Print ISSN: 2321-6379
Online ISSN: 2321-595X

Original Article

# Importance of Side Mirror While Riding a Two-Wheeler with Helmet to Reduce Riding Mishaps

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## Abstract

**Background:** The helmet reduces the impact of injury during an accident, but it minimizes the peripheral field of vision. Mirrors improve the visibility of the road but have to be inclined at the proper angle.

**Objective:** This study evaluates the importance of a side mirror in enhancing the field of view while riding a two-wheeler helmet to reduce riding mishaps.

**Materials and Methods:** Emmetrope subjects, after assessing their field of vision, were made for riding with and without a helmet along with two riders on the right side and two riders on the left side of the subject for 100 m in the following condition. Condition 1: A side mirror turned outward to make the subject experience a drive without the mirror. Condition 2: A two-wheeler with a side mirror in position at an appropriately inclined and maintained angle. After riding, a questionnaire was given to riders.

**Results:** Around 93.5% of the riders stated that riding with a side mirror and helmet is safest. Further, 90% of the riders said that riding two-wheelers without side mirrors and helmets on is not safe from the Chi-square (7.729) and *P*-value ($P = 0.005<0.05$), it is depicted that there is an association between riders feel riding without a mirror and helmet safest, and rider feel riding a two-wheeler with side mirror and helmet on safest.

**Conclusion:** The use of side mirrors in two-wheelers helps compensate for field obstruction because of helmet and help reduce mishaps happening on a busy street. Therefore, using side mirrors in two wheelers should be made mandatory.

**Key words:** Blind-spot and colourblind, Emmetrope, Field of view, Humphrey visual field analyzer, Peripheral field of vision

## INTRODUCTION

In India, two-wheelers motorcycles are spotted everywhere, driven by young teens and adults regardless of gender and age. Although these vehicles are convenient and versatile, their downsides are often neglected, and safety is taken for granted.

"As per the 2019 census, 29.82% of road accidents that happen in India are of those individuals who were riding motorcycles without a helmet."[1] This census proves that every time one goes without a helmet, their life is risked. Therefore, under section 129 of the Motor Vehicle Act, 1989, wearing headgears are compulsory for protecting the head.

A helmet significantly reduces the risk of severe head and brain injuries, thus reducing the impact of a force or collision on the head.

A helmet works in the following ways:

It reduces the impulsive movement of the skull caused by accident, thus preventing the brain movement by managing the impact. In addition, the soft material incorporated in the helmet absorbs some of the impacts, and therefore the head comes to a halt at a slower pace. This means that the brain does not hit the skull with great impulsive force.

Access this article online

www.ijss-sn.com

Month of Submission : 12-2021
Month of Peer Review : 01-2022
Month of Acceptance : 01-2022
Month of Publishing : 02-2022

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It spreads the forces of the impact in an outward direction over a greater surface area so that they are not concentrated on particular areas of the skull hence preventing severe injuries.

It acts as a barrier between the object's skulls, thus protecting the skull during a mishap. Although the helmet comes with its best advantages, it also has a significant downside: It reduces the field of vision.[2] This is one of the wearer's major downsides on the usage of headgears on the busy and congested roads of Chennai.

There are many studies done in the past, and also we have found that there is a considerable amount of loss of field vision in all directions. All normal individuals will have a blind spot (unseen area). This blind spot is the resultant of optic nerve exit from the eye. Normally, the blind spot is located in the temporal field around 12°–17° away from central fixation.[3] The normal blind spot dimension is 7.5° and 1.5°, vertically centered below the horizontal meridian.

The side mirror is necessary for observing objects from the sides and behind. All two-wheeler vehicles must have side mirrors. They play a key role in a smooth ride. The mirrors are designed such that the riders can judge the movement of the vehicle coming from behind using these mirrors.

"As per traffic annual data, many accidents happen due to malfunctioning and not observing mirrors at the proper time. According to the latest traffic provisions (The Motor Vehicles Amendment Act, 2019), both left and right mirrors on two-wheelers are necessary". Let's see the importance of side mirrors for riders:

The field loss/obstacle happening because of usage of headgears can be compensated up to an extent using a side mirror if inclined at the proper angle.

### Objective

The objective of the study was to evaluate the importance of side mirrors in making adjacent vehicles visible to riders while riding two-wheelers with a helmet on the congested street of Chennai.

## MATERIALS AND METHODS

This Interventional Clinical Study was carried out in Dr. Agarwal's Eye Hospital, Chennai, Tamil Nadu, India. The study's sample size was 50, and the mean age group for this study is between 18 and 36 years.

### Inclusion Criteria

The following criteria were included in the study:

- The patient has a valid driving license.
- Emmetropic patient.
- Patient without any ocular pathology and visual field defect.

### Exclusion Criteria

Ametropia, visual field defects and ocular pathology, hearing defect, and color blindness were excluded from the study.

Two-wheeler riders were made to undergo a vision check using a Snellen chart and visual field test with helmet and without the helmet on Humphrey visual field analyzer (HFA). If the rider had unaided vision 6/6 in both eyes, they were made to undergo an HFA test without a helmet, and if field reports were normal, the same rider was made to undergo an HFA test with a helmet. On completion of vision and visual field evaluation, riders were made for riding a two-wheeler on a 100 m stretch with two lanes on the rider's right side and two lanes on the rider's left side. The gap between the subject and 1st lane volunteer was 3 feet, and the gap between the subject and 2nd lane volunteer was 6 feet. This gap between subject and volunteer was maintained on both sides of the rider. Next, the rider was made for riding a two-wheeler the first time without side mirrors (to make the rider ride without mirrors, the mirror of the two-wheeler where inverted) and helmet on. Then for the same stretch with the same setup, riders were made for riding with side mirror in position and helmet on. After completing the ride, the subjects were given a set of questionnaires describing the riding experience with a side mirror and without a side mirror. The response was noted, and statistical analysis of the same was done. In addition, a sample questionnaire included their riding experience.

### Data Analysis

The data were first arrived in an excel file and transferred into SPSS 20.0 version. Thus, using SPSS software, the current study outcomes were analyzed. The sample size for the study is $n = 50$. The analysis calculated out percentage analysis to find out the demographical information of respondents. The Chi-square test is used to find the association between categorical variables.

## RESULTS

Out of 50 riders, while riding a two-wheeler without side mirrors (side mirror-inverted) and helmets on, 6 riders (12%) noticed vehicle 1 approaching next to them at 3 feet, and 44 riders (88%) did not notice the vehicle approaching, whereas 44 riders (88%) noticed a vehicle approaching at 6 feet and 6 riders (12%) did not notice vehicle approaching at 6 feet. Around 41 riders (82%) noticed obstruction in the field of vision with helmets and difficulty without a

side mirror. Because of the non-visibility of the vehicle at 3 feet and obstruction in because of helmet 45 riders (90%) felt riding without side mirror and helmet on not safe [Tables 1 and 2].

The same 50 riders while riding two-wheelers with side mirror and helmet, 46 riders (92%) noticed vehicle 1 approaching at 3 feet and 48 riders (96%) noticed a vehicle approaching at 6 feet. Around 46 riders (92%) riders experienced enhanced field of vision with a helmet because of side mirrors. Because of the vehicle's visibility at 3 feet and enhanced field of view because of side mirrors, 46 riders (92%) feel riding with side mirrors safer when wearing a helmet [Tables 3 and 4].

It is depicted that there is an association between riders feeling riding without mirror and helmet safest and rider feel riding a two-wheeler with side mirror and helmet on safest.

There is a temporal and inferior decrease in field of vision with helmet, because of which a two-wheeler ridden very closer to the subject is noticed by the subject only when it passes away from the unseen area when ridden on a two-wheeler without a mirror and when the same subject rides a two-wheeler with side mirror the subject notices the closer two-wheeler which was not seen when subject rode without mirror.

## DISCUSSION

The visual field is the area visualized by fixating a target. Normally, the extent of visual field nasally is 60°; temporal is 100°, superior is 60°, and inferiorly is 75°. All normal individuals will have a blind spot (unseen area). This blind spot is the resultant of optic nerve exit from the eye. Normally the blind spot is located in the temporal field around 12°–17° away from central fixation. The normal blind spot dimension is 7.67° (SD 1.80) width and 9.65° (SD 1.84) height.[4]

Our study found around a 7–10% decrease in field of vision in all the directions on helmet usage. Mittal *et al.* analyzed the study of the behavior of two-wheelers drivers toward helmet wearing, talking on the cell phone while driving and driving with many pillion riders, and reported three important components of road safety (1) human factors, (2) vehicle factors, and (3) environmental factors. Human factors include ignorance toward the usage of safety accessories.[5] They concluded that changes could be implemented by educating, communicating, planning and promoting safe road behavior among two-wheeler riders.

Faryabi *et al.* analyzed Evaluation of the Use and Reasons for Not Using a Helmet by Motorcyclists Admitted to the Emergency Ward of Shahid Bahonar Hospital in Kerman and concluded out of 377 riders, 57% had visual limitations, 77% found helmet weight heavy, 69.4% reported neck pain as a reason, 59.6% reported limitation of movements of head and neck as reason, 71.4% reason said the feeling of heat as a reason for not using a helmet, 67.7% reported a feeling of suffocation as a reason for not using helmet, and 59.2% handling difficulty before and after riding two-wheeler as a reason for not using a helmet.[6]

**Table 1: Association between riders feel an obstruction in field of vision with helmet and no side mirror, and experience enhanced field of vision with helmet and side mirror**

| Respondents feel an obstruction in the field of vision without a side mirror and helmet on | Respondents experience the enhanced field of vision with side mirror and helmet on | | Total | $\chi^2$ (P) |
|---|---|---|---|---|
| | Yes | No | | |
| Yes | 38 (82.6) | 3 (75.0) | 41 (82.0) | 5.345 (0.012*) |
| No | 8 (17.4) | 1 (25.0) | 9 (18.0) | |
| Total | 46 (100.0) | 4 (100.0) | 50 (100.0) | |

*Significant

**Table 2: Association between riders noticing vehicle 1 approaching next to them at 3 feet without side mirror and helmet on versus vehicle 1 approaching next to them at 3 feet with side mirror and helmet on**

| Riders notice vehicle 1 approaching next to them at 3 feet without side mirror and helmet on | Riders notice vehicle 1 approaching next to them at 3feet with a side mirror and helmet on | | Total | $\chi^2$ (P) |
|---|---|---|---|---|
| | Yes | No | | |
| Yes | 4 (8.7) | 2 (50.0) | 6 (12.0) | 5.945 (0.015*) |
| No | 42 (91.3) | 2 (50.0) | 44 (88.0) | |
| Total | 46 (100.0) | 4 (100.0) | 50 (100.0) | |

*Significant

**Table 3: Association between riders noticing vehicle 2 approaching next to them at 6 feet without side mirror and helmet on versus vehicle 2 approaching next to them at 6 feet with side mirror and helmet on**

| Respondents notice vehicle 2 approaching next to them at 6 feet (without mirror) | Respondents notice vehicle 2 approaching next to them at 6 feet (with side mirror) | | Total | $\chi^2$ (P) |
|---|---|---|---|---|
| | Yes | No | | |
| Yes | 44 (91.7) | 0 (0.0) | 44 (88.0) | 15.278 (0.000**) |
| No | 4 (8.3) | 2 (100.0) | 6 (12.0) | |
| Total | 48 (100.0) | 2 (100.0) | 50 (100.0) | |

**Significant

**Table 4: Association between riders feel riding with a helmet and no side mirror safer and feel riding with side mirror and helmet on safest**

| Rider feel riding without side mirror and helmet on safest | Rider feel riding with side mirror and helmet on safest | | Total | $\chi^2$ (P) |
|---|---|---|---|---|
| | Yes | No | | |
| Yes | 3 (6.5) | 2 (50.0) | 5 (10.0) | 7.729 (0.005**) |
| No | 43 (93.5) | 2 (50.0) | 45 (90.0) | |
| Total | 46 (100.0) | 4 (100.0) | 50 (100.0) | |

**Significant

Joshi *et al.* analyzed the effect of helmet use on visual and auditory reaction time and peripheral field of vision and found no significant change in auditory and visual reaction time but found a significant decrease in the visual field in all directions, that is, nasal, temporal, superior, and inferior.[7]

For safe riding, the rider should have a good visual field. The visual field loss caused by helmets can be enhanced using side mirrors, provided they are inclined at the proper angle. Awareness about the importance of a side mirror is not much among the riders. Even if a side mirror is present in the two-wheeler, its positioning is not given importance. While it is observed that some people think that the mirrors are not necessary, on the contrary, a few of them see it as an object of trend and style.

## CONCLUSION

Helmets are safety gears primarily used to reduce the level of injury or prevent injury from happening because of mishaps. However, helmets have certain drawbacks; one among them is decreased visual field. The use of side mirrors in two-wheelers may help compensate for field obstruction because of the helmet to a certain extent, and mishaps can be reduced. Therefore, it should be mandatory to use side mirrors on both sides of two-wheelers.

## ACKNOWLEDGMENT

We want to acknowledge the support of Dr. Agarwal's Institute of Optometry (a unit of Dr. Agarwal's Eye Hospital) Prof. Heber, Ms. Dhanisha, Mr. Pradeep, Mr. Arun Raj and Ms. Fatema YQ for helping us in designing and carry out this study.

## REFERENCES

1. Road Accidents in India. Government of India Ministry of Road Transport and Highways Research Wing; 2019. Available from: https://morth.nic.in/sites/default/files/ra_uploading.pdf
2. Adhilakshmi AP, Karthiga UK, John NA. Auditory and visual reaction time and peripheral field of vision in helmet users. J Bangladesh Soc Physiol 2016;11:43-6.
3. Walker HK, Hall WD, Hurst JW. Clinical Methods: The History, Physical, and Laboratory Examinations. New York: Butterworths; 1990.
4. Safran AB, Mermillod B, Mermoud C, Weisse CD, Desangles D. Characteristic features of blind spot size and location, when evaluated with automated perimetry: Values obtained in normal subjects. Neuro Ophthalmol 1993;13:309-15.
5. Mittal P, Garg R. Study of Behavior of Two Wheelers Drivers towards Helmet Wearing, Talking on Cell Phone While Driving and Driving with Many Pillion Riders. Beijing, China: 16th International Conference Road Safety on Four Continents. (RS4C 2013). 15-17 May 2013; 2013.
6. Faryabi J, Rajabi M, Alirezaee S. Evaluation of the use and reasons for not using a helmet by motorcyclists admitted to the emergency ward of Shahid Bahonar hospital in Kerman. Arch Trauma Res 2014;3:e19122.
7. Joshi PK, Kaur M, Choity M. Effect of helmet use on visual and auditory reaction time and peripheral field of vision. Natl J Physiol Pharm Pharmacol 2019;9:307-11.

**How to cite this article:** Agarwal A, Fakhruddin AM, Sudha B, Khan F, Seetharaman C, Abdulla S, Abhishek S, Pradeep P. Importance of Side Mirror While Riding a Two-Wheeler with Helmet to Reduce Riding Mishaps. Int J Sci Stud 2022;9(11):105-108.

**Source of Support:** Nil, **Conflicts of Interest:** None declared.