Empirical fitting of rigid gas permeable lenses (comfort relationship between correct and incorrect dioptric power rigid gas permeable lenses)

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Empirical fitting of rigid gas permeable lenses (comfort relationship between correct and incorrect dioptric power rigid gas permeable lenses)

Abstract
Background: Rigid Gas Permeable lenses have proven to offer an increase in quality of vision, improved ocular health, long term comfort, durability, increased oxygen levels, and greater resistance to deposits. However, more practitioners are fitting soft contact lenses rather than RGP lenses due to the large selection of readily available trial lenses and initial comfort during the fitting and adaptation processes. The purpose of this study was to determine if empirically fit RGP lenses of correct refractive power would improve initial impressions and thereby increase patient motivation for long-term RGP wear.

Methods: Twenty subjects, all non-contact lens wearers, were chosen for this study. Each subject had two sets of lenses empirically designed: one set contained their habitual correction, while the second set was three diopters stronger. All other parameters of these lenses were identical. The subjects were divided into two groups: Group 1 was fit with their habitual correction first; Group 2 received the lenses which were three diopters stronger than habitual correction. While wearing the lenses, the subjects were asked a series of questions. After 7 to 14 days, the subjects returned to try the other pair of lenses and to repeat the questionnaire.

Results: With this subject population, there was no significant increase in initial comfort when comparing a habitual corrected lens to that of a lens three diopters stronger than the habitual prescription.

Conclusions: Results are inconclusive due to subject population which has no need for contact lens correction. Further studies should be conducted with subjects who need correction to determine if correct power contact lenses affect initial comfort in the fitting process.

Degree Type
Thesis

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Empirical Fitting of Rigid Gas Permeable Lenses
(Comfort Relationship Between Correct and Incorrect Dioptric Power Rigid Gas Permeable Lenses)

By
Jenny O’Malley
Rochelle Hudson
Jill DeKaye

A thesis submitted to the faculty of the
College of Optometry
Pacific University
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for the degree of
Doctor of Optometry
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Patrick Caroline, FAAO
Jenny O’Malley

Rochelle Hudson

Jill DeKaye

Peter Bergenske, O.D.

Patrick Caroline, FAAO
Jenny O'Malley graduated from University of Minnesota Duluth where she spent her junior year studying in Birmingham, England at the University of Birmingham Westhill. She participated in numerous extracurricular activities including theatre, dance and choir. She graduated cum laude with a B.S. in Biology. Throughout her academic career, Jenny has received numerous awards including membership into two national honors societies: Phi Kappa Phi and Beta Sigma Kappa. In the future, she hopes to complete an optometric residency program and practice optometry in Minnesota.

Rochelle Hudson began her undergraduate degree at University of Alberta, Canada. She continued her education at Pacific University where she graduated with a Bachelor of Visual Science. Throughout her studies, Rochelle has been involved in her community through activities such as hockey and equestrian. She will be graduating from Pacific University College of Optometry in Spring 2005 as a member of the Beta Sigma Kappa Honors Society. Rochelle’s future plans are to practice optometry in Maine for a few years and then possibly pursue a career in Canada.

Jill DeKaye graduated from Pacific University with a bachelor’s degree in Modern Languages in May of 2001. She went on to attend Pacific University College of Optometry where she will graduate in the spring of 2005. During Jill’s undergraduate education, she studied in Montpellier, France. She also participated in extracurricular activities, varsity basketball and softball, while at Pacific University. For three consecutive years, Jill participated in the Oregon Multiple Sclerosis bicycle race, a two-day 150 mile fundraising race throughout Oregon. Jill’s future plans are to practice optometry in rural Idaho or Montana.
ABSTRACT

Background: Rigid Gas Permeable lenses have proven to offer an increase in quality of vision, improved ocular health, long term comfort, durability, increased oxygen levels, and greater resistance to deposits. However, more practitioners are fitting soft contact lenses rather than RGP lenses due to the large selection of readily available trial lenses and initial comfort during the fitting and adaptation processes. The purpose of this study was to determine if empirically fit RGP lenses of correct refractive power would improve initial impressions and thereby increase patient motivation for long-term RGP wear. Methods: Twenty subjects, all non-contact lens wearers, were chosen for this study. Each subject had two sets of lenses empirically designed: one set contained their habitual correction, while the second set was three diopters stronger. All other parameters of these lenses were identical. The subjects were divided into two groups: Group 1 was fit with their habitual correction first; Group 2 received the lenses which were three diopters stronger than habitual correction. While wearing the lenses, the subjects were asked a series of questions. After 7 to 14 days, the subjects returned to try the other pair of lenses and to repeat the questionnaire. Results: With this subject population, there was no significant increase in initial comfort when comparing a habitual corrected lens to that of a lens three diopters stronger than the habitual prescription. Conclusions: Results are inconclusive due to subject population which has no need for contact lens correction. Further studies should be conducted with subjects who need correction to determine if correct power contact lenses affect initial comfort in the fitting process.
Keywords: rigid gas permeable lenses, comfort, empirical fitting, incorrect lens power
When comparing fitting benefits of a rigid gas permeable, RGP, contact lens to a soft contact lens, one of the first factors considered by most practitioners is the initial comfort of the lens. As a result, the use of RGP lenses is noticeably less than that of soft contact lenses (1, 5). However, previous studies have proven that RGP lenses offer an increase in quality of vision, improved ocular health, long term comfort, durability, increased oxygen levels, and greater resistance to deposits (4). Even with these benefits, RGP lenses only comprise 12% of all new fittings in the United States (1, 5). This brings up an important question: "How can initial comfort be optimized by first time RGP wearers to increase RGP use"?

Obviously, as practitioners, we can try to provide the most appropriate lenses at the first fitting. This reduces the amount of irritation that can occur when multiple lenses are tried. Several factors play an important role in the correct RGP fit. Lens diameter should be selected based on Horizontal Visible Iris Diameter (HVID), with the overall lens diameter being 2.5mm smaller than the HVID (3). Previous studies have provided evidence that a larger diameter actually decreases the initial awareness of the lens (2, 4). For optimal lens performance, the base curve should contact mid-peripherally along the horizontal meridian and allow unobstructed movement along the vertical meridian. It has as well been recommended that a slight apical clearance of 15 micrometers across the cornea will provide a good fit, as well as, increased comfort of the lens (3). Another probable method that has proven to decrease lid awareness, and thereby increase initial comfort of a lens, is to use a smooth edge on the RGP lens (2, 7).

During the fitting process, evidence has also been found that initial discomfort can be greatly decreased by instilling one drop of topical anesthetic in each eye before
inserting the RGP lens (1). Previous studies have shown that topical anesthetic not only increases comfort initially, but has increased overall satisfaction with the RGP lens two and four weeks after the fit (1).

In all previous studies, comfort has been evaluated after the patient has been fit using a standard fitting set. Most fitting sets come in one dioptic power (usually -3.00D); therefore, the patient is usually fit with a lens that is not the correct prescription (1, 4). An incorrect prescription can create a variety of unpleasant symptoms for the patient such as nausea, headaches, diplopia, eyestrain and blurry vision (6). If the first impression of comfort with RGP lenses is coupled with an incorrect prescription, it may jeopardize the patients desire to wear the contact lens. In theory then, a RGP lens fit with the correct prescription would eliminate these unpleasant symptoms and thereby increase the patient’s initial comfort.

The purpose of this study was to evaluate the comfort level of an initial RGP fitting to determine if the correct dioptic power of the RGP increases the patient’s comfort and likelihood to try the lens.

**Methods and Materials**

Twenty patients were selected on a volunteer basis from first, second and third year optometry students. Selection criteria included: no previous soft or hard contact lens wear, unremarkable ocular health, and a complete eye exam within the last year. The Institutional Review Board at Pacific University approved the study and informed consent was obtained from all subjects.
Three test sessions were allotted to each patient. During the first session, the patients' corneal surface was measured using the Zeiss Corneal Topographer. The RGP base curve was calculated with the MasterVue software on the topographer using 15 micrometers of clearance under the lens as ideal. Paragon HDS rigid gas permeable lenses with 9.0mm diameters were used for all subjects. Two sets of lenses were ordered for each patient: one set of lenses used the patient's habitual prescription and the other used +3.00 D more than the patient's habitual prescription.

Scheduling for sessions 2 and 3 were made after all lenses were received, verified for correct base curve, and cleaned. Patients were randomized into two groups by picking names out of a hat. Group A consisted of eleven people: five females and six males. The average age of this group was 25 with a standard deviation of 3.1. Average refractive error of this group was +0.15 ± 0.35 for the right eye, and +0.13 ± 0.34 for the left eye. Group B contained 9 people: four men and five women. The average age of this group was 25 with a standard deviation of 2.65. The average habitual correction of this group for the right and left eye was -0.03 ± 0.44, and -0.11 ± 0.54. Group A received lenses based on their habitual prescription at session 2; Group B received the lenses +3.00 D greater than their habitual prescription at this session.

The lenses were placed on the patient's eyes without the use of topical anesthetic. After one minute of wear time, the patient was asked to answer the first question of the prepared questionnaire (Figure 1). While the patient wore the lenses for ten minutes, fit was assessed using fluorescein dye, cobalt blue filtered light, and a Wratten filter. After the patient had worn the lenses for a full ten-minute period, he or she finished the remainder of the survey while still wearing the lenses. When the survey was completed,
the lenses were removed and habitual Snellen visual acuities were taken. Patients were
scheduled seven to fourteen days later for session 3. At session 3, Group A received the
lenses which were +3.00 over habitual prescription while Group B received habitually
corrected lenses. Protocol at sessions 2 and 3 were identical.

Results

The data collected from the surveys administered to Groups A and B are found in
Tables 1 and 2. Friedman's Two-way ANOVA By Ranks test was used to test for
difference in response to each survey item for the two conditions. Items 14 (stinging) and
15 (vision compared to habitual) yielded differences at the .05 significance level. There
was no significant evidence of an order effect for either of these. None of the other
survey items indicated significant difference between the two test conditions.

Discussion

Based on the results of this study, no significant increase in initial comfort was
found when comparing a habitual corrected lens to that of a lens +3.00D greater than the
habitual prescription. This may be explained by the lack of subject motivation, the
dioptric power difference between the two trial lenses, and/or the small subject
population.

The lack of subject motivation to wear the lenses through the fitting process may
account for the insignificant differences found between the comfort of the two RGP
trialed. All subjects were non-contact lens wearers, with the majority being emmetropic.
These subjects may have been unmotivated to wear the RGP lenses as they did not need
lenses for corrective purposes. This could have affected the answers to survey question 11 (willingness to try lenses). Since they did not require a prescription, subjects may have had a lack of interest while evaluating the comfort of these lenses, as well as, while filling out the survey.

Another explanation for the insignificant results found may be that the difference of dioptric power between the two lenses was not a great enough value to allow the subjects to consciously recognize a difference. If the two lenses trialed produced similar images, the comfort of each should, theoretically, be the same.

The small subject population may also have led to insignificant findings between the comfort of the two RGP lenses. The subjects used for this study were all optometry students. Half of the students had previous knowledge of contact lenses and the fitting process. This atypical population would not normally be seen in the average population of contact lens wearers. Perhaps this small population was unrealistic of actual RGP wearers and caused the uniform results found in this study.

Any of these explanations alone or in combination with each other could have affected the findings of this study. However, the underlying explanation of the insignificant results may actually be that the dioptric power of the lenses, whether habitual correction or +3.00 more than habitual, does not have an effect on the subject’s perceived comfort of a lens or motivation to wear a lens. This study then suggests that practitioners, by only having one standard dioptric power of RGPs may not be affecting their patients’ initial comfort or their willingness to try a lens.

In summary, it may be concluded from the results of this study that the dioptric power of a fitting lens may not be crucial to the patient’s initial comfort or his or her
motivation to try a RGP. Future research should look further at initial comfort and its relationship to dioptic power of a RGP by using a larger, more diverse subject population that is currently in need of corrective lenses.
REFERENCES


ACKNOWLEDGEMENTS

We would like to thank Dr. Peter Bergenske and Patrick Caroline for their willingness to advise us for the entirety of this project. Without their efforts, ideas and guidance, this project could not have been completed.

We would also like to thank Valley Contacts for their time and effort in assisting our study. Their kind donation of contact lenses is greatly appreciated.
1. After the first minute of wearing the contact lenses, how much of an increase in comfort have you had?

No increase slight mild moderate significant
in comfort increase in increase in increase in when lenses were put in
or worse than comfort comfort comfort
comfort

2. How tired feeling are your eyes, compared to normal, with the contact lens on?

Not a little mildly moderately constantly
tired tired tired tired

3. How much lens/lid awareness do you have?

No lid Awareness little awareness mild awareness moderate awareness constant awareness

4. What percent more tearing, compared to normal, do you have with the contact lens on?

no extra tearing extra increased more tearing

5. How much relief do you get when you close your eyes?

much worse worse no relief moderate total relief

6. How much more glare, compared to normal, do you have with the contact lens on?

No Extra glare glare glare glare
a little mildly moderately significantly increased increased increased increased

7. How comfortable are the lenses overall?

very uncomfortable aware comfortable very uncomfortable but comfortable tolerable
8. How comfortable are the lenses when you look right or left?
0------10------20------30------40------50------60------70------80------90------100
very uncomfortable aware comfortable very uncomfortable but tolerable

9. Since we put the lenses in, how much of an increase in comfort have you had?
0------10------20------30------40------50------60------70------80------90------100
No increase slight mild moderate significant
in comfort increase in increase in increase in
or worse than comfort comfort comfort comfort
when lenses were put in

10. How much more itching, compared to normal, do you have with the contact lens on?
0------10------20------30------40------50------60------70------80------90------100
None a little mildly moderately significantly
more more more more

11. How willing would you be to try these contact lenses?
0------10------20------30------40------50------60------70------80------90------100
very unwilling unsure willing very unwilling

12. Given time, do you think you can get used to these lenses?
0------10------20------30------40------50------60------70------80------90------100
definitely probably unsure probably definitely
not not yes yes

13. How nauseous do you feel with the contact lenses in?
0------10------20------30------40------50------60------70------80------90------100
No mild moderate severe unbearable
Nausea nausea nausea nausea nausea

14. How much stinging of your eyes do you have with the contact lenses in?
0------10------20------30------40------50------60------70------80------90------100
No mild moderate severe unbearable
Stinging stinging stinging stinging stinging

15. Compared to your normal vision, how is your vision with these contact lenses?
0------10------20------30------40------50------60------70------80------90------100
poor slightly no difference good excellent
reduced
Table 1. Data collected from Group A.

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Table 2. Data collected from Group B.

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