

# Angle of rotation changes psychology essay



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Participants were advised by verbal, written and Ertslab instructions, in how to carry out an experiment, which contained 48 trials of rotated or mirrored images, in order, to detect the subject's reaction time. There was a three second cut off time for each image, and a 'wrong' would indicate to the participant if they answered incorrectly.

## **Results**

The current study fitted with the set hypothesis 'Reaction time increases as the angle of rotation differs.'

## **Conclusion**

The current study, including that of Shepard and Metzler (1971) demonstrated that when the degree of an image changed, there was an increase of reaction time

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## **Introduction:**

Mental rotation has been an important factor in cognitive psychology, as it has the ability to allow investigators, understand related phenomenons, such as, hallucinations, day dreaming as well as a more detailed approach to understanding the mind and the 'automatic process of correcting images.'

Shepard and Metzler (1971) were one of the first psychologists to introduce the concept of mental imagery. They proposed a theory that people mentally rotate a three-dimensional image into its upright position; so overall reaction time will increase as the angle of rotation changes.

Cooper (1975) who also investigated mental rotation, came to the conclusion, that the linear reaction time increases accordingly with the degree change of an object, this happens regardless of the images complexity, as people automatically created a mental image.

This theory of mental imagery was further enhanced by latter studies.

Pylyshyn (1973, 2003) conducted an investigation that ultimately aimed at discovering what the mind's eye tells the brain, in correcting a rotated image. Finally, Hyde and McKinley (1997) discovered a difference in reaction time between men and women in mental imagery.

The current investigation is based similarly on Shepard and Metzlers (1971) study. However participants were advised to react according to letters or numbers being mirrored or rotated. With the advances in technology, a modern experiment is used to prove the hypothesis; ' Reaction time increases as the angle of rotation differs.'

## **Method:**

Apparatus: A Lab Manual which provided a written instruction guide. A Dell Laptop, and ERTslab; were used in order to depict a more accurate reaction time for participants.

Participants: 39 adult subjects participated in the experiment; 6 Males and 33 Females, studying psychology in University.

Design: A ' Repeated method' design was used in order to establish a correlation with an individual's reaction time over different set rotations.

With accordance of the investigation, there were three main variables that needed to be considered;

The dependant variable of reaction time, which cannot be influenced.

The independent variable which was the angle of rotation, that could be influenced

Confounding variables which were made up of any issues that could ultimately affect the results

As participants were in a Lab room there may have been distraction

Participants may suffer with fatigue thus losing concentration

Educational background and intelligence

Gender, due to the studies by Hyde and McKinley (1997) which indicated men had faster reaction times than women.

Specific learning difficulties (dyslexia) may enable better reaction times as at times they reverse lettering.

Medical health problems, (Arthritis), as mobility issues result in delayed answering.

If a participant uses their left hand for daily tasks, it may allow them to perform better, as their brains automatically learn to reverse objects.

If participants ' Game played' on a computer console, this may also increase their reaction time as it aids in the ability to rotate images (Cherney, 2008).

**Procedure:**

Subjects were advised how to conduct 'The Mental Rotation' experiment via both verbal instructions from the coordinator and written instructions in their 'Lab Manuals.' The instructor remained the same throughout the investigation to avoid distraction.

The participants were advised to log onto the Dell laptop and follow the instructions as per ERTslab (which provided another explanation of how to conduct the study.) The investigation consisted of 48 trials, letters and numbers were mirrored or rotated; there was a 'three second cut off time' for reaction.

Once the participant had completed all 48 trials, an automated email was sent to their university account (figure 1), detailing their reaction time. This data was then downloaded in Excel to obtain the mean and standard deviance.

Figure 1: automated email after completing mental rotation experiment

**Results:**

The following results demonstrate the reaction time for one participant, it was found that initially there was an increase in reaction time, this decreased as the rotation angle reached 240-300 degrees. Nevertheless, the results do fit the original hypothesis that 'Reaction time increases during the degree change of an image.'

## **Angle of Rotation**

**Reaction time (ms)**

**Standard Deviance**

0

756.88

296.25

60

945.38

532.70

120

884.50

293.65

180

761.00

361.59

240

692.13

173.84

300

726. 88

123. 77

Figure 2: The graph shows a participants ability to respond to an image that was mirrored or rotated. It demonstrates the increase and decrease of reaction time according to the change of degree angle.

## Figure 2

In the table below it illustrates the average reaction time of all 39 participants, where they had a total standard deviance of 88. 16.

Angle of Rotation

0

60

120

180

240

300

Reaction Time (ms)

944. 91

1007. 00

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1136. 50

1182. 82

1058. 29

1016. 41

Figure 3: demonstrates the initial increase of reaction time as the rotation of an angle changed, it did however decrease as the degree difference reached its larger rotations, thus supporting the initial hypothesis set.

### **Figure 3**

#### **Discussion:**

When results were correlated, in both instances, there was an increase of reaction time when the angle of rotation reached between 60 – 180 degrees. However reaction time for participants decreased around 240- 300 degrees, which would indicate a faster ability to ‘ correct’ the numbers and letters presented to them.

Therefore the original hypothesis ‘ Reaction time increases as the angle of rotation differs’ did fit with the results achieved as there was an increase of reaction time according to the rotation of the set images even if this didn’t reflect throughout the data for the higher degree angles.

As previously stated, Shepard and Metzler (1971) conducted an investigation into the increase reaction time taken to distinguish if an object was normal or mirrored; the data acquired from this experiment supports their original hypothesis.



Although the investigation was successfully conducted, there were methodological shortcomings, which would need to be addressed in future experiments, for example; the original experiment was a 'Repeated method' design, however it would have been beneficial to do a 'Between groups' design, allowing for a detailed correlation of results that included a larger participant size.

The main issue with the experiment taking place in a Lab room was that subjects may have felt self-conscious if they answered incorrectly as a 'Wrong' flashed up on the laptop, this may result in hesitate answering. It may be beneficial in the future to conduct the experiment were the flashing 'Wrong' was removed or the addition of 'Right' is placed for correctly answered images.

Another fault to acknowledge is that the conducted experiment allowed only a three second reaction time before the system would move onto the next image. However, when the data was downloaded demonstrating the results, the missed trial was given a 'zero'. This became problematic when correlating the data as the zero then becomes a positive result.

The results which were issued also included incorrect answers, for more accurate descriptions of reaction time only correct answers should have been included. However this may cause a participant to take longer in answering thus increasing their reaction time.

Another point to consider is that, as the experiment contained 48 trials, a 'practise effect' could occur, this would affect the result when comparing correlated data, and maybe an indication of why reaction time decreased

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between 240 and 300 degrees as participants had faster recall for similar images.

Additionally, as the subjects were in University studying psychology, they would have a higher intelligence than the general population and be familiar with statistical experiments, this means the data collected cannot be generalised across the general public.

Furthermore, there was no health screenings of subjects before the investigation took place, meaning those who had medical issues (arthritis) were not accounted for in having a slower reaction time.

Lastly, it may have been beneficial to acknowledge age, as many studies have concluded that this affects reaction time. Gender, could also have been addressed to determine if it had an effect on the investigation (Hyde and McKinley; 1997).

To conclude, it was found that reaction time did increase due to the angle of rotation changing, thus fitting with the set hypothesis.