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Common Factors in Multifocal Contact Lens Success

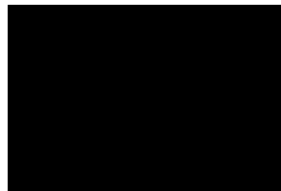
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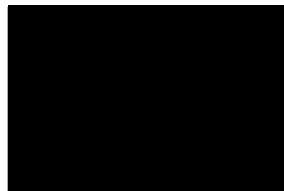
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Common Factors in Multifocal Contact Lens Success

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Abstract

Purpose: This research project was designed to determine the commonalities amongst successful multifocal contact lens patients in an attempt to increase the success rate of patients who are interested in wearing these lenses.

Methods: Twelve (12) subjects wearing multifocal soft lenses and eight (8) subjects wearing multifocal gas permeable lenses were recruited through a chart review of electronic medical records at the University Eye Center at Ferris State University. Patients were eligible to participate in the study if they were at least 45 years old with demonstrable presbyopia, if they had a complete eye exam within the last year, and answered positively to the question, *“Is your contact lens use meeting your expectations for success”*. Subjects then presented to the University Eye Center for an examination, which included a variety of tests and surveys.

Results: Subjects in this study rated their distance, near, and intermediate vision fairly high despite increased near vision demands and significant visual aberrations. The NEO-FFI-3 personality survey revealed that compared to the average population, subjects exhibited a high level of emotional stability and a willingness to experience new ideas. They are also highly determined to achieve with high standards for success. The Contact Lens Impact on Quality of Life Survey, originally designed for the prepresbyopic population, appears to be valid and useful for presbyopic subjects. The ability of the lenses to meet the patients' visual demands was highly correlated with an increased quality of life. Patients who are successful in multifocal contact lenses are highly motivated with little concerns about initial and ongoing costs, medical complications, discomfort, or complications associated with caring and maintenance of the lenses.

Conclusion: When fitting a patient who is a candidate for multifocal contact lenses, it is important that the eye care practitioner fully consider personality, visual demands, and patient motivation as well as successfully address cost, contact lens maintenance, comfort, and eye health concerns.

INTRODUCTION

Presbyopia is defined as the loss of the ability to accommodate.¹ This loss of accommodative ability begins in a patient's 20's and is almost completely depleted by age 50 to 55.^{2,3} While accommodative ability is not completely lost until the early to mid 50's, patients begin to feel the effects of its degradation by the age of 40-45.²⁻⁵

The rate of presbyopia is increasing rapidly worldwide, especially in the United States with the ageing baby boomers who have entered this stage of life. In the United States, there is estimated to be more than 135 million persons over the age of 40 who suffer from presbyopia.⁵ Meeting the refractive needs of these patients has become a significant part of optometry and area of great interest in research. There currently exist a variety of prescriptive and surgical options for meeting the visual needs of presbyopes. There are four main prescriptive options available to optometrists to treat presbyopia: bifocal or progressive addition lens spectacles; supplemental spectacle correction over contact lenses; monovision; and multifocal contact lenses.²⁻⁶ For the purpose of this paper, we are going to concentrate on those modalities that involve contact lenses.

Supplemental spectacle correction implies wearing glasses,

typically for reading, over top of single vision contact lenses. This modality provides the patient with excellent distance vision with their contact lenses, but limited intermediate and near vision without the aid of spectacles. While some patients are very happy with this type of wear, many dislike the hassle of having to continuously carry with and put-on reading glasses to see at near.

Monovision is a method of contact lens correction where one eye is corrected for distance and the other for near using single vision contact lenses. This modality typically provides patients with crisp distance and near vision while freeing them from spectacles. While monovision provides good distance and near vision to patients and is typically easy to fit initially, some patients can have difficulty adapting to it.⁶ By having one eye corrected for distance and the other for near, patients must constantly switch between suppressing one eye or the other each time they switch from distant to near viewing, which can be very difficult for some. Not only do patients struggle with alternating suppression of their eyes, but also monovision deprives them of the benefits of binocularity, including visual summation and stereoacuity.⁵

The final contact lens modality for treating presbyopia is multifocal contact lenses. Within the multifocal contact lens category, there exist two main designs: translating multifocal

lenses and simultaneous vision multifocal lenses.^{2,4} Translating multifocal lenses, or more accurately bifocal lenses, provide two separate viewing areas, one for distance and one for near. Translating designs are almost exclusively made using gas permeable materials. These lenses center on the cornea with the distance portion over the visual axis and translate upward when the wearer looks down to read by resting on the lower lid. By having separate distance and near viewing segments, translating bifocal contact lenses provide excellent distance and near vision, but have limited intermediate vision.

Simultaneous vision multifocal lenses provide distance and near vision by focusing light rays from all distances onto the retina simultaneously. These lenses use one of two designs: concentric rings of distance and near power or an aspheric design with near

power centrally which gradually changes to the necessary distance power in the periphery. An illustration of the different multifocal contact lenses designs is provided in Figure 1. These lenses provide the benefits of binocularity for viewing distant, intermediate and near targets, but also require some adaptation. Patients must adapt to having multiple images focused on the retina simultaneously and decide which image to concentrate on.⁶ Many practitioners liken this to looking through a screen door, one can either focus on the screen itself or look through the screen to the world beyond. For patients interested in multifocal contact lenses it is important to determine if they are willing to tolerate some visual tradeoffs for the lifestyle benefits of wearing contact lenses.⁶ If so, multifocal contact lenses should be at the forefront of treating presbyopia, but current prescribing trends indicate otherwise.

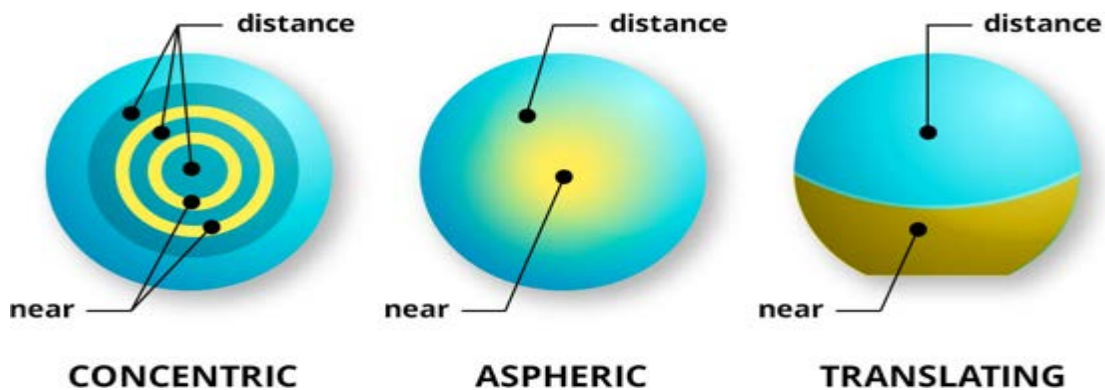


Figure 1: Illustration of concentric (left), aspheric (center) and translating (right) multifocal contact lens designs.

Even with a significant population available to reap the benefits of multifocal contact lenses, and a variety of designs available for use, many presbyopic patients are not being treated with these lenses. It is reported that 90% of current contact lens wearers 35 to 55 years old are committed to continuing contact lens wear.^{4,5} However, data from the 2012 annual contact lens fitting surveys demonstrated that less than 40% of contact lenses wearers over the age of 45 were prescribed a presbyopic treatment.⁵ Furthermore, within the distribution of contact lenses fitting overall, soft multifocal contact lenses comprised only 12% of fits and gas permeable multifocal lens fits accounted for a mere 3% (Figure 2).⁵ This lack of prescribing of multifocal contact lenses means there is a large, untapped market available for optometrists to enter into. While in theory multifocal contact lenses seem easy enough to fit and prescribe, most practitioners have had both great and terrible experiences when fitting patients. That raises the question, why do multifocal contact lenses work for some patients and not for others? This question in turn led to the focus of this

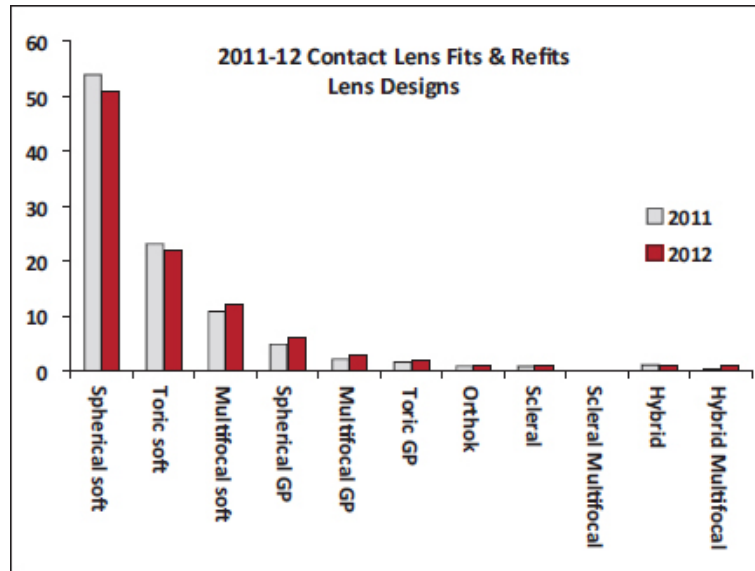


Figure 2: Contact lens fitting distribution based upon lens design.

experiment to determine if there exist commonalities among successful multifocal contact lenses wearers.

The driving goal of this research was to if there are common factors amongst successful multifocal contact lenses wearers that contribute to their success. By answering this question, we hope to identify patient characteristics that with help to increase the success rate of fitting patients interested in multifocal contact lenses.

METHODS

Patients

Twenty patients were recruited through a chart review of the electronic health records at the University Eye center at Ferris State University. Patients were eligible to participate in the study if they were at least 45 years

old with demonstrable presbyopia, had a complete eye exam within the last year, and answered positively to the question, *"Is your contact lens use meeting your expectations for success"*. The final subject group consisted of 12 soft multifocal lens wearers and 8 gas permeable multifocal wearers. OF the 20 participants, 3 were male and 17 female. The average age was 56 +/- 6.8, with ages ranging from 45-71. Participants wore a variety of contact lens designs and demonstrated a range of refractive errors. Once selected, subjects presented to the University Eye Center for an examination, which included a variety of surveys and clinical examinations.

Surveys

Three different surveys were utilized for this experiment, the first of which included a variety of questions assessing the individuals daily activities, their typical contact lens wear time and use, and also asked the participants to rate their distance, intermediate, and near vision and their perceived comfort.

The second survey utilized was the Contact Lens Impact on Quality of Life (CLIQ) developed by Pesudovs et al. The CLIQ survey assessed the participant's quality of life based upon their contact lens use. The survey was originally devised to use with non-multifocal contact lens wearers;

however, the investigators determined it to be acceptable for this study also.

The final survey used in this investigation was the NEO-Five Factor Inventory-3 personality survey. This survey provides a quick, simple, and accurate breakdown of an individual's personality into five specific domains, including: neuroticism, extraversion, openness, agreeableness, and conscientiousness.

Clinical Examination

Following completion of the three surveys, each patient underwent a thorough examination, which included visual acuity measurement, contact lens and corneal health assessment, corneal topography and wavefront aberrometry. Visual acuity was measured using 4 different methods, including: distance, near, habitual, and contrast sensitivity. Distance visual acuity was measured with the participant seated in a standard exam chair facing a computer screen with an adjusted Snellen chart displayed. Near visual acuity was measured using a near Snellen acuity card held at 40 cm measured from the participant's right temporal canthus. The habitual visual acuity was measured using a continuous text target held at the patient's preferred reading distance, which was then measured and recorded. Contrast sensitivity acuity was measured using a standard Pelli-Robson contrast

sensitivity chart with the patient standing 1 meter from the chart in normal room illumination.

Contact lens and corneal health assessment was performed using a Haag-Streit biomicroscope. The contact lenses were assessed to ensure proper fitting and alignment. Pictures and videos were also taken of the contact lenses on eye for further documentation.

Corneal topography was performed using a Medmont 300 corneal topographer to assess the curvature and power of each participant's cornea. These measurements were performed both with and without contact lenses.

Finally, wavefront aberrometry was performed using a Nidek OPD Scan III to assess and quantify the amount of aberrations within the eye of each participant. This again was performed both with and without contact lenses, which allowed in determining what amount of aberration was induced by the multifocal contact lenses.

RESULTS

The results of the Contact Lens Use survey are as follows. Participants indicated they first started wearing multifocal contact lenses because they wanted freedom from glasses. Nearly half of the subjects had never worn contact lenses before wearing multifocal contact lenses. This indicates that the participants were highly motivated to be successful with wearing contact lenses. When asked about their current occupation and their average daily activities, subjects reported occupations that included receptionists, educators, retirees and members of the health service industry. Their average daily activities including typically office duties, cooking, yard work, housework, reading, and computer work. The participants also reported commonly using desktop or laptop computers, tablets, and smartphones indicating a high demand on their near vision. The results of this portion of the questionnaire are organized and displayed in Table 1.

Participants also were asked to

Question Topic	Participant Response	Indication
Why did you begin to wear MFCLs?	Freedom from glasses	Motivated
Occupation	Receptionist, Education, Health Worker, Retired	High near vision demands
Typical daily tasks	Office duties, Cooking, Yard work, House work, Computer work, Reading	High near vision demands
Devices routinely used	Desktop, Laptop, Tablet, Smartphone	High near vision demands

Table 1: Daily activity results of the Contact Lens Use Survey

rate their distance, intermediate, and near vision and daily comfort with their lenses. These ratings were complete on a continuous scale from 1 to 5, 5 being the highest. Subjects placed a hash on the continuous the line and that distance was then measured and converted to a numerical value between 1 and 5. They also estimated their daily average wear time and how many days per week they typically wore their lenses. The results of this portion of the survey can be found in Table 2. As can

Category	Average Rating
Distance vision	4.30/5.0
Intermediate Vision	4.31/5.0
Near Vision	3.89/5.0
Daily Comfort	4.48/5.0
Average Wear Time	11.63 hours
Days/Week Wear Time	5.58 days

Table 2: Vision rating and wear time results of the Contact Lens Use Survey

be seen, the subjects on average rated their vision at all three distances relatively high as well as their daily comfort rating. Thus, patients felt their vision was very good most of the time, near vision was the only area where patients felt it could be better. In fact, only 22% preferred the vision with glasses to contact lenses. Also, 25% of these patients reported using basic reading glasses in combination with their multifocal contacts for tasks that required better near vision or if they were performing extended near vision tasks such as reading and they were fine using them. The average daily wear time

was approximately 11.5 hours, however this time ranged from 5 to 18 hours within our subject group. Patients also wore their lenses approximately 5.5 days per week, but again this number ranged from 1 or 2 days to 7 days per week. Eighty percent of participants reported using rewetting drops to help improve comfort and extend wearing time throughout the day. Even though there are large ranges of wear time among the subjects and many reported needing lubricating drops for comfort, each of these subjects felt their multifocal contact lenses met their expectations for success. This implies that successful wearing of multifocal contact lenses is not based on the patient’s ability to wear the lenses all day and every day, but rather allowing them to wear the lenses during times they feel are important.

The CLIQ survey encompasses a large range of questions and provides a significant amount of information. After thorough analysis, there were four areas found to be statistically significant. First, participants felt wearing contact lenses significantly improved areas such as physical appearance, general happiness, and having the ability to “do the things you want to do”. Participants also reported little financial concerns and showed minimal health concerns toward wearing contact lenses. This indicates the participants were not swayed from

Category	Average Score (Standard Deviation)	Indication
Neuroticism (N)	17.95 (+/- 4.72)	Low-Average
Extraversion	30.50 (+/- 3.50)	High-Average
Openness (O)	33.65 (+/- 4.72)	High
Agreeableness (A)	36.15 (+/- 4.73)	High-Average
Conscientiousness (C)	36.65 (+/- 4.99)	High

Table 3: Results of the NEO Five-Factor Inventory-3 personality survey (Costa, PT., McCrae RR. NEO Inventories™ Five-Factor Inventory-3)

wearing multifocal contact lenses based upon the increased cost of such lenses, nor were they frightened by the potential health complications associated with contact lens wear. Participants also reported no problem with routine care of their contact lenses or the use of rewetting drops throughout the day to help improve comfort.

Analysis of the NEO-FFF-3 personality survey showed the subjects shared a lot of the same personality traits. Participants on average scored high in two traits in particular, Openness and Conscientiousness. A high score in Openness indicates these people were all highly open to exploring new ideas or experiences. And high conscientiousness means that these are very self-disciplined people who are organized and very motivated to

achieve success. The results of the NEO-FFI-3 personality survey are provided in Table 3.

Of the clinical examination procedures, the results of the visual acuity testing (Table 4) were most relevant for discussion. As can be seen by the results, the participants displayed excellent distance and near acuity and contrast sensitivity. While there are many other factors influencing multifocal contact lens success, having acceptable vision remains an important aspect and is one of the most easily assessed. And as noted by the Contact Lens Use survey, the participants not only displayed excellent vision during clinical testing, but also in their everyday lives.

The results of pupil size and aberration testing are also important to note. Both gas permeable and soft

Acuity with Contacts (OU)	LogMAR	Approximate Snellen
Distance Acuity	-0.36 (+/- 0.06)	20/20
Near Acuity	0.12 (+/- 0.12)	20/25
Habitual Near	N/A	6pt print (+/- 2) at 43cm (+/- 8cm)
Contrast Sensitivity (Pelli-Robson)	1.95 log CS (+/- 0.07)	N/A

Table 4: Clinical examination visual acuity results

contact lens wearers alike showed an increase in induced ocular aberrations, 0.53 μm and 0.30 μm respectively, when wearing their multifocal contact lenses. While multifocal lenses induce aberrations, which typically degrade the quality of vision, the benefits of increased depth of focus provided to these participants outweighed the cost to their visual clarity.

Assessment of the contact lens fits revealed mild lens decentration, typically 0.0-0.2mm. The minimal decentration noted of the lenses indicates an excellent fit and ideal alignment of the optical system with the visual axis. Therefore, ensuring proper fit and alignment of the lenses is of great importance to successful patient outcomes.

CONCLUSION

No one single element was found among these multifocal contact lens wearers that appears to have single-handedly determined their success, rather a multitude of factors appear to be influential. When talking to patients about multifocal contact lenses it is good to consider their visual demands. The participants of this study both reported and displayed excellent vision with their multifocal contact lenses and felt their lenses met their visual needs despite having high visual demands. Even though a patient may report high visual demands, it is

important not to disregard them, as they too can be successful with multifocal contact lenses. It is also important to address issues of comfort and dry eye with these patients and reassure them that a wide variety of multifocal lenses are available as well as rewetting drops that may be used to improve their experience. Proper education regarding contact lens use and the required adaptation period to adjust to multifocal vision is important to address when considering multifocal contacts with a patient.⁵ When possible, try to get patients into multifocal contact lenses earlier as it allows for easier visual adaptation and a smoother transition into presbyopia.

Finally, it is important to remember not to set your expectations higher than the patient's. Multifocal contact lenses have shown to improve the quality of life of those patients who wear them, providing them freedom from glasses and improving their self-esteem. Determine what motivates your patient to wear contact lenses, when and how often they want to wear the contacts, and what their visual demands are during that time and strive to meet those goals.

FUTURE EXPLORATION

Increasing the study population and including non-successful patients to compare their traits with those who consider themselves successful would

be beneficial in determining what makes a successful multifocal contact lens wearer successful.

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