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Evaluating the Impact of Presbyopic Eyewear on Driving Performance Among Commercial Drivers

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CONFLICT OF INTEREST
None declared.

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None declared.

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ABSTRACT

Purpose: To establish how presbyopic eyewear affects the performance of commercial drivers on the road.
Methods: Eighty six commercial drivers who were between the ages of 40 to 65 years were recruited and the cross sectional study conducted through purposive sampling. The sample was divided into two age brackets namely 40 50 years and 51 65 years. The inclusion criteria were to be an active commercial driver within the above age bracket with the diagnosis of presbyopia and were or had worn or still wore presbyopic corrective eyewear. Those drivers with ocular pathology not related to the presbyopia or the drivers with neurological diseases with the vision or driving impairments were excluded.
Results: The sampling population of this cross-sectional experiment was 86 commercial drivers aged 40-65 years, separated into 2 age groups (40-50 and 51-65 years) of sample. Individuals with presbyopia and corrective eyewear were chosen. Information was gathered by use of survey questionnaires on the basis of checking visual challenges during driving, eyewear, driving experience and record of accidents. Distance and near vision visual acuity was conducted with no correction and corrected. T-tests, ANOVA and Chi-square were also used to analyze the relationships between the use of presbyopic eyewear and visual performance and difficulties in driving. The level of significance of p was considered as 0.05.
Conclusion: The research points out that the prevalence of presbyopia is very high among the commercial drivers in the age group of 40-65 years old the majority of which are aware of corrective eyewear and use it. Although presbyopic eyewear is highly effective in enhancing the level of visual acuity and certain tasks related to driving, they continue to experience challenges such as the inability to change the focus, poor visibility at the dashboard, night glare and visual fatigue, especially among people with a shorter period or infrequent eyewear usage. Even though the eyewear use did not cause any substantial decrease in the accidents involvement, regular and extended use seems to be crucial to reduce the visual impairments during driving. These results indicate that to improve the safety and comfort of driving in this group, specific methods of vision correction, as well as frequent eye exams are necessary.

KEYWORDS Hypermetropia, Myopia, Quality of vision, Progressive addition lenses, Presbyopia

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INTRODUCTION

Older people are the most rapidly expanding group of the population in comparison with other age categories, (1) which is ind icated in the increasing amount of older drivers. It has road safety implications because when the distance covered by road users is factored, older drivers are found to be involved in the greatest number of crashes than any other age bracket(2).

In most of the nations, driving is the main means of transport. It makes it easier to execute the daily routine life, work and also social activities(2,3).

The most common causes of visual impairment in adult human beings older than 40 years are uncorrected refractive error and cataracts1 and the prevalence rate increases with age dramatically (3).

One of the most critical conditions to safe driving is vision which enables drivers to perceive the distance correctly, recognize the road signs, status of traffic and react promptly on possible potential dangers. Nevertheless, as ones age the eye starts to experience various changes, the most frequent of them being that of presbyopia - a progressive loss of near focusing, which might adversely affect driving performance. Presbyopia usually starts at the age of 40 and necessitates the use of optical devices like reading glasses, bifocal, or progressive lenses to bring the person to a certain distance in order to see something clearly. Though these correctional solutions contribute to the enhancement of near vision, they may pose complications to the drivers such as inability to shift focus between the dashboard and the road, limited peripheral vision, image distortions, and glare sensitivity(4).

Along with presbyopia divers age related eye afflictions have the potential to further hinder driving capabilities. When the eye is affected by cataracts, it becomes blurred due to vision clouding and problems with glare especially during night time. Glauco ma influences the peripheral vision thus one will not easily spot other vehicles or pedestrians in side blind spots. Macular degeneration (AMD) causes loss of sight that would directly affect reading signs and being able to see an object that is right before them (Thacker, 2013). The results mentioned above may lead to vision variability, blind spots, and problems with the perception of depth, wh ich may make it easy to make wrong judgments of distances (5). The syndrome of dry eyes can result in discomfort and light sensit ivity, whereas keratoconus results in distorted vision and visual impairments of the depth. The presence of other ailments such as n ight blindness (nyctalopia) and diplopia (dual vision) further blur the vision and tracking ability of the moving objects on the road (6).

These are visual impairments in addition to the isotope of presbyopic adjustment, which include difficulty in driving, especially when there is low light or high-speed and in situations where a person needs to make some abrupt changes in his or her vision. As a way of reducing these risks, special driving glasses and lens designs and use of anti-reflective coating and appropriate light adjustments can enhance visual performance and comfort on the road by means of early and subsequent management of all visual-related complications in the driver. It is important to get to know how presbyopia and other eye conditions affect the driving performance to facilitate road safety and, additionally, increase the visual comfort of the aging population (7,8).

Cataract is a common cause of eye blindness in individuals above the age of 60 years. Nearly half of the elderly individuals at the age of 75 years have early cataract, and about one quarter have late cataract. Usually bilateral in older adults, the condition impairs most of the vision aspects and this consists of acuity, contrast sensitivity and visual field sensitivity and aggravates disability glare. (1,4,9)

There are various challenges that may be associated with the use of presbyopic correction during driving such as lack of clarity and inability to see long distances through the reading glasses, low peripheral awareness as a result of bifocal or progressive lenses and the inability to vary focus between the road, mirrors, and the dashboard. Distorted visual perception from lens transition zo nes can lead to misjudging distances, while glare from headlights and sunlight may reduce visibility, especially at night. Drivers ma y struggle with inconsistent dashboard readability and may experience postural discomfort from tilting their heads to find the right foc us zone. Adaptation to new lenses can take time, causing dizziness or disorientation, and slower focusing may delay hazard detection. To improve safety, drivers can use specialized driving glasses, occupational bifocals, or lenses with anti-reflective coatings while ensuring regular eye check-ups for proper prescription updates.(10)

The impairment of central vision (VI) may affect the independent performance of the daily activities, such as driving. Indirect differences in jurisdictional requirements of driving with VI are widespread and this may be because of historic requirements, or a lack of evidence on the effectiveness and safety of strategies of driving with central VI, including bioptic telescopes. The purpose of this thesis was to augment the evidence-base on driving with central VI by exploring existing and possible management strategy. (11)

Despite the critical importance of this issue, research specifically focused on the impact of presbyopic eyewear on the driving performance of commercial drivers is limited. Existing studies tend to address general age-related visual decline or focus on private drivers, leaving a gap in our understanding of how these corrective measures affect those in the commercial driving sector. As the number of aging drivers in this industry continues to grow, it is essential to determine whether current presbyopic eyewear p ractices are enhancing or inadvertently impairing driving performance. (13) the objective of study is to determine the impact of presbyopic eyewear on driving performance among commercial drivers.

MATERIAL AND METHOD

This observational cross-sectional study was conducted at THQ Kabirwala, Khanewal, over a period of 6 months. The sample size was determined using a paired t-test with an effect size of 0.1836777, considering a mean of 52.9 for group 1 and 52.1 for group 2, with standard deviations of 4.8 and 3.7, respectively. Based on these calculations, a total sample size of 86 participants wa s required to detect statistically significant differences. However, accounting for an expected 10% dropout rate, the sample size was ad justed to 93 participants using G-Power version 3.1.9.7. A purposive sampling technique was employed to select participants who met the inclusion criteria, which included presbyopic individuals aged 40-65 years with driving experience and annual driving mileage of 400-500 km per month, without any eye diseases. Participants with cataracts, glaucoma, age-related macular degeneration (AMD), diabetic retinopathy, amblyopia, neurological disorders, or a history of driving accidents were excluded. The study utilized various

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ORIGINAL RESEARCH
Volume 4 | Issue 2 | 2026
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tools, including Snellen Chart for distance visual acuity, Near vision chart (Jaeger eye chart) for near vision, Pelli-Robson chart for contrast sensitivity, autorefractometer, ophthalmoscopy, retinoscopy, and lensometry.
A structured questionnaire was administered to gather demographic information, driving habits, and presbyopia-related data. Visual function tests, including visual acuity, and contrast sensitivity, were conducted to assess participants' visual abilities. A driving performance assessment, were evaluate participants' driving performance without presbyopic eyewear (pre-test). A presbyopic eyewear was then fitted to the participants and explained how to wear it. Lastly, the driving performance test was re-administered using presbyopic lenses (post -test). The statistical analysis was done to determine the effects of presbyopic eyewear on driving performance in commercial drivers. Qualitative questions Descriptive stat. The descriptive data have been presented in terms of the mean and standard deviation including frequencies, proportions (prevalence), and simple bar charts and curves and (association) was done through the Chi-square test with a level of significance of 0.05. - Independent T- Test: The independent T- test will be used when comparing the means of driving performance scores of the people who have presbyopic eyewear against those without them. ANOVA (Analysis of Variance) to discuss the impact of using various types of presbyopic eyewear (i.e. single vision, a progressive addition lenses, multi-focal contact lenses, etc.) on driving performance.

RESULTS

The participants were 86 people between the age of 40 and 65 years divided into 2 major age groups: 40 50 years-old (58.1) and 51 65 years -old (41.9). The gender balance was very leaning toward female gender (53.5) as compared to male gender (46.5). One-sample t-test showed the statistical significance of the awareness and wearing of the presbyopic eyewear, an overwhelming majority acknowledged to have the presbyopia (mean difference = 1.03, $p < 0.001$), were currently wearing the corrective eyewear (mean difference = 2.04, $p < 0.001$), and had been wearing it some quite time (mean = 3.28 years). ANOVA indicated that there is a viable linkage between the duration of the use of presbyopic eyewear and difficulties driving ($p = 0.000$), particularly in missing road signs ($p = 0.006$) and general driving scenarios ($p = 0.043$). It is worth noting that, 25.6 percent have experienced road traffic accident within the past 12 months, and 64 percent have had near-miss accidents. Crosstab analysis showed that the 4050 age group had higher difficulties changing focus between far and near objects (32) and seeing the dashboard clearly(27). Moreover, 24.4% of the respondents claimed that they would always feel fatigued because of it being visual strain when driving. There was no notable association with the use of presbyopic eyewear and accident involvement ($p = 0.971$) which can be shown through chi-square analysis because it can be assumed that despite the common use of eyewear, it cannot completely prevent visual activity during the driving process. Generally, the results show that despite the positive effects of presbyopic eyewear on the visual qualities of participants, other demerits like dashboard visibility, night glare, and fatigue still occur, particularly in the participants who wore eyewear less frequently or with less time.

Table 1: Age of participants

Age of participants			
		Frequency	Percent
	40-50years	50	58.1
	51-65years	36	41.9
	Total	86	100.0

The number of commercial drivers (participants in the study) was 86, divided into two age groups. Most of the respondents (n=50, 58.1) fell in the age groups of 40-50 years whereas the rest (n=36, 41.9) were in the age groups 51-65 years. This distribution is skewed slightly towards the younger age group within the presbyopic range but the sample is relatively balanced. The cumulative percentage attribute indicates that 58.1 percent of respondents are in the 4050 years bracket with 100 percent of the respondents being accounted when both age groups are put together which implies that all the data on the age variable has been collected.

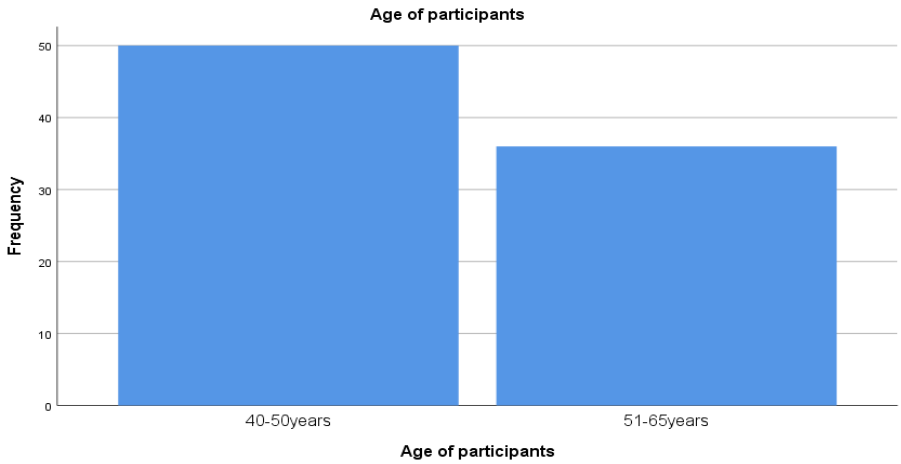

Figure 1: Age of participants

INSIGHTS-IJHR
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ORIGINAL RESEARCH
Volume 4 | Issue 2 | 2026
ISSN: 3007-2948

Table 2: Years of Driving Experience

Years of Driving Experience			
		Frequency	Percent
	2-3years	40	46.5
	4-5years	15	17.4
	6-7years	31	36.0
	Total	86	100.0

The subjects of the experiment were different in terms of driving experience being between 2 and 7 years. Among the overall 86 commercial drivers, the most significant part of which was represented by those that had 2-3 years of experience (n=40, 46.5%). It was followed by 31 drivers (36.0%), who had a 617 years of driving experience, and 15 participants (17.4) had a 45 years of experience. The cumulative percentage indicates that percentage of participants between overall experience of 5 years experienced up to this time was 64.0 per cent. This shows that most of the drivers were still quite recent in their commercial driving profession. The total distribution amount to 100% which proves that there is no missing data associated with this variable.

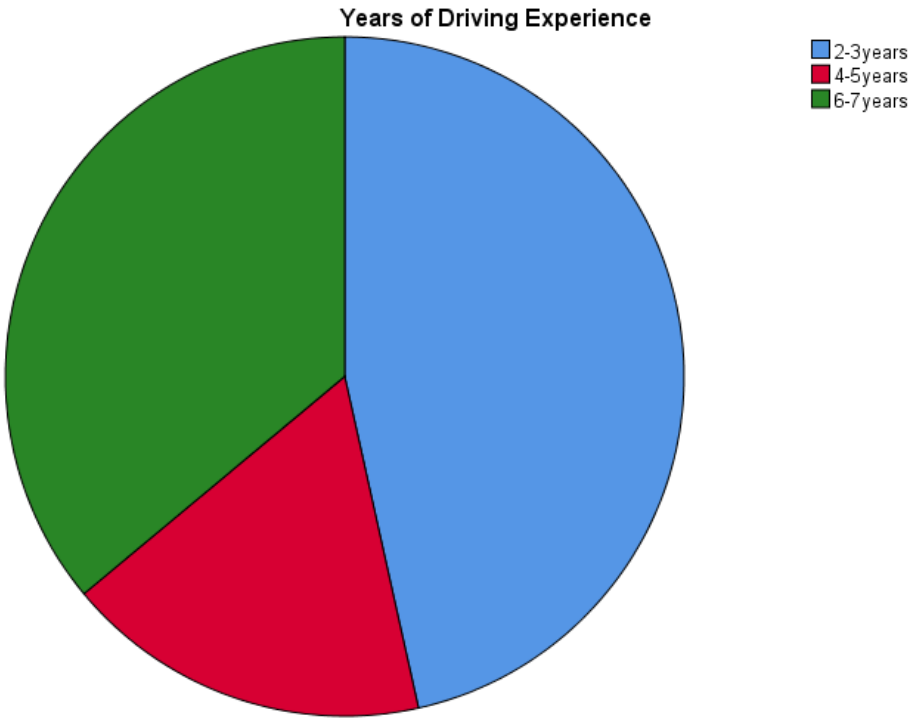

Figure 2: Years of Driving Experience

Table3: Type of Commercial Vehicle Driven

Type of Commercial Vehicle Driven			
		Frequency	Percent
	Bus	28	32.6
	Truck	23	26.7
	Taxi	16	18.6
	Delivery Van	10	11.6
	Other	9	10.5
	Total	86	100.0

There were 86 commercial drivers who participated in the study and were driving different types of vehicles. The bus was the most frequently driven vehicle among them, with 28 of them (32.6) reporting this, then 23 truck drivers (26.7). Only taxi drivers (16) made 18.6 percent and only 10 drivers (11.6 percent) were delivering vans. The other 9 respondents (10. 5) were classified under the "Other" category that can have specified or less popular commercial vehicles. This cumulative percentage is distributed in a gradual manner with most of them (77.9) at the wheel of buses, trucks, or taxis. The information gives a broad summarization of the kind of vehicles that were captured in the study as it, indeed, indicates that the sample was diversified in terms of the different categories of commercial vehicles.

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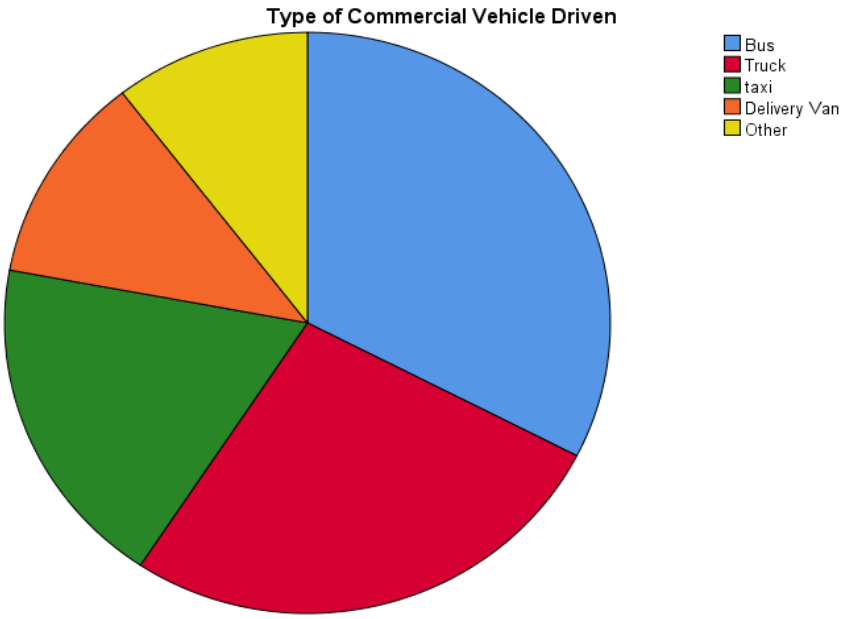
ORIGINAL RESEARCH

Volume 4 | Issue 2 | 2026
ISSN: 3007-2948



Figuree3: Type of Commercial Vehicle Driven Visual History and Eyewear Use

Table4: Visual Acuity OD VS (BCVA) OD

Crosstab					
		BCVA OD			Total
		6/12	6/9	6/6	
Visual Acuity OD	6/60- 6/36	9	17	7	33
	6/24-6/18	5	24	9	38
	6/12-6/9	0	8	7	15
Total		14	49	23	86

The analysis of the unaided vision within the right eye (OD) and the best-corrected vision (BCVA) OD of 86 commercial drivers showed that there was an improvement in the visual acuity after correcting vision. Out of participants with unaided visual acuity with 6/60 to 6/36, 9 out of them had BCVA of 6/12, 17 out of them had 6/9 and 7 out of them had 6/6 with correction, bringing the total number of participants in this category to 33. In the case of unaided acuity ranging between 6/24 and 6/18, 5 participants attained 6/12, 24 attained 6/9 and 9 attained 6/6 as a total of 38 participants. Considering the individuals that had an unaided acuity of between 6/12 and 6/9, 8 of them had improved to 6/9, 7 had improved to 6/6, and no one was at 6/12; this was among 15 participants. All, 49 persons (57.0 per cent.) were able to attain a BCVA of 6/9 and 23 persons (26.7 per cent.) attained a BCVA of 6/6 and 14 persons (16.3 per cent.) were left at 6/12. These outcomes show that the visual acuity is greatly improved when there is the use of properly refractive correction.

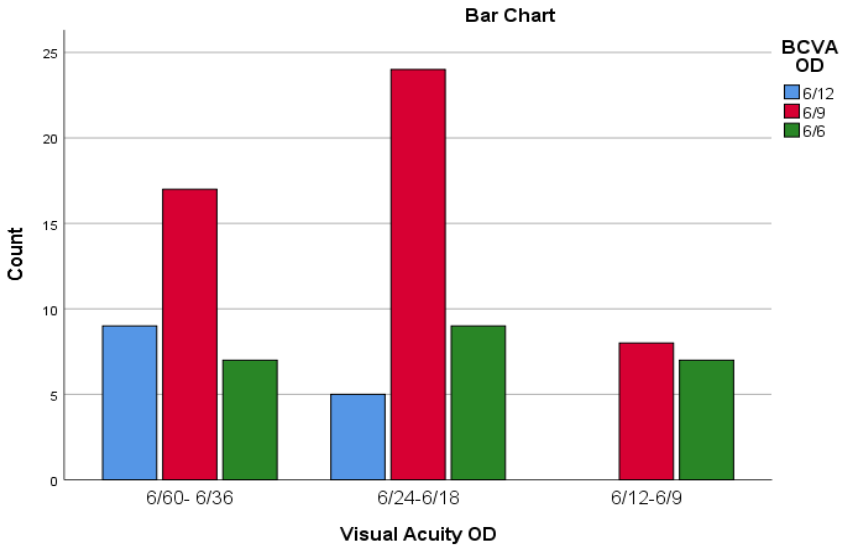


Figure4: Visual Acuity OD VS (BCVA) OD

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INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION
ORIGINAL RESEARCH
Volume 4 | Issue 2 | 2026
ISSN: 3007-2948

Table5: Visual Acuity OS VS BCVA OS

Crosstab					
		BCVA OS			Total
		6/12	6/9	6/6	
Visual Acuity OS	6/60- 6/36	9	17	7	33
	6/24-6/18	5	24	9	38
	6/12-6/9	0	8	7	15
Total		14	49	23	86

The comparison of the unaided visual acuity (VA) in the left eye (OS) and the best-corrected visual acuity (BCVA OS) between the 86 commercial drivers revealed that there was a significant improvement of the vision after the correction in the nonmonocula r state. Out of 33 respondents of unaided VA of 6/60 to 6/36, it was found that 9 of them were able to reach 6/12, 17 to reach 6/9, and 7 to reach 6/6 with the correct correction. Out of the 38 individuals who had baseline VA between 6/24 and 6/18, 5 of them got 6/1 2, 24 improved to 6/9, and 9 to all the way to 6/6. In the 15 who had an initially unaided VA of 6/12 -6/9, 8 people had 6/9 and 7 people had 6/6 and no one was having 6/12. Overall, 49 participants (57.05) had 6/9, 23 (26.70) attained 6/6, and 14 participants (1 6.30) 6/12. This trend resembles the results of the right eye and shows that a considerable number of commercial drivers had a substantial increase in the visual field of the left eye when corrected appropriately by the optical correction.

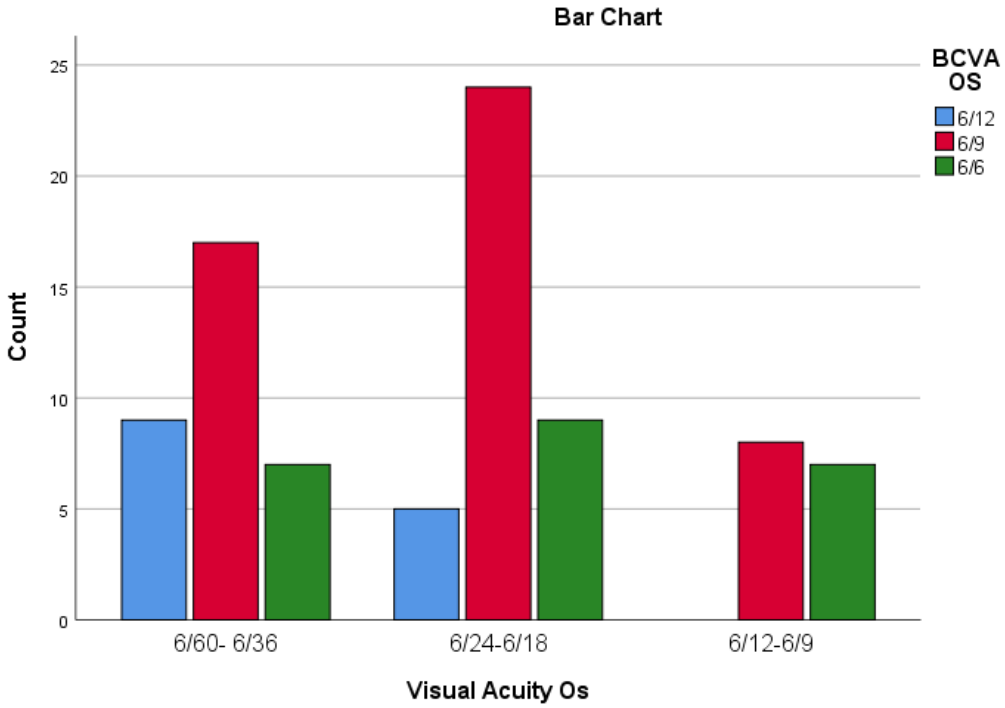

Figure5: Visual Acuity OS VS BCVA OS

Table5: NVA OD VS BCNVA OD

NVA OD VS BCNVA OD				
		BCNVA OD		Total
		N6	N5	
NVA OD	N14	21	10	31
	N12	20	20	40
	N10	5	10	15
Total		46	40	86

The near visual acuity (NVA OD) and best-corrected near visual acuity (BCNVA OD) of the unaided unaided near visual acuity of 86 commercial drivers (vermonitors) was cross-tabulated in the right eye, which showed high results of increased near vision after corrections. Among participants (31) whose NVA (unaided) is N14, 21 raised their NVA to N6 whilst 10 raised their NVA to N5 after correction. Among the 40 participants who had unaided NVA of N12, 20 of them performed at N6 and the remaining 20 actually enhanced to N5 which is an equal distribution. A positive NVA of N10, in the group with NVA of N10 (15 persons), resulted into 5 persons developing into N6 and 10 persons developing into N5. Overall, 46 (53.5) of the participants had an initial

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INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION
ORIGINAL RESEARCH
Volume 4 | Issue 2 | 2026
ISSN: 3007-2948

best-corrected near VA of N6 and 40 (46.5) of the participants had an initial best-corrected near VA of N5. These results suggest the usefulness of presbyopic correction in functional near vision that is vital in reading and operating dashboard instruments during driving.

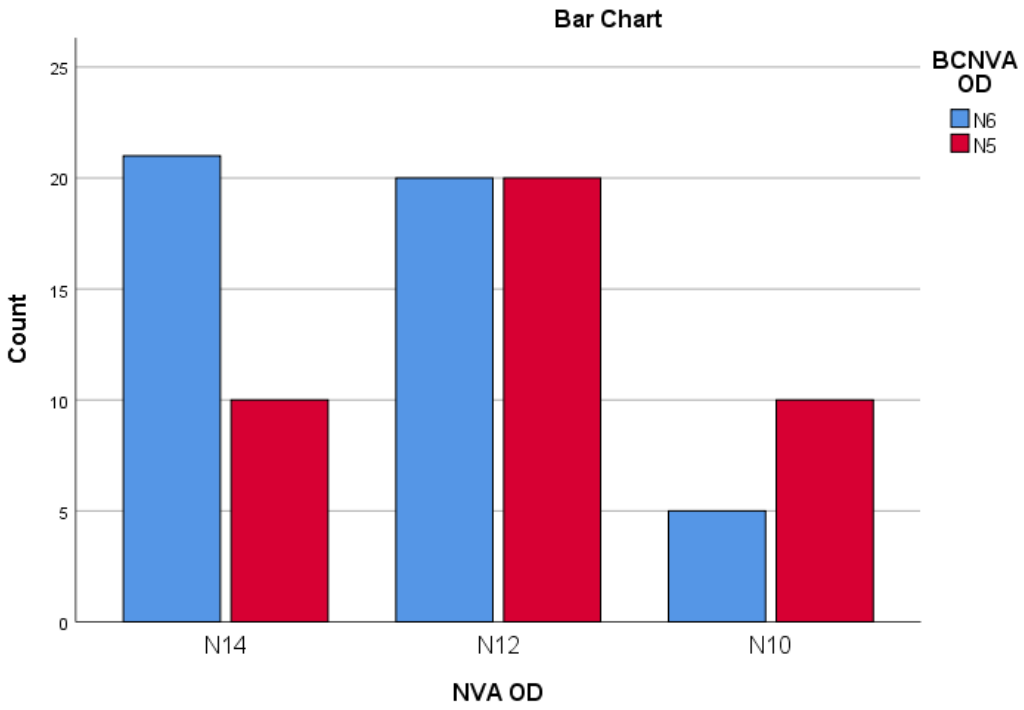

Figure5: NVA OD VS BCNVA OD

Table6: NVA OS VS BCNVA OS

NVA OS VS BCNVA OS				
		BCNVA OS		Total
		N6	N5	
NVA OS	N14	21	10	31
	N12	20	20	40
	N10	5	10	15
Total		46	40	86

The cross tabulation of unaided near visual acuity (NVA OS) and best corrected near visual acuity (BCNVA OS) at the left eye among 86 commercial drivers indicated the definite cost reduction by optical image correction in the near vision. Out of the original cohort of 31 NVA N14 was 31, and 21 out of these 31 showed improvement to N6 and 10 with correction. An equal number of 20 participants out of the 40 participants who started with NVA of N12 improved to N6 and N5. On the same note, out of the 15 participants that had NVA of N10 unaided, 5 were able to improve to N6, and 10 improved to N5. So, a total of 46 participants (53.5%) had an attained BCNV of N6 and 40 (46.5%) attained N5, which showed that a large percentage of the experiment sample obtained functional near vision with which they could perform their tasks such as reading small print and dashboard boards. These findings also prove the beneficial effect of the near vision correction on the visual performance of the left eye among presbyopic commercial drivers.

INSIGHTS-IJHR
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ORIGINAL RESEARCH
Volume 4 | Issue 2 | 2026
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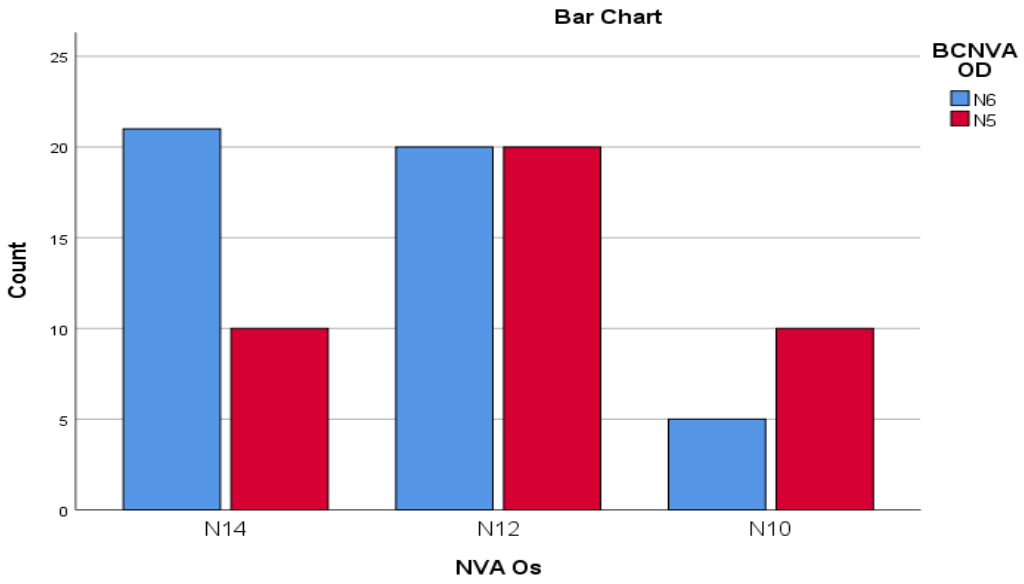

Figure6: NVA OS VS BCNVA OS

Table7: Age-Related near vision difficulty

Crosstab				
		Age of participants		Total
		40-50years	51-65years	
Have you been diagnosed with presbyopia (age-related near vision difficulty)	Yes	46	32	78
	No	4	4	8
Total		50	36	86

The cross tabulation involving the age of the participants and the fact whether they were diagnosed with presbyopia (age difficulty in seeing properly) indicated that an increasing age is strongly related to prevalence of presbyopia. Of the 50 participants who were between 40 and 50 years old, 46 (92) of them said that they were diagnosed with presbyopia and 4 (8) did not. The age group of 51-65 years (n=36) showed a higher factor demonstrating the diagnosis of presbyopia; 32 (88.9) being diagnosed and only 4 (11.1) undiagnosed. In general, among all the participants (86 out of 86) 78% (n= 78) reported having presbyopia indicating its frequent occurrence among the participants who were commercial drivers and aged 40 years and over. The results further indicate that presbyopia is widely reported within both age groups though a little more in the younger age group 40-50 years in this case.

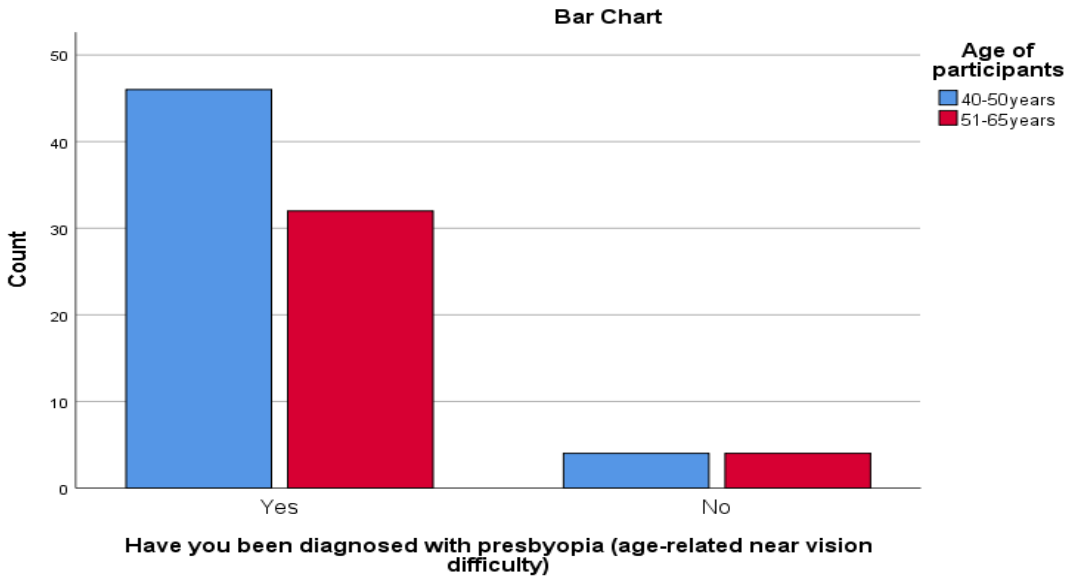

Figure7: Age-Related near vision difficulty

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ORIGINAL RESEARCH
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ISSN: 3007-2948

Table8: Use of glasses for vision correction while driving

Crosstab				
		Age of participants		Total
		40-50years	51-65years	
Currently use any glasses for vision correction while driving	Reading glasses	6	11	17
	Bifocal glasses	28	16	44
	Progressive lenses	15	9	24
	Contact lenses	1	0	1
Total		50	36	86

The cross tabulation of the age brackets and the kinds of glasses worn during driving to have a vision correction gives different trends on the eyewear preference of the 86 commercial drivers. Most of the drivers wore bifocal glasses in the 4050 years of age bracket (n=50) and next came progressive lenses (n=15, 30 percent), then reading glasses (n=6, 12 percent). The age group with only one participant (2 is 2% of the total participants) said they use contact lenses. Bifocal glasses (16 participants, 44.4%), reading glasses (11 participants, 30.6%), and progressive lenses (9 participants, 25) were also the most frequent eyewears among the 51-65 years old age group (n=36). None of the participants aged in this bracket said that they used contact lenses. In general, the most popular vision correction technique was bifocal glasses (44 participants, 51.2%), then there were progressive lenses (24 participants, 27.9), and reading glasses (17 participants, 19.8). The fact that multifocal eyewear is more popular with commercial drivers and bifocals are the most common among both age ranges insinuates that a combination of both bifocal and multifocal lenses meets the needs of the typical business driver.

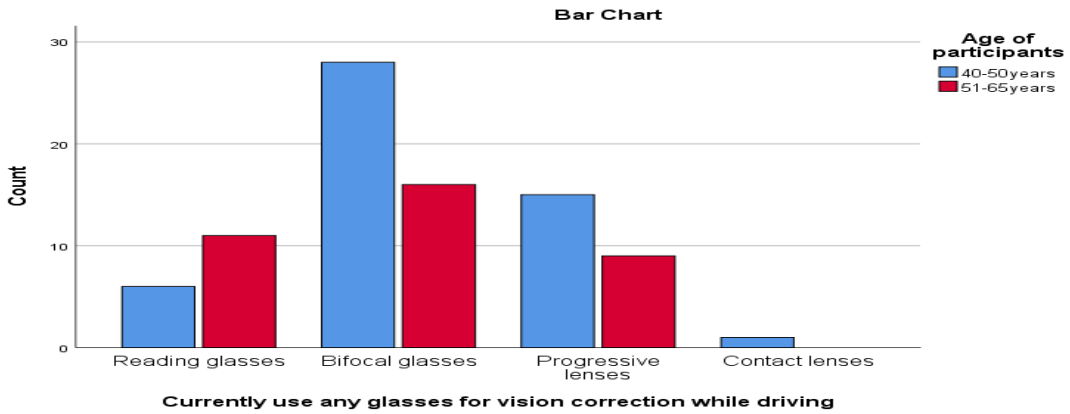

Figure8: Use of glasses for vision correction while driving

Table9: How long have been using presbyopic eyewear

Crosstab				
		Age of participants		Total
		40-50years	51-65years	
How long have you been using presbyopic eyewear	6 months – 1 year	4	8	12
	1–2 years	22	11	33
	> 2 years	24	17	41
Total		50	36	86

The cross-tabulation of age groups and the time period of wearing presbyopic eyewears by 86 commercial drivers indicate that there are differences in longevity of use by the participants in using vision correction. The prevalence of presbyopic eyewear was as follows in 4050 age group (n=50); almost half of the participants (24 drivers, 48%) wore the eyewear more than 2 years, 22 drivers (44) more than 1-2 years, and only 4 drivers (8) used them more than 6 months to 1 year. Within the 5165 years age group (n=36), 17 (47.2) subjects had been wearing the presbyopic eyewear over 2 years, 11 (30.6) over 1-2 years, and 8(22.2) over 6 months to 1 year. Generally, most participants (41, 47.7) have used presbyopic eyewear over 2 years meaning they wear long. These results indicate that majority of commercial drivers are used to presbyopic corrective over a long time.

INSIGHTS-IJHR
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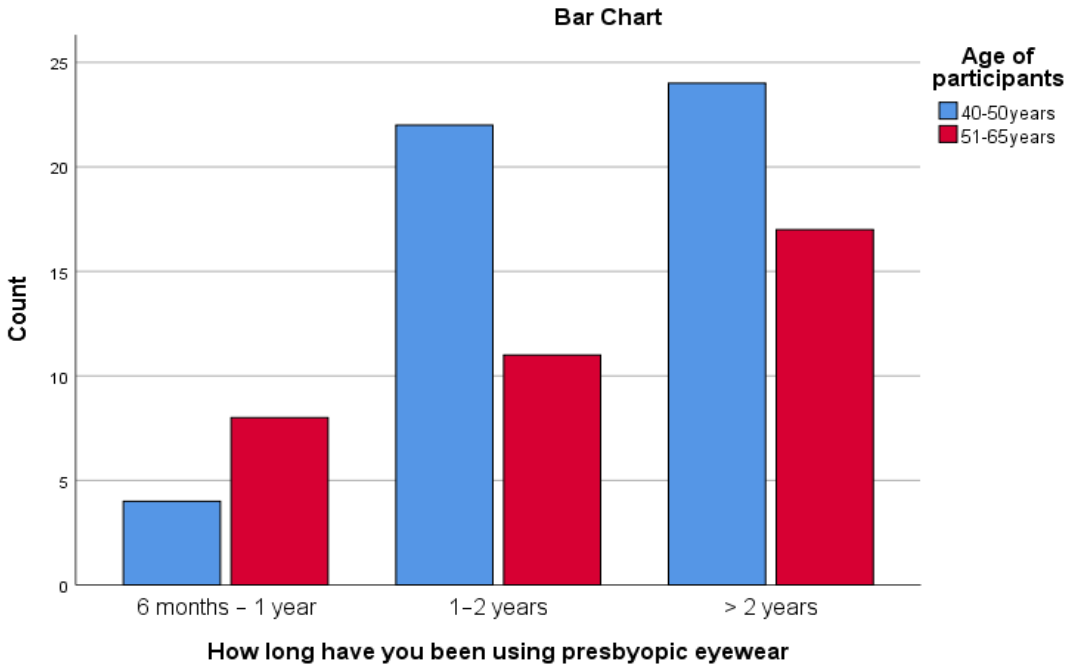

Figure9: How long have been using presbyopic eyewear

Table10: Consistently use of Presbyopic eyewear while Driving

Crosstab				
		Age of participants		Total
		40-50years	51-65years	
Consistently use of presbyopic eyewear while driving	Always	25	21	46
	Sometimes	15	6	21
	Rarely	3	9	12
	Never	7	0	7
Total		50	36	86

The cross-tabulation of age groups and consistency of use of a presbyopic eyewear when driving amongst 86 commercial drivers designate disparities in compliance to use of corrective lenses. Among the age group of 4050 (n=50) years only slightly less than half (25 drivers, 50 percent) said that they never wore nondispersive eyewear driving. A total of 15 drivers (30%) said he/she occasionally wear them, 3 drivers (6) said that he/she rarely wears his/her presbyopic eyewear when driving, and 7 drivers (14) said he/she never wore his/her presbyptic eyewear when driving. Conversely, among the 518565 years age bracket (n=36) 21 (58.3) of them used their eyewear always, 6 (16.7) used it occasionally and 9 (25) used it seldom; none of them used their glasses never when driving. All in all, 46 participants (53.5) will wear their presbyopic eyewear regularly when driving, but the rest of them indicate that they will use it inconsistently. These findings imply that the older group had higher consistency in the use of eyewear and that there is need to encourage the use of the corrective lenses to prevent unsafe driving.

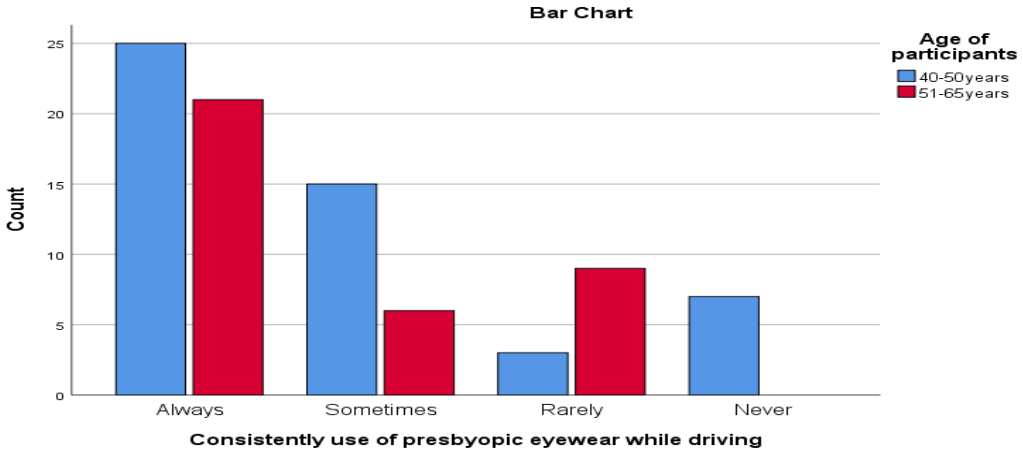

Figure10: Consistently use of Presbyopic eyewear while Driving

INSIGHTS-IJHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION
ORIGINAL RESEARCH
Volume 4 | Issue 2 | 2026
ISSN: 3007-2948

Table11: Experienced while driving with Presbyopic Eyewear

Crosstab				
		Age of participants		Total
		40-50years	51-65years	
Experienced while driving with presbyopic eyewear	Blurred vision	5	3	8
	Glare or halos at night	14	8	22
	Difficulty seeing dashboard	11	12	23
	Difficulty shifting focus between far and near objects	16	1	17
	No issues	4	12	16
Total		50	36	86

The cross-tabulation of the age groups and vision-related problems in case of driving with presbyopic eyewear among 86 commercial drivers provides scope of reported problems. The reported problem that was most prevalent in the 40 50 years age bracket (n=5 0) was difficulty moving between far and near objects with 16 participants (32) affected whereas glare or halos at night was 14 (28) participants and difficulty seeing the dashboard was 11 (22) participants. Also, 5 participants (10% displayed visual blurrin ess and only 4 participants (8% reported no problems. The commonest complaint in the 51-65 years age group (n=36) was difficulty with dashboard (12 participants, 33.3%), then glare or night halos (8 participants, 22.2%), and blurred vision (3 participants, 8.3%). Surprisingly, the proportion of respondents in this older age cohort (2.8 percent) noted that they had no problems in terms of taking the focus between distant and near objects, and 12 individuals (33.3 percent) of this older age group had no problems using presbyopic eyewear as long as they were driving. In general, the most frequent problems among all the participants were difficulty seeing the dashboard (23 participants out of 26.7) as well as glare or halos during night (22 participants out of 25.6). The younger group indicated more problems with distance-based focused and the older with fewer problems in the focus but reported more problems with the view of the dashboard and less total complaints. The results emphasize the multiplicity of considerations of commercial drivers who use presbyopic eyewear and indicates the necessity of especially developed vision correction treatment options depending on the unique age-related visual needs.

Table12: Driving Performance (Self-Reported)

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Driving Situation	12(14.05%)	25(29.1%)	27(31.4%)	21(24.4%)	1(1.2%)
I miss road signs or signals due to unclear vision.	17(19.8%)	27(31.4%)	21(24.4%)	21(24.4%)	1(1.2%)
I find it difficult to drive at night.	24(27.9%)	25(29.1%)	15(17.4%)	22(25.6%)S	1(1.2%)
I have trouble reading the dashboard or GPS display.	10(11.6%)	14(16.3%)	23(26.7%)	22(25.6%)	17(19.8%)
I feel confident in my driving performance with my current eyewear.	7(8.1%)	18(20.9%)	40(46.5%)	14(16.3%)	7(8.1%)
I feel fatigued due to visual strain while driving.	9(10.5%)	18(20.9%)	18(20.9%)	19(22.1%)	22(25.6%)

The subjects had several experiences with the presbyopic eyewear when it came to their driving performance and visual comfort. Concerning the issue of road signs or lights being missed considering the lack of clarity in the vision, the answers were rather divided, 19.8% strongly agreed, 31.4% agreed, 24.4% strongly disagreed and 24.4% disagree, which reveals a controversial attitude of drivers towards the problem. On questioning the issues related to driving at night, 27.9% responded strongly agree and 29.1% agree which indicates that over half of the respondents had problems with night driving, and the responses of 17.4% and 25.6% reported discouragement and strongly discouraged, respectively. A smaller percentage was found to have trouble with a dashboard or GPS monitor with 11.6 and 16.3 strongly agree and agree respectively, with a larger percentage that neither agreed nor disagree being 26.7%. In the meantime, 25.6% disagreed and a significant percentage indicated strongly disagreed of 19.8 who had different experiences with dashboard visibility. Trust in the ability to make a positive contribution by using the current eyewear was quite high with 46.5 percent of respondents neither agreeing nor disagreeing, 20.9 percent agreeing, though the number of those who agree strongly was a mere 8.1 percent. On the other hand, 16.3% differed and 8.1% strongly differed indicating that there was some doubt or total confidence amongst the drivers. Lastly, cared about visual strain-related fatigue during driving, the responses were well distributed 10.5 strongly agreed, 20.9 agreed, and 20.9 neutral. The number, 22.1% of which indicate disagreement and 25.6 you strongly disagree was a considerable number, and this implies that fatigue caused by visual strain influences a significant but not substantial percentage of the drivers. On the whole, the results demonstrate a range of issues and perceptions of driving complications with vision problems and comfort in presbyopic eyewear among truck drivers.

INSIGHTS-IJHR
INSIGHTS-JOURNAL OF HEALTH AND REHABILITATION
ORIGINAL RESEARCH
Volume 4 | Issue 2 | 2026
ISSN: 3007-2948

Table13: Driving Performance (Self-Reported) after 15 Days

Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Driving Situation	9(11.05%)	18(19.1%)	22(21.4%)	19(14.4%)	1(1.2%)
I miss road signs or signals due to unclear vision.	13(19.8%)	16(14.3%)	18(24.4%)	11(14.4%)	0
I find it difficult to drive at night.	14(17.9%)	15(19.1%)	12(18.4%)	12(25.6%)S	0
I have trouble reading the dashboard or GPS display.	09(10.6%)	12(11.3%)	23(21.7%)	12(15.6%)	12(19.8%)
I feel confident in my driving performance with my current eyewear.	3(5.1%)	11(10.9%)	30(46.5%)	24(16.3%)	5(5.1%)
I feel fatigued due to visual strain while driving.	5(6.5%)	11(12.9%)	15(20.9%)	13(12.1%)	18(15.6%)

The results show self-reported results of driving performance after 15 days which show the role of the visual clarity on various driving conditions. There was a significant proportion of respondents that missed road signals or road signs given an obscure sight with 19.8% strongly agreeing and 24.4 agreeing. The issue of night driving too was considered, with 17.9% of the respondents strongly agreeing, 18.4% agreeing, 25.6% being neutral. Many reported that it was hard to read the dashboard or GPS display with 21.7% agreeing and 19.8% strongly disagree which was inconsistent across the board. The feeling of confidence about driving with existing eyewear remained mostly positive with the majority (46.5) giving agree and few (16.3) giving strong agree with the options, which indicated that most of the participants felt that their eyesight was sufficiently adjusted. Nevertheless, visual fatigue during driving did exist, and 20.9% still agreed and 15.6% strongly agreeing with the fact that they felt strained. Totally, the results indicate that although the number of people who felt more confident when driving increased, some still had some visual impairments such as night driving and fatigue.

Table14: Road traffic accidents in the last 12 months

Any road traffic accidents in the last 12 months			
		Frequency	Percent
	Yes	22	25.6
	No	64	74.4
	Total	86	100.0

Out of the 86 commercial drivers interviewed, 22 respondents (25.6% indicated that they had experienced at least one road traffic accident in the last 12 months whilst the largest number of 64 respondents (74.4%), never experienced a road accident in the last 12 months. This implies that about a quarter of the motorists had an accident somewhere in the past year, and it is important to note that the visual performance of the motorists and eyewear contribute to road safety of the commercial drivers

Table15: Near-miss incidents (almost had an accident) in the last 12 months

Had any near-miss incidents (almost had an accident) in the last 12 months			
		Frequency	Percent
	Yes	55	64.0
	No	31	36.0
	Total	86	100.0

Among the 86 commercial drivers interviewed, a large proportion 55 of the participants (64.00) indicated having had at least one form of near-miss event (an accident that was narrowly missed) in the last 12 months. On the other hand, 31 drivers (36.0% stated that they did not have any such incidents during the period in question. Such a high rate of near-miss experience confirms the possible dangers of commercial drivers and emphasizes the necessity to investigate such aspects as visual acuity and the ability of presbyopic eyewear to prevent accidents.

Table 16: One-Sample Test:

One-Sample Test						
	Test Value = 0.06					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Have you been diagnosed with presbyopia (age-related near vision difficulty)	32.789	85	.000	1.03302	.9704	1.0957

INSIGHTS-IJHR
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ORIGINAL RESEARCH
Volume 4 | Issue 2 | 2026
ISSN: 3007-2948

Currently use any glasses for vision correction while driving	26.337	85	.01	2.04465	1.8903	2.1990
How long have you been using presbyopic eyewear	42.620	85	.000	3.27721	3.1243	3.4301
Consistently use of presbyopic eyewear while driving	16.186	85	.03	1.70744	1.4977	1.9172
Experienced while driving with presbyopic eyewear	22.694	85	.000	3.06791	2.7991	3.3367

A one-sample t-test was also used to find out the difference between the means of a number of significant variables concerned with the use of presbyopic eyewear and visual experience during driving it was significant and equal to a test value of 0.06. The findings showed that all the variables tested differed statistically ($p < 0.001$). The mean of the participants who reported presbyopia was 1.03 ($t = 32.789$, $p = .000$), which shows that there were much more people who were diagnosed with bad eyesight than with the test figure. In the same vein, the mean score of respondents who currently wear some form of glasses to correct their vision during driving stood at 2.04 ($t = 26.337$, $p = .01$), which implies that the respondents are highly dependent on eyewear to help them during driving. Mean of the time of using presbyopic eyewear was also high and attributed to 3.28 ($t = 42.620$, $p = .000$): this means that a significant number of drivers have used such eyewear over a year. In the issue of regular usage of the presbyopic eyewear during driving, the mean score was 1.71 ($t = 16.186$, $p = .000$), showing that there was a tendency of the usage of the eyewear regularly, although there was a certain level of variation.

And finally, driving with presbyopic eyewear visual experience provided a significant mean of 3.07 ($t = 22.694$, $p = .03$), which implies that there is a moderate difficulty or adaptation to eyewear that the drivers do experience when driving. The t-values and confidence interval in all the cases are very high and the confidence interval is tight which once again proves the dependability of the same results and the necessity of the use of presbyopic correction in making the aging commercial drivers safe and comfortable during driving.

DISCUSSION

The vision of a driver is one of the most important components of safe driving as it enables a driver to perceive distances properly, identify road signs, control traffic situation, and react promptly to any possible hazard. As people age, however, the eye will have a number of changes, which may adversely affect driving performance, one of the most prevalent of which is prescyopia, defined as a gradual deterioration of close focusing functions. Presbyopia typically begins around the age of 40 and requires corrective lenses such as reading glasses, bifocals, or progressive lenses to see objects clearly at different distances. Although they are corrective solutions used to improve near vision, they may bring problems to the drivers, such as inability to focus on the dashboard and the road or vice versa, poor peripheral vision, image distortion, highly sensitive to glare (4,13).

A study conducted by Safa H. in the year 2023 indicated that subjective visual sight in different presbyopic vision corrections in driving operations is not constant depending on the operation of visual activities and lighting conditions. Ocular health professionals are supposed to acknowledge driving related issues associated with every corrective modality and why it would be paramount to opt on a strategy of corrective modalities that resonate with the driving needs of the patients. The study was based on a semi structured approach. Information gathered included demography, routes of driving, the history of road traffic collisions, factors that result to the occurrence of the collision, eyewear specification and patterns of use. Each of the subjects was evaluated with complex eye examinations. The results show that 221 out of 268 drivers attended (participation rate: 82.5%). The age (20-90 years old) of the participants was average with its standard deviation of 9.2 years. Sixty-eight patients (35.3%), complained of having difficulty reading small print, and 17 respondents (7.7%) complained of impaired distance vision. Only 10 drivers (4.5%), had visual acuity less than 6/12 and would not qualify to hold driving licence. The most common ocular condition was presbyopia that afflicted 94 people (42.5%). Most presbyopic patients, 63 cases (67. 0%), needed between +1.50 and +2.00 DS corrections. Only a small (10.6% as a percentage) group of presbyopic people (10) had the right presbyopic corrective eyewear. There were 6 its (2.7) presented myopia, and one individual (0.5) had unilateral aphakia. (14)

Our results suggest that the age range between 40 and 65 years was split into two groups (two age groups 58.1 and 41.9): 40–50 months and 51565 months. The proportion between the male and female was a slight difference in favor of females (53.5%) over the males (46.5) gender. A one-sample t-test revealed statistically significant awareness and use of presbyopic eyewear, with most participants diagnosed with presbyopia (mean difference = 1.03, $p < 0.001$), currently using corrective eyewear (mean difference = 2.04, $p < 0.001$), and having used it for a considerable duration (mean = 3.28 years). ANOVA revealed that the duration of presbyopic eyewear usage was significantly related to difficulties in driving performance ($p = 0.000$), particularly on the ways of missing road signs ($p = 0.006$), and general driving conditions ($p = 0.043$). Interestingly, 25.6 percent of them reported road traffic accident within the last 12 months, and 64 percent of the respondents described near-miss accidents.

When the current research is compared with the study by Sukati VN published in 2018, the results can be seen as similar and different at the same time; both authors identify the issue of refractive errors and their impact on drivers. A descriptive study by Sukati concentrated on the commercial drivers in North India and it stated that out of 281 screened drivers, 55.8% had presbyopia,

INSIGHTS-IJHR
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ORIGINAL RESEARCH

Volume 4 | Issue 2 | 2026
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8.2% hyperopia, 5.3% myopia and 2.1% astigmatism. There were also other eye complications that were noted including dry eye (24.9%), stereo deficiency (27.4%), and color vision deficiency (3.9%), although there were minor cataract and retinal problems. Nonetheless, these conditions did not interact with functional implications to driving in that study. Conversely, the present research that involved 86 individuals aged between 40 and 65 years especially dwelt on presbyopia and its effects on driving ability when using corrective eyewear. Although presbyopia was the most common once again, current study applied the statistical methodology including t-tests, ANOVA, and chi-square to reveal significant correlations between the years and frequency of presbyopic eyewear wear and real-life driving disabilities. It is interesting to note that 25.6% of the respondents had road traffic accidents and 64% according to the survey had near-miss experiences in the last one year. Some problems like lack of road signs, absence of visibility to the dashboard, and eye straining were also repeatedly cited and especially within the age range of 40-50. In contrast to the work by Sukati which was mostly descriptive in character, the current study gives a deeper insight into how presbyopia despite correction remains a problem to drivers which underscores the importance of improved vision check, educating the patients besides possibly improving the developed corrective system to suit the driving purpose.

CONCLUSION

The paper highlights the high prevalence of presbyopia among commercial drivers between 40 to 65 years of age and it justifies the importance of corrective eyewear as a way of reducing age-related visual loss. Despite the fact that the majority of the drivers use presbyopic lenses, there are still much-needed issues with visual challenges, especially in situations when the driver is required to make quick shifts in their focus, see the dashboard clearly, and drive at night, which commonly causes psychological exhaustion in the eyes. Such challenges are particularly apparent among younger drivers in this cohort or those that do not have regular or frequent use of eyewear or have limited use. The results indicate that though presbyopic correction improves some of the visual functions and the driving capabilities, it will never be enough to cover the multifaceted visual skills of commercial driving. Hence, custom-made vision arrangement approaches and advertisements of repeated, lasting wearing of proper eyewear are vital in enhancing security and comfort on the highway amidst the elderly drivers.

RECOMMENDATIONS

Long-term studies should be conducted to follow change in the visual functioning and driving performance over time, as this may give more insight on the effectiveness of various presbyopic corrections and assist in formulating adaptive strategies.

Research on the use of visual aids such as anti-reflective surfaces, blue-light overlaying or augmented reality dashboards could provide additional relief to drivers with visual impairment.

Routine and thorough eye check-ups of commercial drivers can be put in place to monitor early signs of impaired vision in order to change their corrective eyewear early enough and possibly cut accidents.

A program that will help to increase awareness among commercial drivers as a part of advocating the significance of eyewear use and eye care may increase adherence and decrease driving challenges caused by straining vision.

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