

7. CONCLUSION:

General conclusion:

In the present study the motion stereotype of the Bengali (Indian) population has been established. From the results it may be concluded that clear-cut direction of motion stereotypes were found in the said population for operation of some common control display units. The predominant motion stereotypes for adult and children of both sexes were as follows:

1. “Clockwise to increase”,
2. “Anticlockwise to decrease”,
3. “Clockwise to clockwise motion”,
4. “Anticlockwise to anticlockwise motion”,
5. “Clockwise to rightward direction motion ”,
6. “Anticlockwise to leftward direction motion”,
7. “Clockwise to upward motion ”,
8. “Anticlockwise to downward motion”,
9. “Right to increase”,
10. “Left to decrease”,
11. “Up to increase”,
12. “Down to decrease”,
13. “Right to on response”,
14. “Left to off response”,
15. “Down to on” and
16. “Up to off response”.

There was no variation in the direction of stereotype between male and female subjects. However, variations were noted in stereotype strength (SS), response initiation time (RIT) and Index of reversibility (IR). No adult-children variation was noted in motion stereotype strength but variation in IR and response initiation time (RIT) were found. Vertical rocker switch-electric

light unit and Digital display-horizontally sliding switch unit were found to be the most compatible analog and digital displays respectively for studied population.

An indication of colour stereotype was also noted for Bengali (Indian) population. A conspicuous colour stereotype for different human sensations / action was found in Bengali (Indian) population which is presented in the following Table 7.A:

Table 7.A: Dominant colour preference/ colour stereotypes of the Bengali (Indian) population

Criterion	Colour stereotype
Hot sensation, danger zone and “stop”	Red
“On” response and “Go”	Green

In cases of “cold sensation”, “off response”, “safe area” and “caution” no clear cut colour preference or colour stereotype was noted. A significant gender variation in colour preference was noted but no significant rural-urban variation was found in colour stereotype. It was noted that sometimes manufactures did not pay much attention to colour stereotype of the population during designing of products. Different manufacturers found to use opposite colour code for the same operation in the interfaces (discussed in details in chapter 6.3). Therefore, arrangement of awareness programmes regarding use of appropriate population colour stereotype for the product manufactures and designers could be a solution for this particular problem.

In case motion stereotype there was a significant variation in stereotype strength (SS), IR and RIT between left handed and right handed subjects but direction of motion stereotypes were found to be the same in left handed and right handed male and female subjects.

Socioeconomic status and educational status of the subjects also had significant impacts on SS, IR and RIT but the direction of motion stereotypes were found to be the same for all the subjects of both sexes.

Impact of rural-urban variation on the strength of motion stereotype, IR and RIT was noted but direction of motion stereotypes was found to be the same in rural and urban subjects.

It was concluded from the present investigation that the motion stereotype pattern might be altered under stress condition. Higher level of work related cardiovascular stress changed the direction of motion stereotypes significantly in almost all the control display operations. IR was also found to be changed due to cardiovascular stress. Heat stress caused significant variation in the stereotype strength (SS), RIT and IR. Job related psychological stress, however, had no significant impact on SS but IR and RIT were found to be changed significantly due to variation in job related psychological stress.

Y-Z^R plane (sagittal) was found to be the most compatible and suitable plane for positioning control in both digital and analog display units for studied population. A modification of a conventional gas burner oven, a commonly used control-display unit, on the basis of the population stereotype was suggested in the present study. The modified gas burner oven was analyzed and compared with the conventional gas burner oven. It was found that the modified gas burner oven showed more efficiency and human compatibility for operation among the users and it also created less confusion during operation than that of the conventional gas burner oven.

Novelty of the study:

- As there was no published data for the motion stereotype pattern, the results of the present study established motion stereotype pattern of Bengali (Indian) population for

operating some common control display units. This might be the only representative information about the motion stereotype pattern of Indian population

- There was also a lack of colour stereotype pattern for Indian population. The findings of the present investigation revealed different stereotype pattern of colours regarding thermal sensation and representation of safe-danger, go-caution-stop, on-off response of the Bengali (Indian) population.
- In the present investigation a novel concept for an interface design has been put forwarded with the application of the principle of motion stereotype. A new interface has suggested and tested for the control unit of the gas burner oven. The design of the gas burner oven was modified on the principle of motion stereotype – ‘clockwise motion to decrease’ and ‘anticlockwise motion to increase’. The modified control interface of the gas burner oven was found to more effective and less error prone.
- The following findings would be helpful for designing man-machine interface regarding control- display operation in the studied population:
 - i. In case of the analog display the vertical rocker switch-electric light unit was found to be the most compatible interface for Bengali (Indian) population among all analog displays tested.
 - ii. Among all the digital displays, horizontally sliding switch and digital display unit was found to be the most compatible interface for Bengali (Indian) population.
 - iii. The most compatible and most suitable plane for positioning the controls for a digital and analog display was $Y-Z^R$, i.e., the sagittal plane among three planes.

Limitations:

The motion stereotype study was done on the Bengali population of India. A national data base could be prepared which may be more precise to portray the Indian population. As India is a federal union comprising 29 states and 7 union territories with a vast population, so it will be a mammoth task to cover the entire population and requires huge financial liability. Being a Ph.D. work, time constraint is also a factor.

The impact of stress on colour stereotype pattern had not been studied. Experimental devices might be designed for testing the influence of stress on colour stereotype.

Whether there is any variation of the stereotype pattern in elderly people has not been studied.

Scope of the further study:

The study opens the paths for future scope where more control-display units could be studied, which were not studied in the present investigation, like liver handle controls with analog or digital displays, toggle switch, crank, and pedal which are commonly used as interfaces in industries. Beside this latch handle, box opening devices, cork opener etc which were used for domestic purpose, may be taken into account for further study. In addition to that some more different controls could be incorporated to test the motion stereotype (in the present study rotary control was used in most of the interfaces) like, toggle or *dolly*, a push-button, Mercury tilt switch, Knife switch etc.

There is a scope for future study where some more interface could be redesigned or modified on the basis of population stereotype. So at the last but not the least, lots had done but still lots have to done.