Does Age and Gender Affect Time-and-Movement Anticipation of Young Drivers: A Case of Indian Drivers

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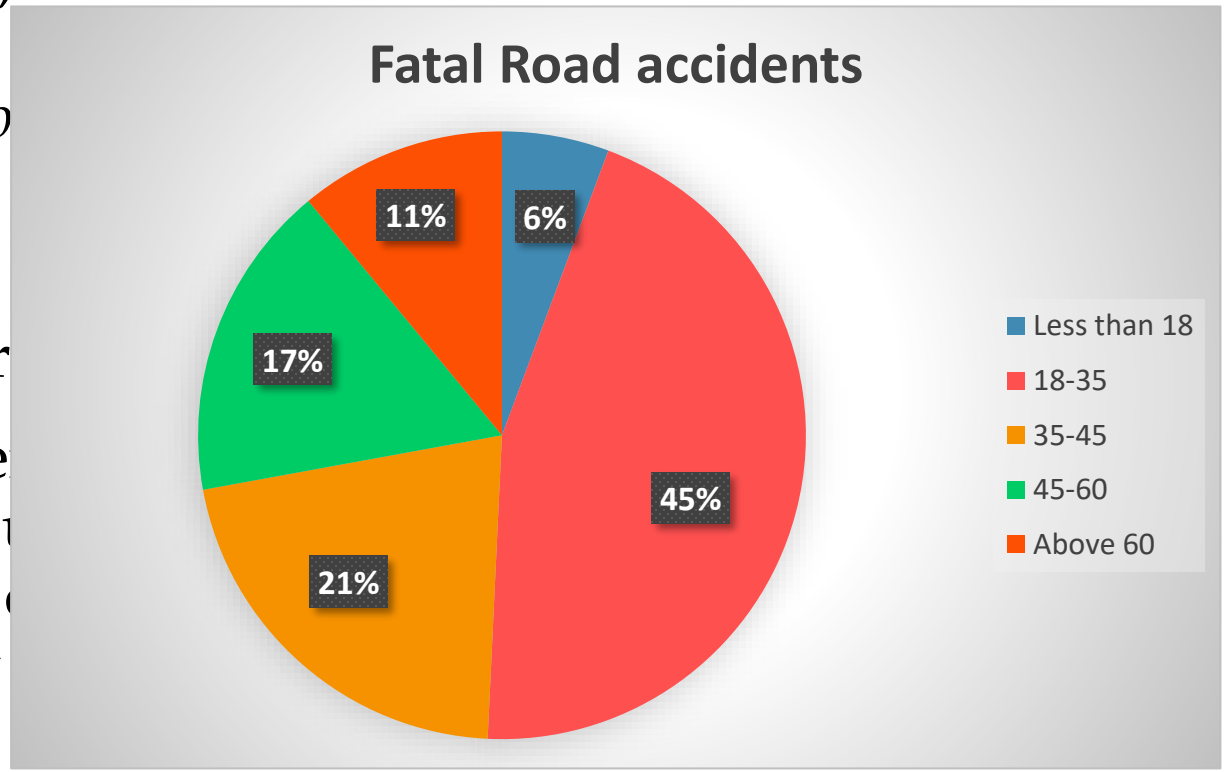
INTRODUCTION

- According to MORTH 2022 report, a total of 4.6 lakhs road accident have been reported. Road accidents are as, *(i) **human error**, (ii) road co condition.*
- Alertness level, Fatigue and parameters included in Human err
- Many factors influence the drive durations, sleep insufficiency, infl attentiveness, alertness and accomplishment of tasks requiring



- As per MORTH 2022 report

RESEARCH QUESTIONS?

- Did the gender affect the perception in depth?
- How the visual affects the speed prediction?
- Did the reaction time vary with vision condition?

OBJECTIVES

i. To study the variation of reaction time depending upon gender, vision and usage of phone.

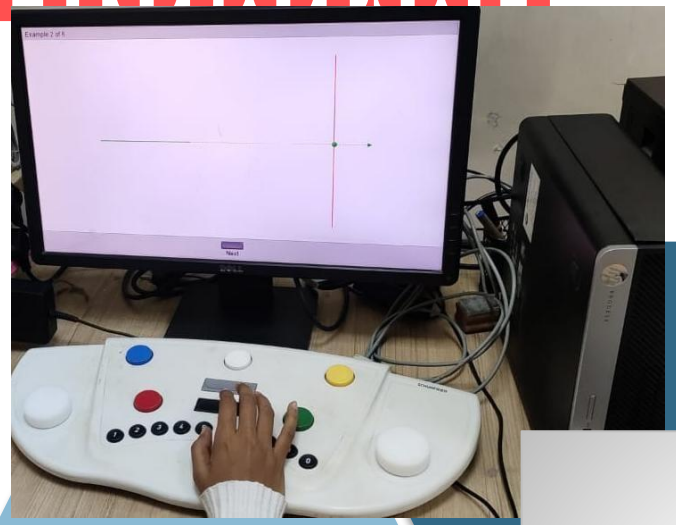
ii. To study the relationship between the gender, vision, usage of phone and perception in depth.

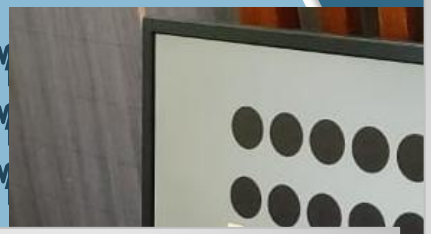
iii. Comparison between mentioned factors on the results of speed and distance estimation done by drivers.

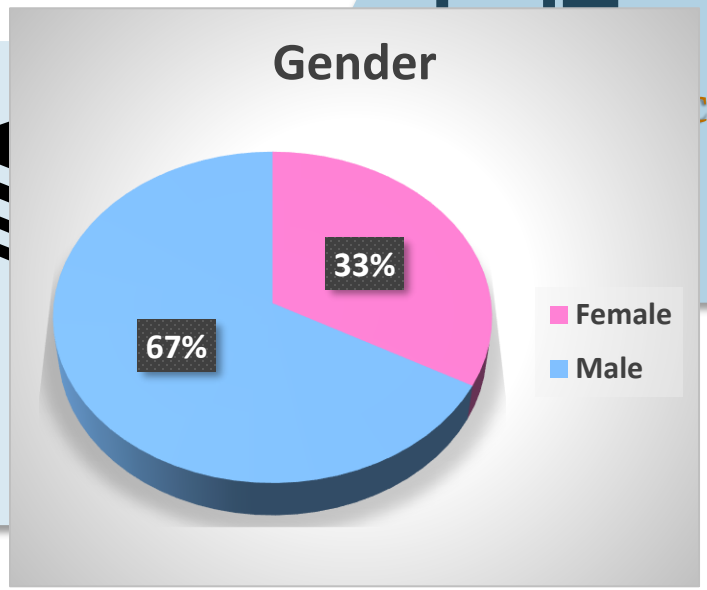
iv. To study effect of fatigue on alertness levels.

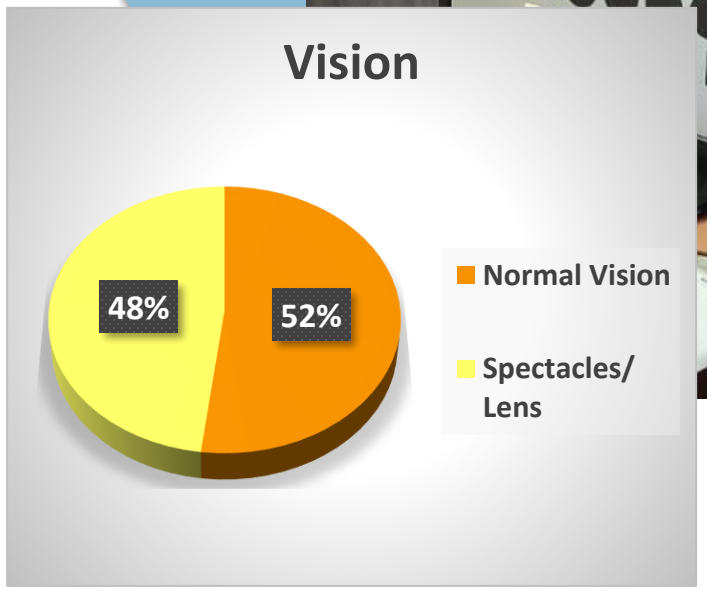
METHODOLOGY

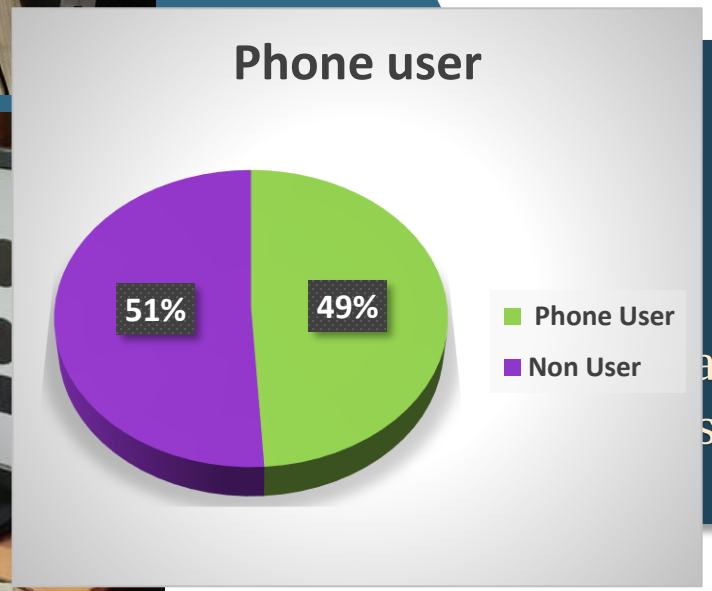
VIENNA TEST SYSTEM

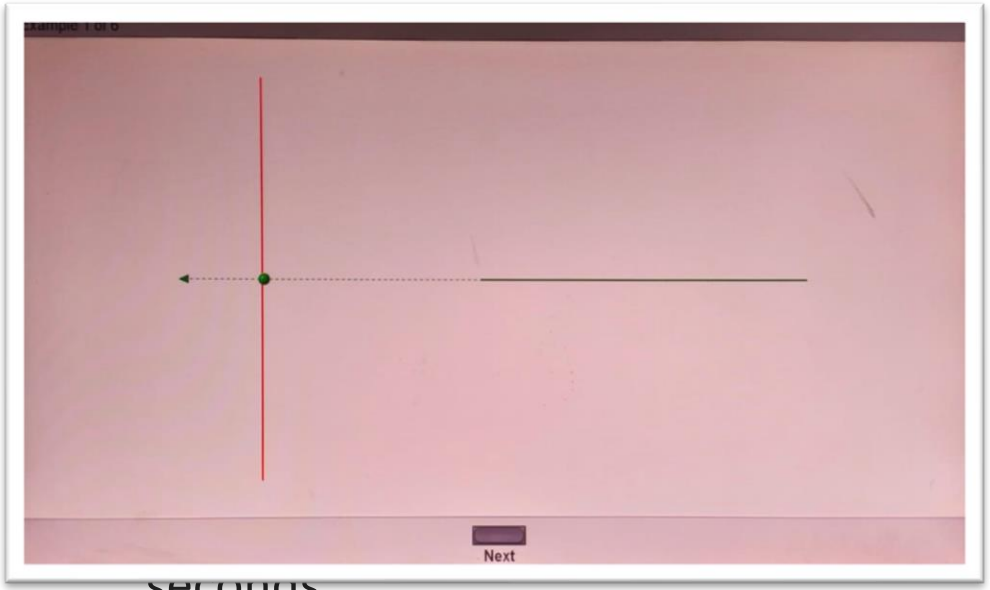






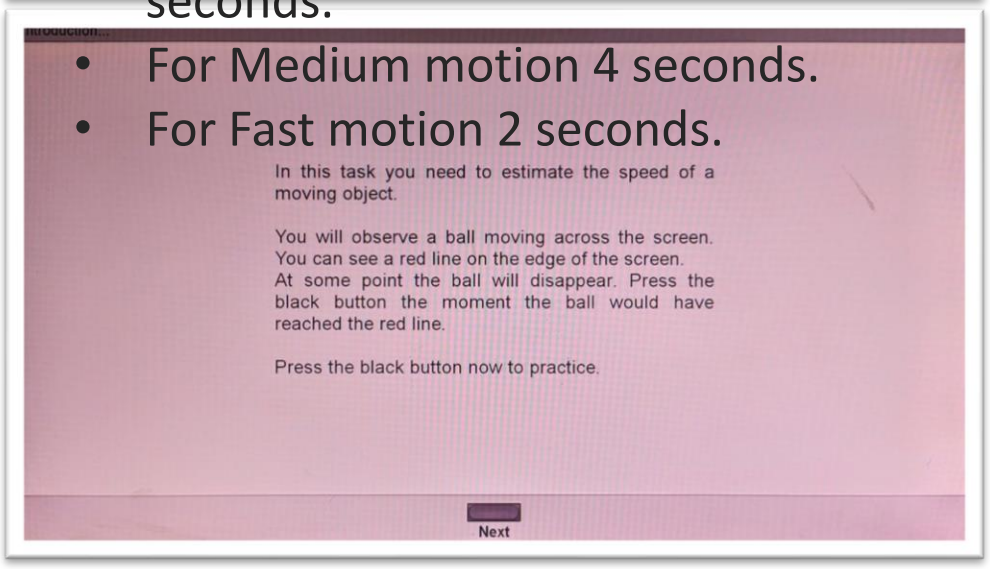






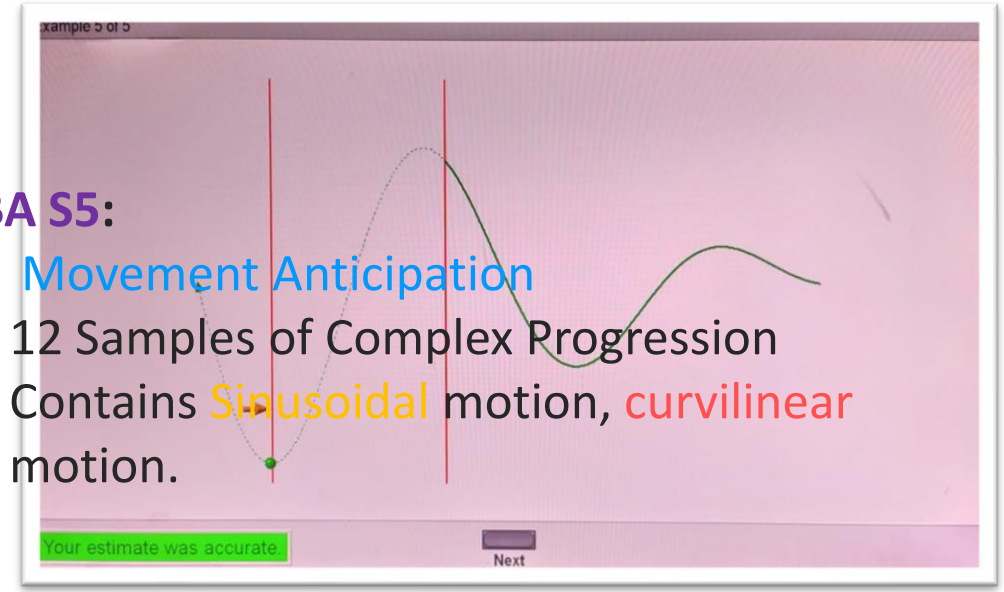
seconds.

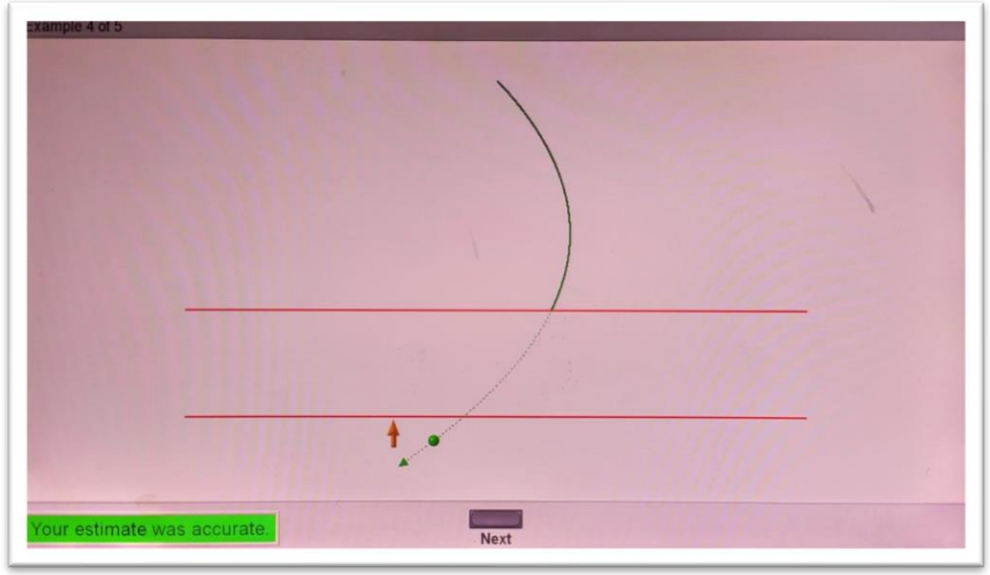
- For Medium motion 4 seconds.
- For Fast motion 2 seconds.



ZBA S5:

- Movement Anticipation
- 12 Samples of Complex Progression
- Contains Sinusoidal motion, curvilinear motion.



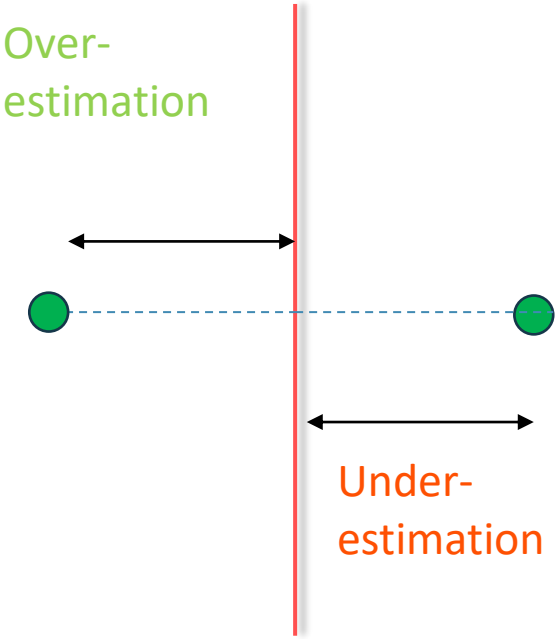


DATA ANALYSIS

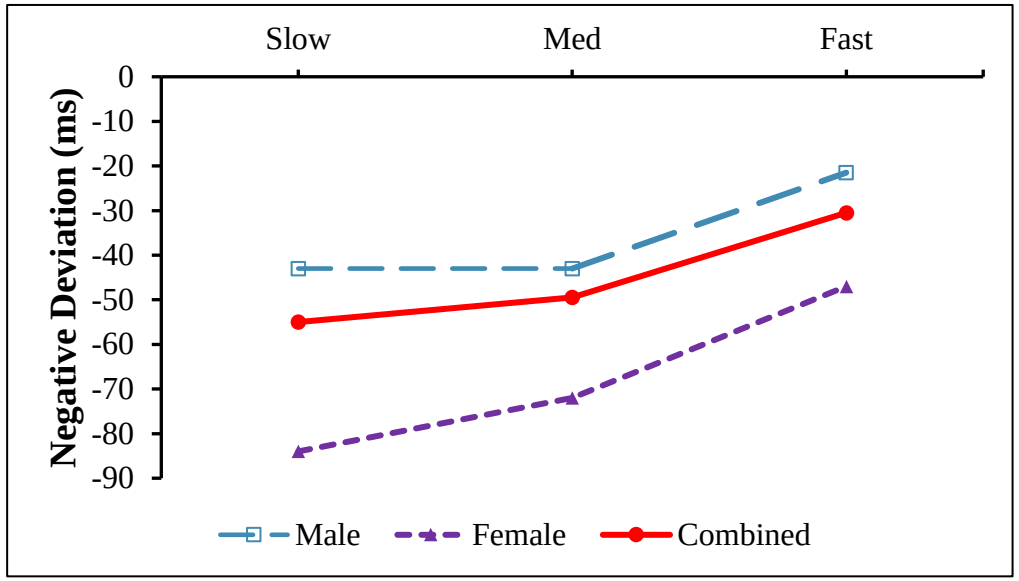
- *ZBA S5*

1) Variation of Reaction time in accordance with Gender

Speed	Slow_Male	Slow_Female	Med_Male	Med_Female	Fast_Male	Fast_Female
Positive Deviation [Over-Estimation] (%)	66.31	55.83	69.86	60.83	89.29	76.27
Negative Deviation [Under-Estimation] (%)	33.69	44.17	30.14	39.17	10.71	23.73



- From the **table**, in comparison with males, the female respondents tend to underestimate the speed for all three cases. While comparing the same scenario for e.g., Fast Case, the result shows that the males (89.29%) are more cautious than female subjects (76.27%).
- This means females have lower time anticipation ability than males



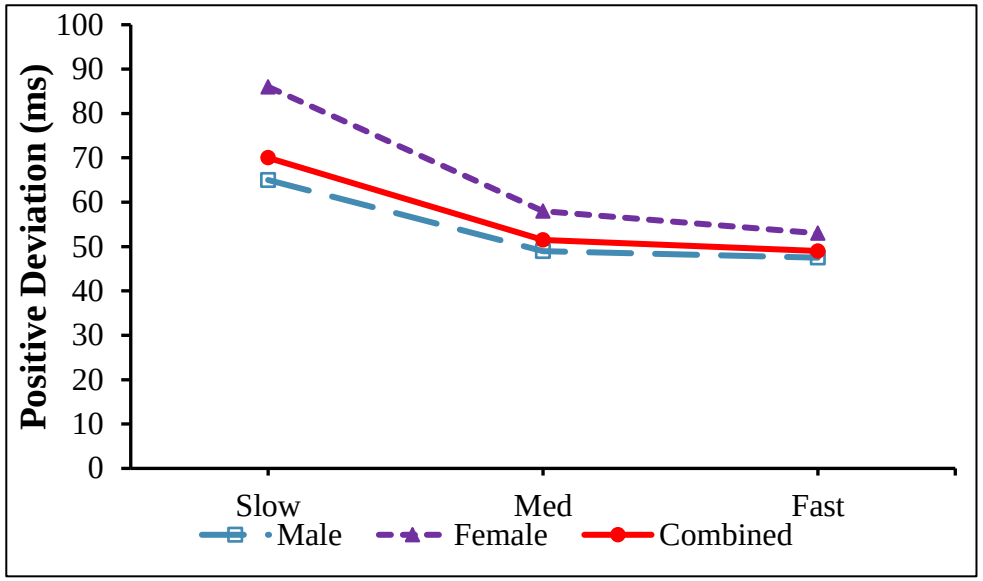


Fig shows the variation of median values of the deviation for three cases with respect to the gender.

Particular	Slow -Male	Slow - Female	Medium - Male	Medium - Female	Fast- Male	Fast - Female
Positive Deviation						
Mean	69.84	84.76	51.79	62.16	51.96	56.23
Known Variance	2018.25	2828.12	964.65	1439.86	604.23	673.03
z	-2.048		-2.090		-1.105	
p-value	0.040		0.036		0.269	
Negative Deviation						
Mean	-64.91	-90.41	-62.94	-87.04	-46.13	-60.50
Known Variance	3675.35	5257.09	3664.03	4077.56	3176.67	2832.55
Z	2.172		2.115		0.998	
p-value	0.029		0.034		0.318	

Table shows z-test for mean results.

- On a Highway at having higher speed

Same reaction irrespective of gender

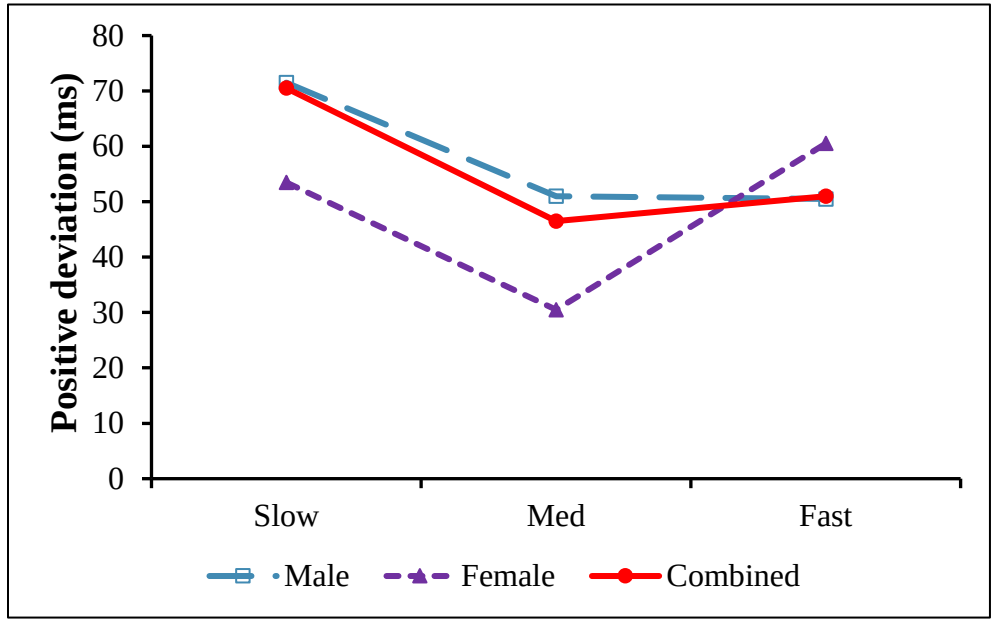
- For slow cases, such as urban roads or village roads

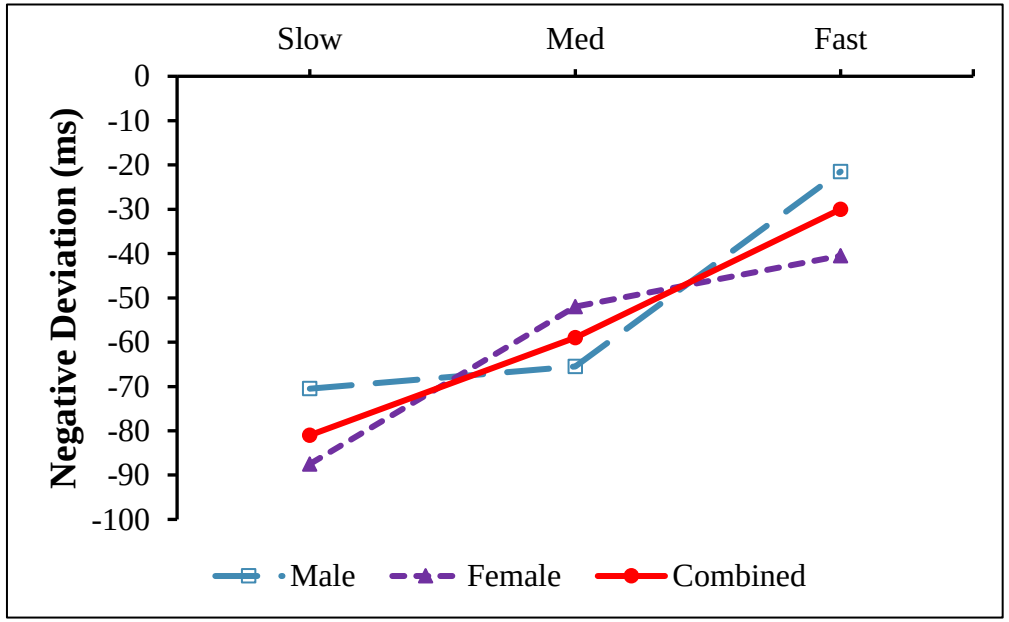
Males are more cautious in comparison with female

- *ZBA S5*

2) Variation of Reaction time in accordance with Age (18-20)

	Slow - Male	Slow - Female	Medium - Male	Medium - Female	Fast - Male	Fast - Female
Positive Deviation [Over-Estimation] (%)	66.66	75.76	87.87	40.00	53.33	80.0
Negative Deviation [Under-Estimation] (%)	33.34	24.24	12.13	60.00	46.67	20.00

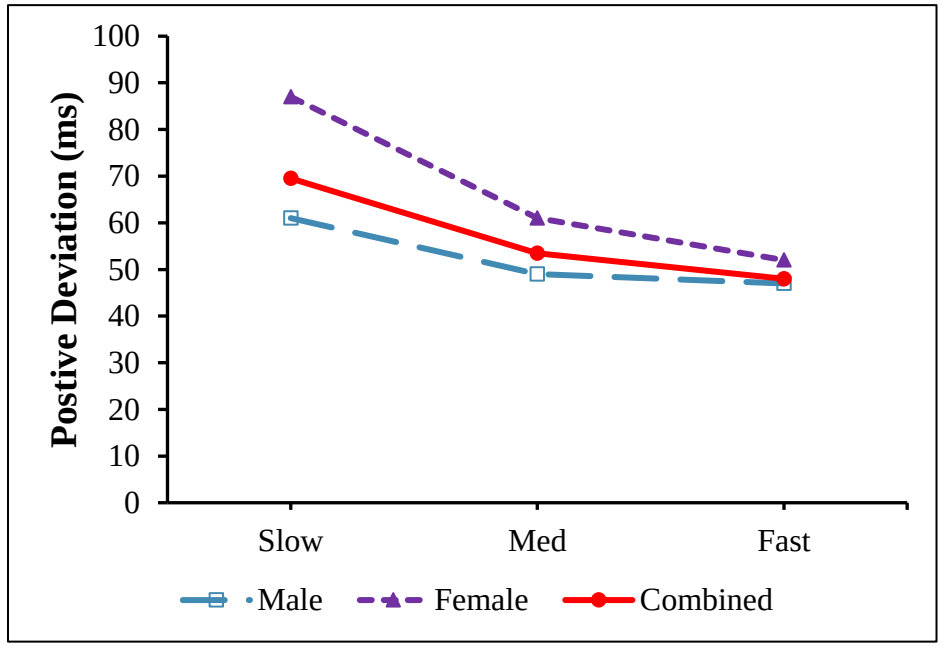


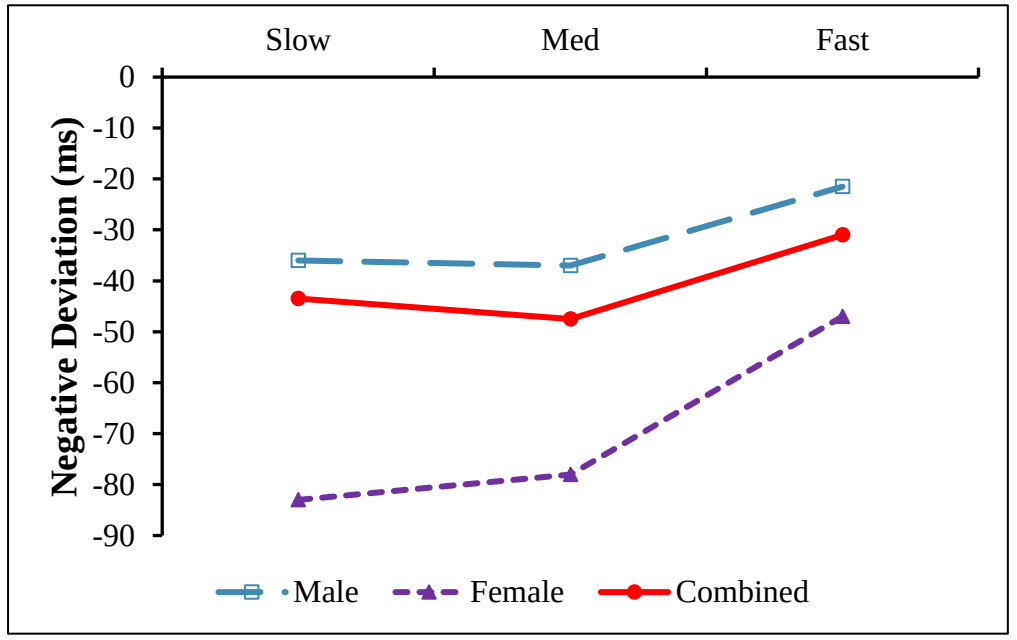


- *ZBA S5*

3) Variation of Reaction time in accordance with Age (21-30)

	Slow - Male	Slow - Female	Medium - Male	Medium - Female	Fast - Male	Fast - Female
Positive Deviation [Over-Estimation] (%)	66.21	68.05	89.72	61.11	63.33	75.00
Negative Deviation [Under-Estimation] (%)	33.79	31.95	10.28	38.89	36.67	25.00



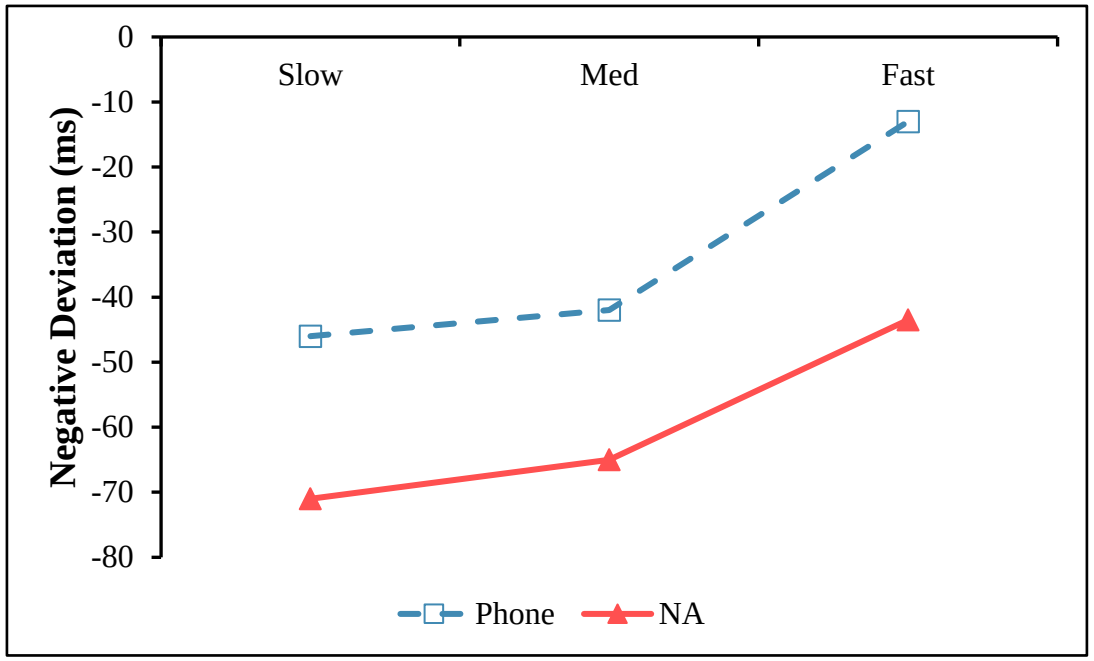


Particular	Slow -Male	Slow - Female	Medium - Male	Medium - Female	Fast- Male	Fast - Female
Positive Deviation						
Mean	70.979	85.81	50.98	67.35	48.21	50.12
Known Variance	2224.54	2298.04	953.58	1410.01	647.64	605.00
z	-1.960		-2.930		-0.539	
p-value	0.050		0.003		0.590	
Negative Deviation						
Mean	-54.89	-94.28	-54.46	-94.33	-45.95	-58.77
Known Variance	2244.21	6948.50	2339.63	4219.54	2922.99	2034.18
z	2.6018		3.1346		0.8539	
p-value	0.0093		0.0017		0.3931	

Table shows z-test for mean results. Group (21-30)

4) Along with these, effect of hearing and vision is also checked but no significant results are found and hence not shown in the analysis part.

5) Variation of reaction time with respect to the use of mobile phone.



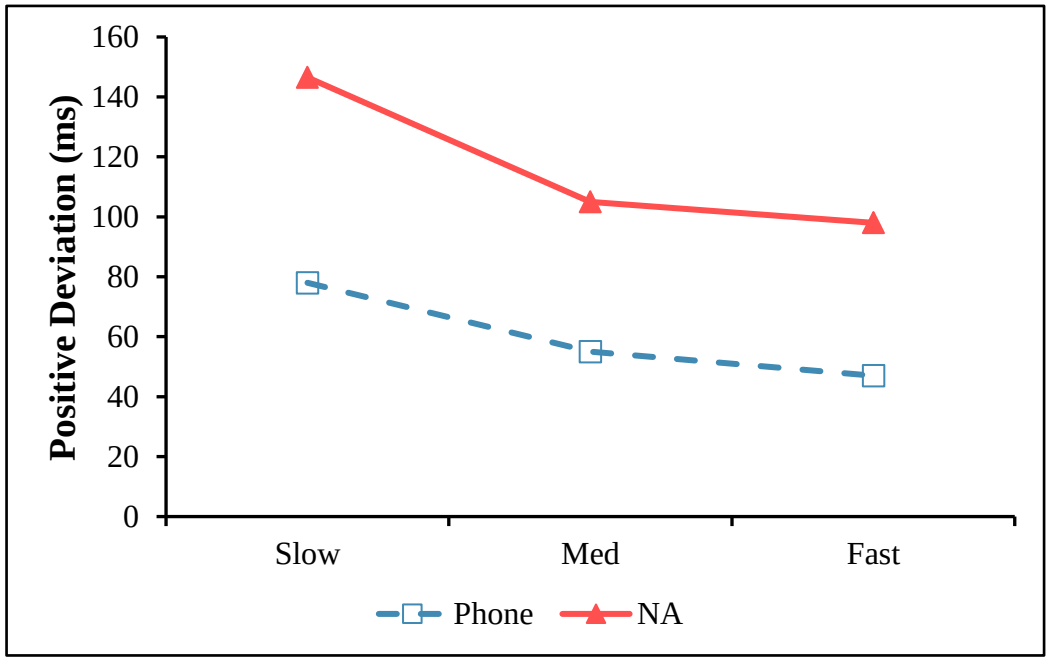


Fig shows the variation of median values of the deviation for three cases with respect to the Phone user.

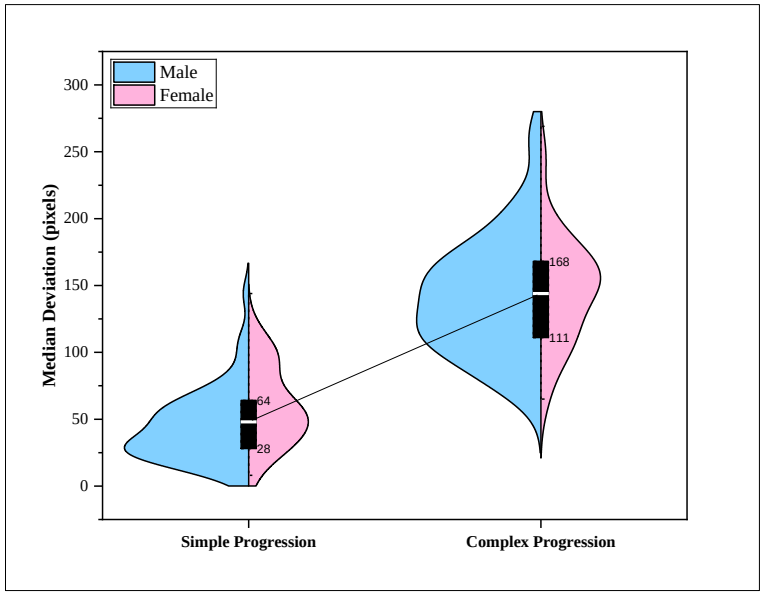
- From the Fig, there is a significant variation between phone user and non-user for all three motions in positive as well as negative deviation.
- The results of z-test for positive deviation case stated that for slow and medium motion there exists a significant variation between the phone user and non-user. But for the fast motion it was not valid.
- For negative deviation the medium and fast motion had significant difference between response by participants using phone and non-user. However, the slow motion did not show significant difference.

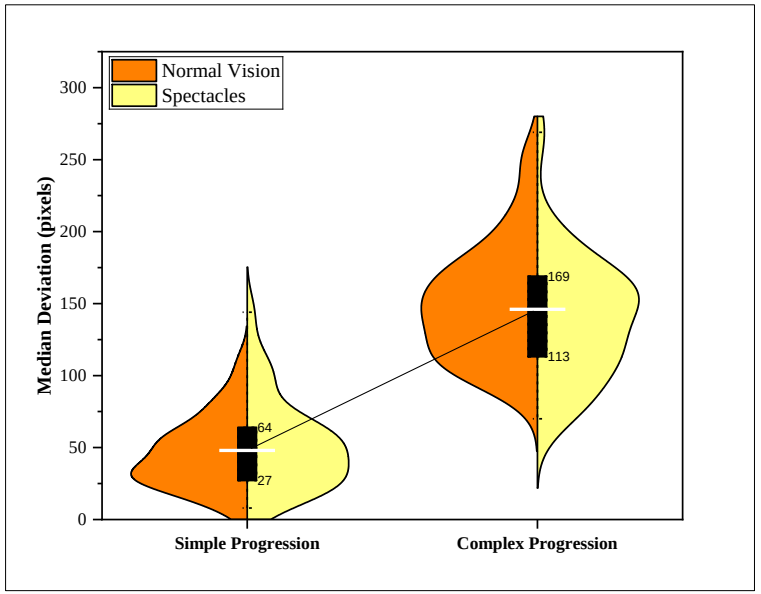
Particular	Slow -Phone	Slow – Non user	Medium - Phone	Medium – Non user	Fast-Phone	Fast – Non user
Positive Deviation						
Mean	82.78	73.41	60.95	51.96	46.16	48.80
Known Variance	3362.09	222.47	1426.79	1065.71	558.17	686.49
z	1.7381		2.0689		-0.9692	
p-value	0.0822		0.0386		0.3325	
Negative Deviation						
Mean	-75.95	-79.53	-56.47	-83.05	-25.34	-61.02
Known Variance	6211.70	3492.66	2641.00	4521.64	877.99	3037.49
z	0.3297		2.7344		3.5711	
p-value	0.7417		0.0062		0.0004	

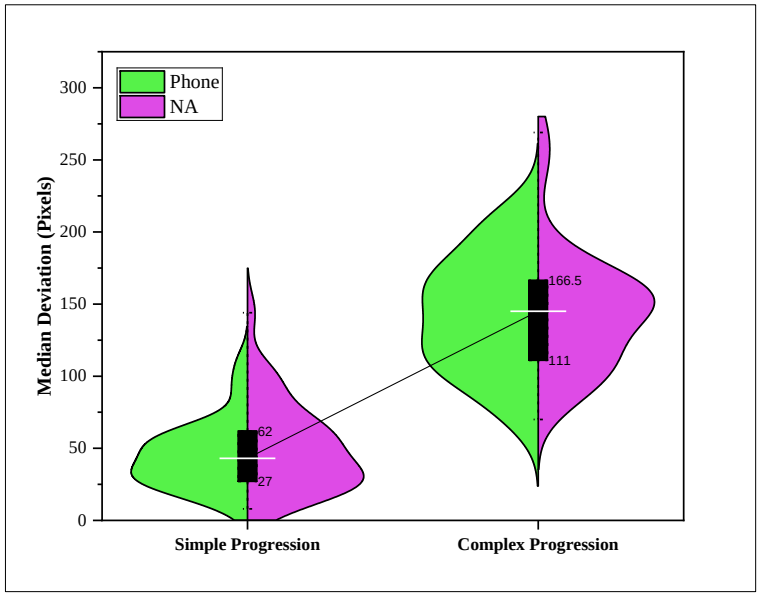
Table shows z-test for mean results.

- *ZBA S2*

1) Variation of median deviation median
(a) Gender (b) Effect of Vision (c) Effect of mobile phone







Sr. No.	Particulars		Median Values of Progression (pixels)		Percentage change (simple to complex progression)
			Simple Progression	Complex Progression	
1	Gender	Male	38.00	139.00	265.785%
		Female	53.00	149.00	181.13%
2	Effect of Vision	Normal Vision	40.50	132.00	225.92%
		Spectacles	49.00	140.00	185.71%
3	Effect of Mobile Phone	Phone user	48.00	147.50	207.29%
		Non-User	40.00	143.00	257.50%

Table shows percentage change over Progressions for Gender, Vision and Phone user..

CONCLUSIONS

- For ZBA S5 & ZBA S2,

- Significant difference is observed in graph as well as p-values in age group 21-30 for male and female.

-In analysis for GENDER "10.48%" and "9.03%" of female proportion tend to over-estimate speed perception for slow and medium motion of test indicating lower time anticipation ability than males. For Complex Progression median value is "139" for male and "149" for female. In terms of gender, stating that females tend to make more errors when predicting direction, implying that their accuracy in perceiving the position of a vehicle/object in motion is lower than males.

-For Vision, no changes observed for speed perception whereas for depth perception the effect of complex progression on normal vision drivers (percentage change = 225.92%) is more than the drivers with spectacles (percentage change = 185.71%). But the error deviation is greater for individuals with spectacles.

CONCLUSIONS

- For ZBA S5 & ZBA S2,

-For Phone User, participants who over-estimated speed showed significant differences for slow and medium motion of test stating that Non Users are more cautious while driving . Percentage change of median deviation for complex progression over simple progression for phone user is “207%” and for non user is “257%” indicating decrease in depth perception ability due to change in progression. But when compared among themselves i.e.. Phone user vs Non user, the use of phone impacts the user ability to perceive motion in depth and so appears to increase crash probability.

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THANK YOU