

# Review of Presbyopia and Spectacle Management

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## Abstract

Presbyopia is a physiological phenomenon. It is a disability to concentrate effectively on closer objects that occurs as the eye ages. It affects mainly the age group over 40 and also in some cases before the age of 40, many persons get difficulties to see at near point. Around 1.8 billion people have presbyopia globally which is nearly 25% of the world's population. It also significantly affects the quality of life. It occurs as the people get older it affects more. The main symptoms of presbyopia are headache and difficulty to see at near objects. Presbyopia is not a disease; it is a natural component of age. As we become old our lens start losing flexibility to make itself in convex shape and strength of ciliary muscles. It is also known as age-related farsightedness. It can also occur with uncorrected refractive errors like hyperopia. In this paper, we will discuss the physiological changes of the eye and possible spectacle management which are available in the recent market.

## Introduction

Presbyopia is a rapidly increasing visual impairment that affects the quality of life among the 35 to above age group. Presbyopia is affecting over a billion people worldwide [1]. According to ICD-10 presbyopia is a refractive and accommodative disturbance; it is a slow and age-related irreversible accommodation decline. Presbyopia is a chronic disorder that changes the accommodative ability to see clearly at a certain distance special at near objects [2,3]. A person with presbyopia can see distant objects clearly but cannot see near objects clearly because of the loss of accommodation. After going through the literature survey method, I have found two different types of presbyopia definitions. Functional presbyopia is defined as giving the best distance correction to achieve near visual acuity with at least 1 line of improvement at the near visual acuity chart (Burke et al., 2006). Objective presbyopia is defined as needing an optical correction of at least 1.00 D added to the best-corrected distance correction to improve near vision at least N8 [4]. Presbyopia is an accommodative dysfunction but the etiology of this accommodative mechanism is still a debatable topic. According to Helmholtz's theory [5] in older age biochemical changes happen in the crystalline lens capsule and the lens becomes rigid, the result is lens loses elasticity to make itself in convex shape to see clear the near objects [6]. According to Donders theory [7], loss of accommodation is not because of lens rigidity; loss of ciliary muscle contraction is the reason for presbyopia. Treatment of presbyopia is another task to reduce the presbyopia, various therapies are available like glasses, contact lenses, corneal laser surgery, and ICL.

## Gender variation

In the category of sex, presbyopia is more common in females over 40 years of age. This difference is not because of any physiological changes in accommodation. It happens due to viewing distance requirements, tasks performed, and arm length [8,9]. This presbyopia correction would lead to an even greater disparity among men and women in terms of uncorrected presbyopia versus corrected presbyopia [8].

## Refractive status impact

Presbyopia is not a refractive error. If we consider the uncorrected refractive error in the case of presbyopia, indirectly it affects presbyopia signs & symptoms. Low rates of uncorrected hyperopia can occur early need for presbyopia correction before the age of 40.

## Environmental effect

Presbyopia is present around 40 years of age in Western countries. It is reported that presbyopia occurs early in the countries closer to the equator, such as Central/South American countries [9]. Ultraviolet radiation can be a cause of degradation of crystalline lenses which is reported to have premature onset presbyopia [10].

## Various spectacle analyses

The most common intervention for correcting presbyopia is spectacle correction with plus power [11]. Spectacle correction cannot restore that dynamic range of accommodation in the aging eye [12]. Refractive correction of presbyopia can be achieved by reading glasses, bifocal lenses, trifocal lenses, or progressive addition lenses with different distance viewing objects.

In the form of bifocal correction round segment, D-segment, executive, ribbon segment, and curved top segment designs are available.

Round segment or kryptok bifocal is the cheapest bifocal with segments of 22 to 38mm. It is used for all purposes of seeing in distance and near objects. As the optical center of these glasses lies at the geometrical center of the segment, it gives an extra base-down prism effect. It gives an excess field of view. Image jump is more in this type (Figure 1).

Flat top bifocal is also called a D-segment. Segment height varies from 22 to 45 mm mostly used is 28mm. A wide reading area gives a better effect in near vision but it affects distance vision for small distance segments. Image jump is negotiable since the optical center is near the distance segment. Curved top segment similar to flat top segment with

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**Figure 1:** Kryptok Bi-focal.



**Figure 2:** D Bi-focal.

segment height of about 22mm. it has a wider reading area (Figure 2).

One piece solid bifocal is executive with one optical center on the dividing line. No image jumps as the optical center on the segment line. The ribbon segment has a wider field of view with a limited reading area.

The above +2.00 DS of additions are ideal for prescribing flat-top trifocal lenses. People wearing bifocal but uncomfortable with PAL's including typists, dentists, and card players. Executive trifocals are the best choice for occupations requiring a wide near and intermediate field. People like a chemist who finds it difficult to read small prints on bottles. E-D trifocal same as E-line and D-segment bifocals. It requires minimal horizontal and vertical head movements. It is only suitable for people with time computer or working. Librarian is the best client for the use of Flat-top trifocal and Executive occupational trifocal, both are similar but executive occupational trifocal is only available in glass.

Progressive additional lenses were successfully designed by 'the varilux' from Essel (Essilor). Two types of progressive design are available soft design and hard design. Hard design has a wider reading area and distance area. Progression of power in the intermediate zone is short and hard periphery. Due to narrow reading zones and distance zones in soft design, people with active mobile users and new presbyopes are suitable for soft design.

## Conclusion

Presbyopia is a global problem, affecting billions of people worldwide in the aging population. Currently available all the presbyopic corrections should be given to every portion of rural area because most of the cases are coming from this portion of society. The uncorrected refractive error should be treated as early as possible to avoid early onset presbyopia with available spectacle correction. Further studies should be considered in the development of presbyopia and treatment of presbyopia that can restore the accommodation.

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