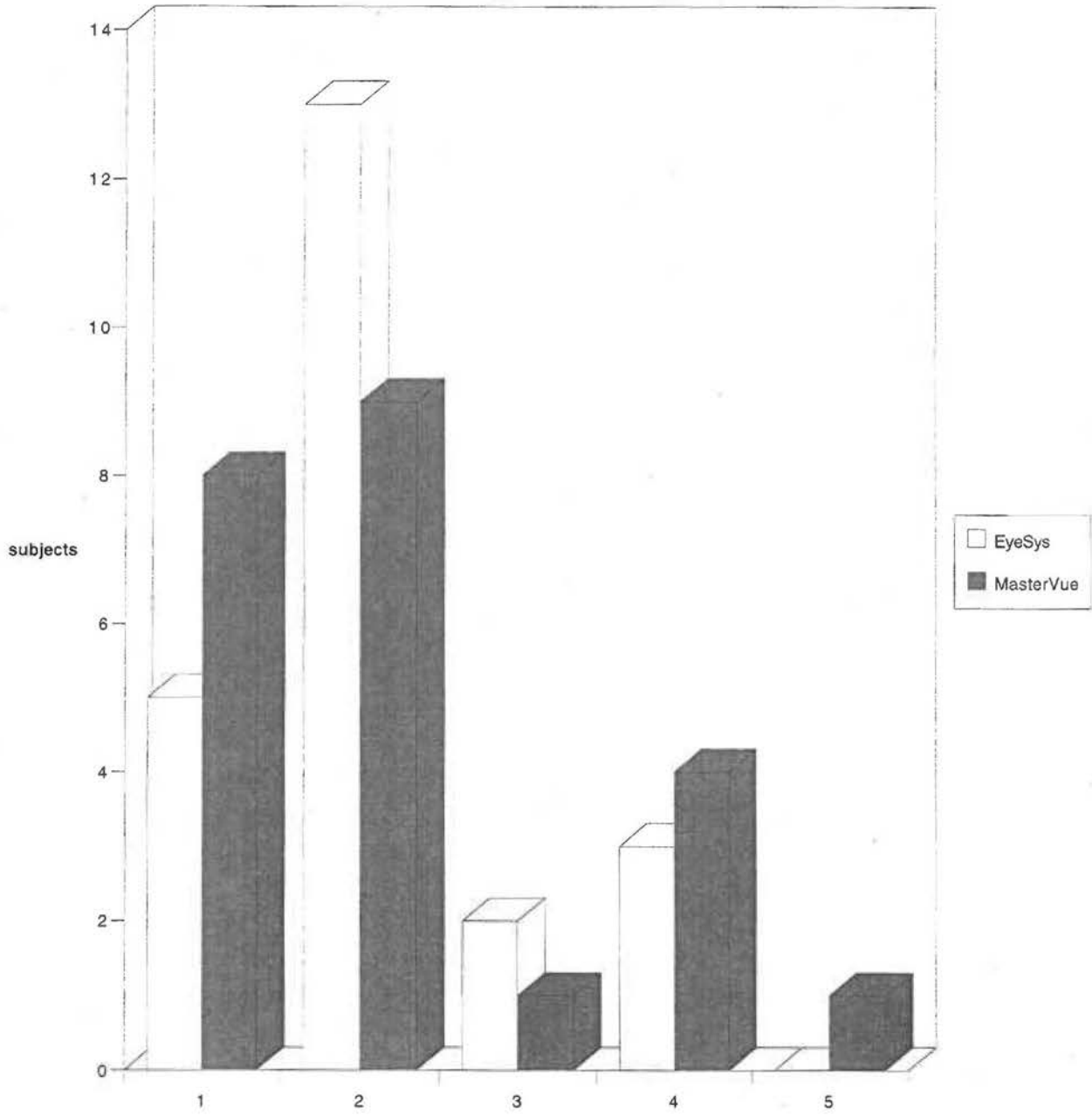
Graph 1

Visual Acuity
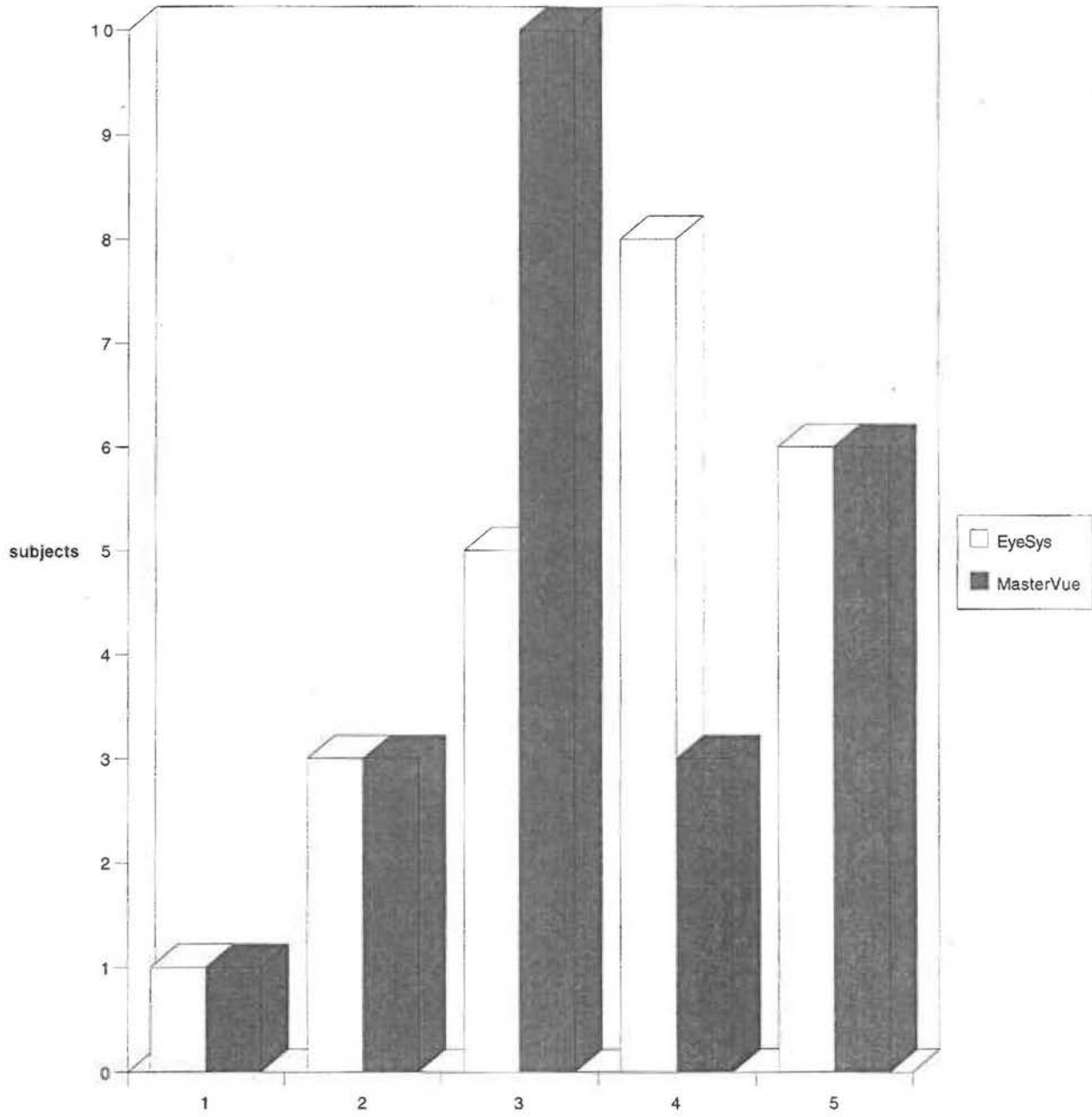
Graph 2
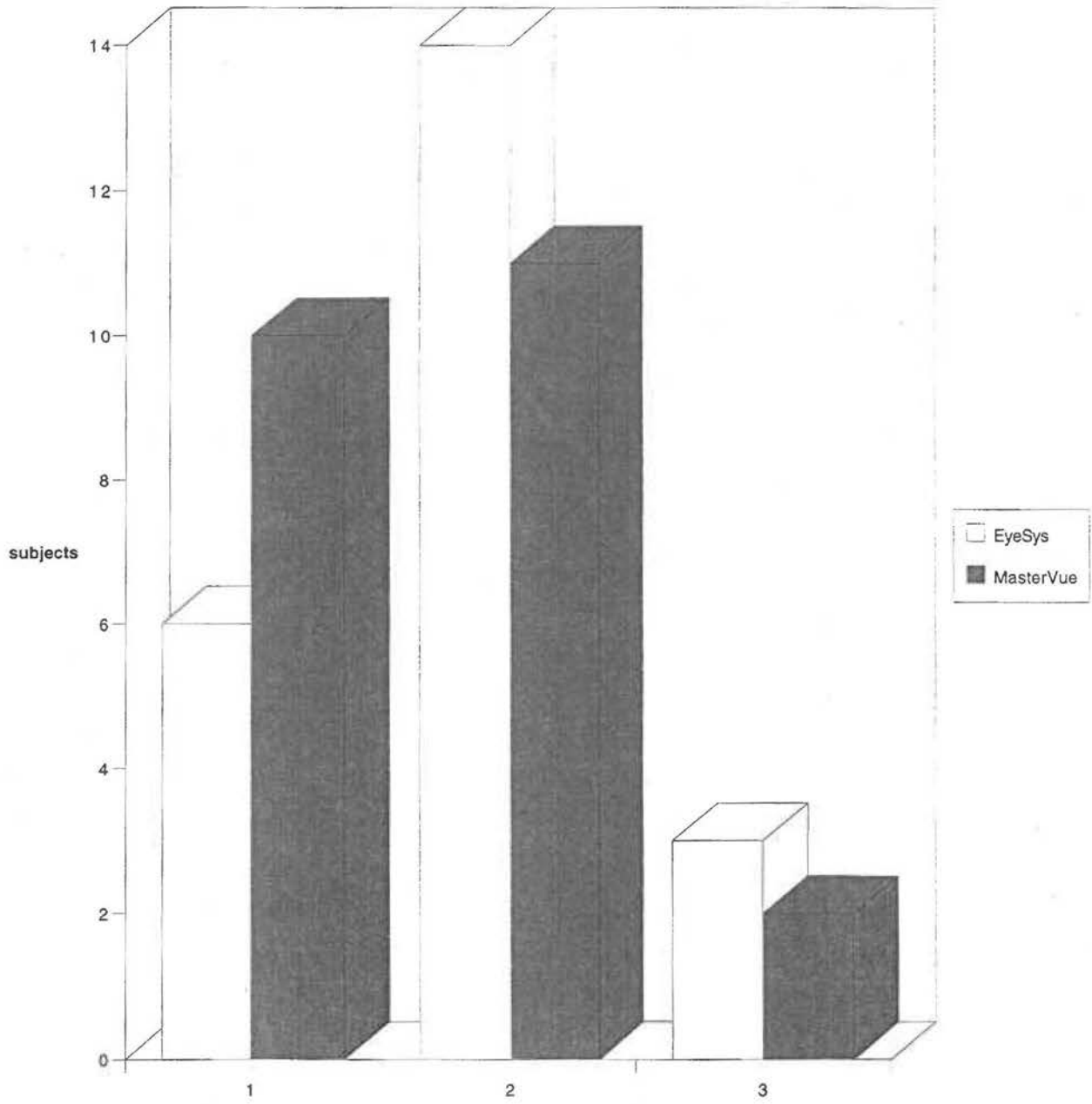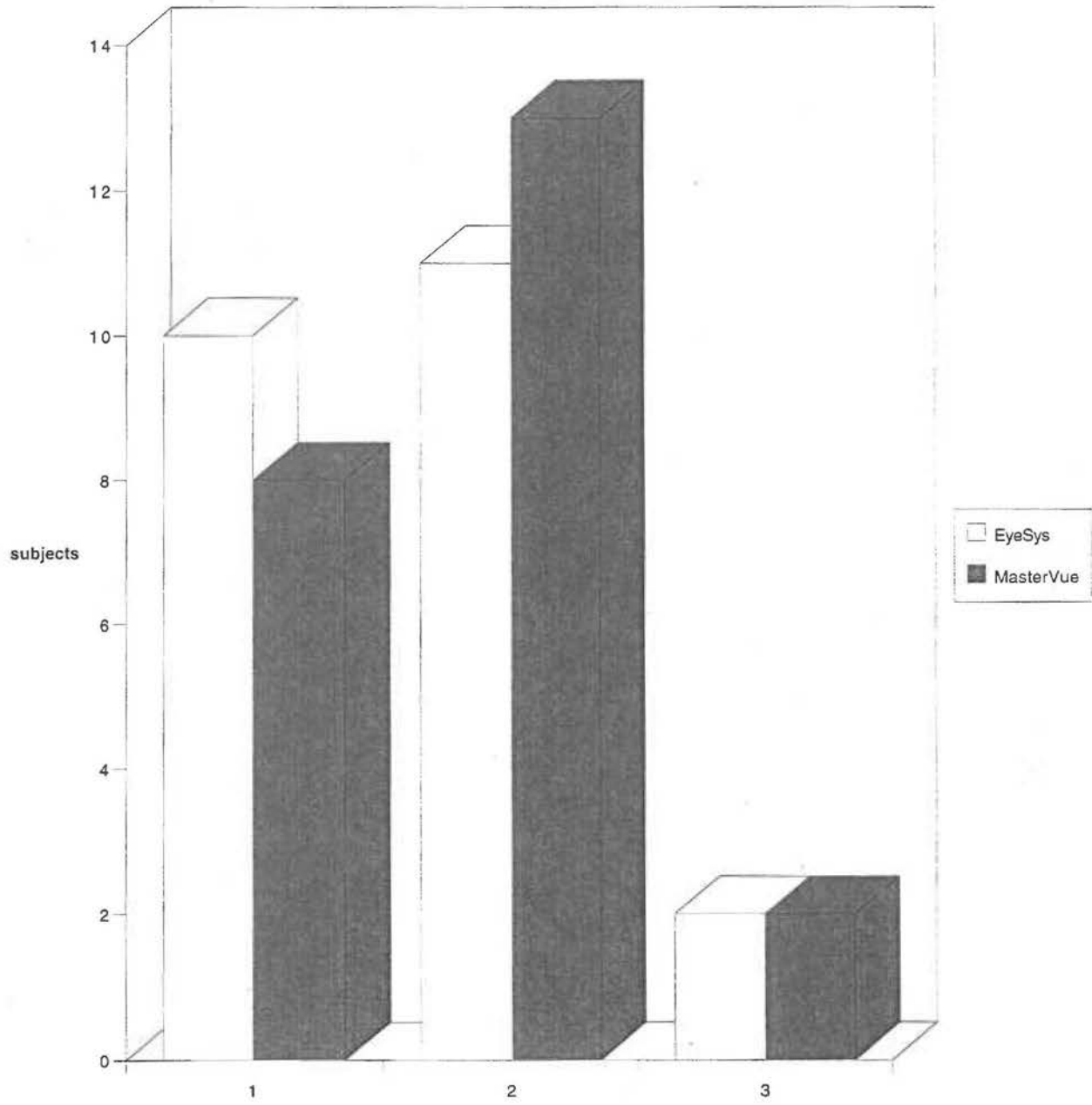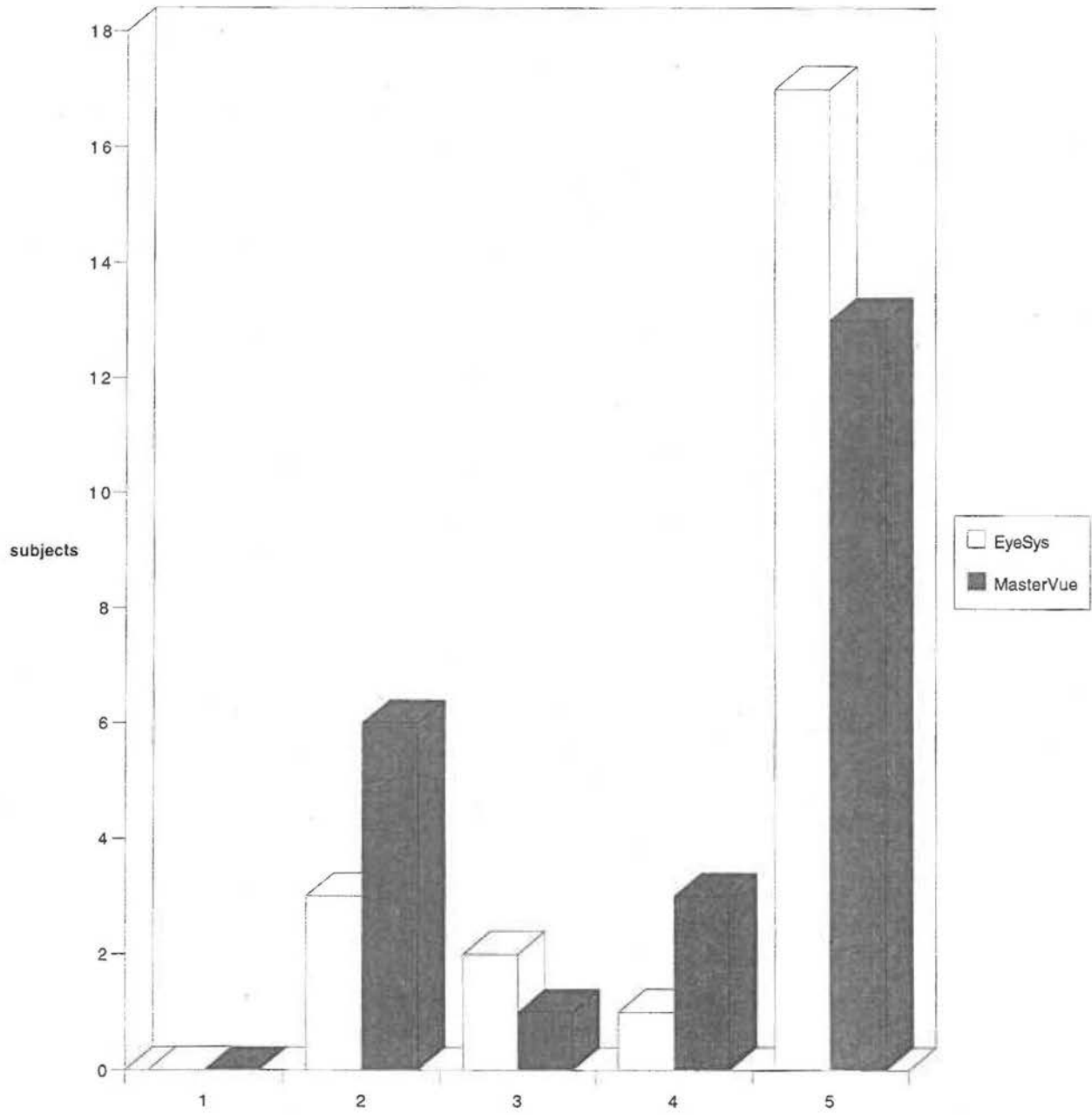
Over-Refraction
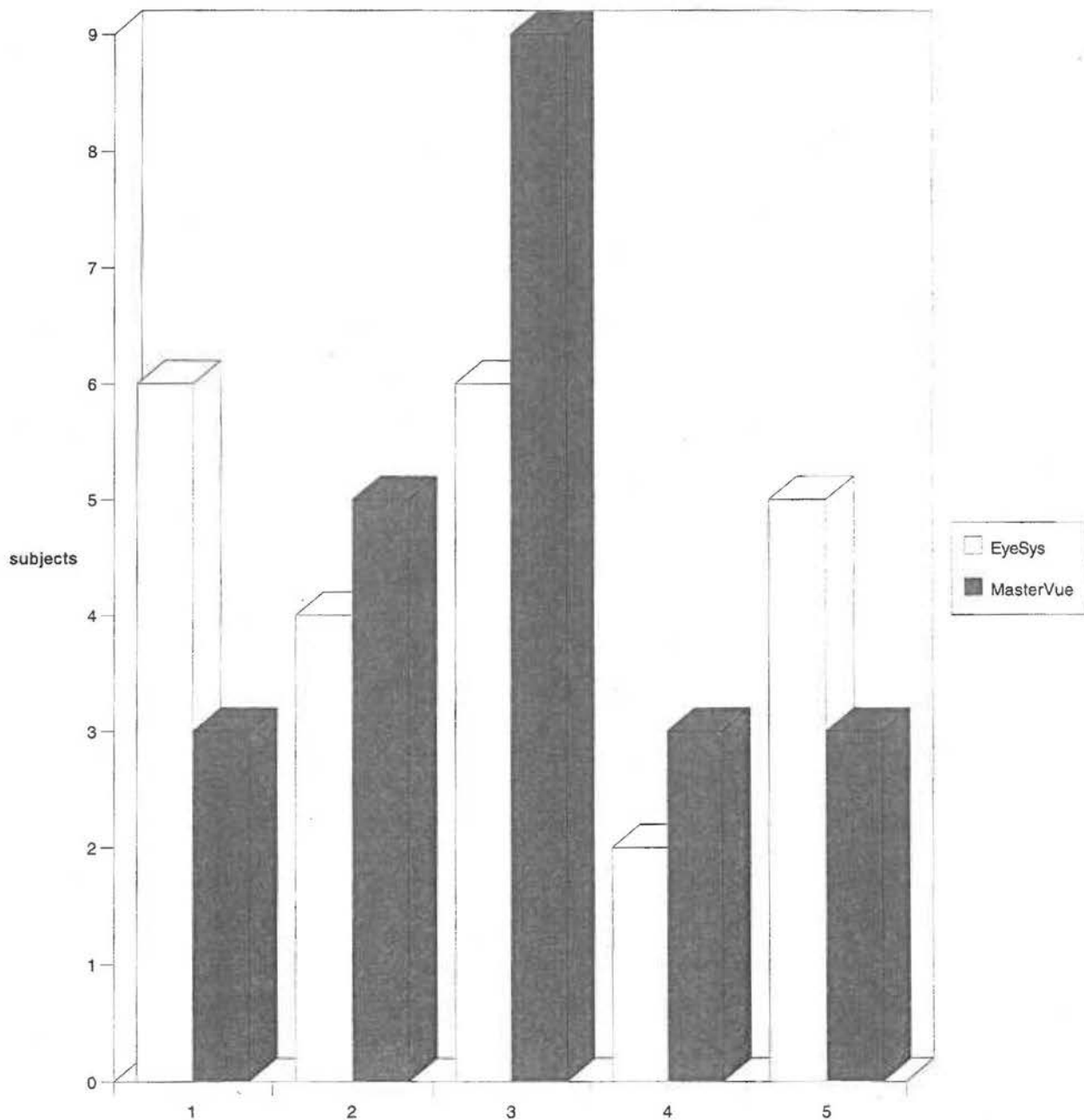
Graph 3

Lens Position

Graph 4

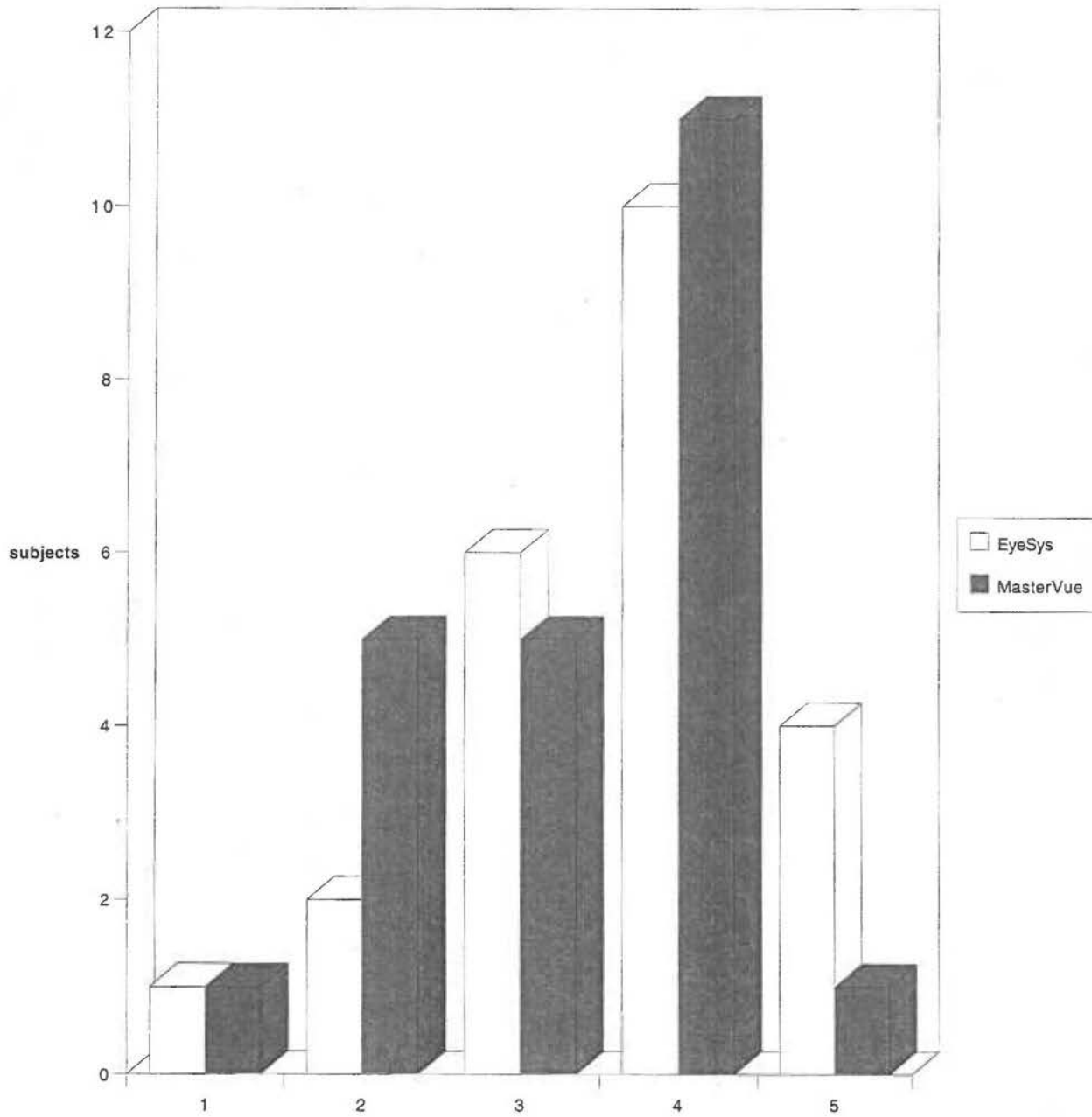**Edge Pattern**

Graph 5

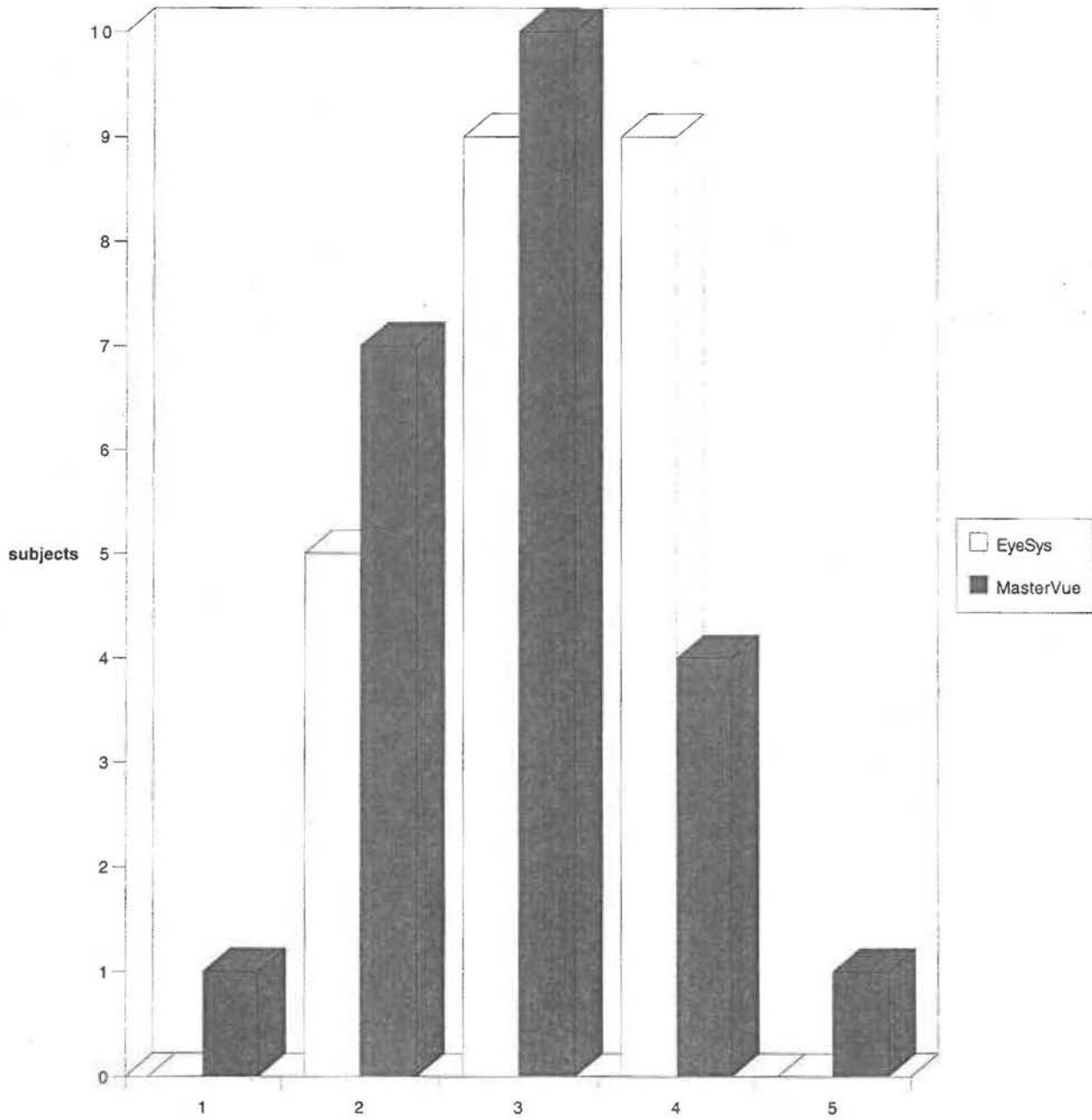Apical Pattern

Graph 6

Outcome

Graph 7

Subjective Vision

Graph 8

Subjective Comfort

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