

Date: _____

Nervous System Investigation

Name: Brooklyn Royce

Investigation: _____

Your Task: Design an experiment to illustrate the effect of stimulus on response times.

SECTION	COMPONENT	Possible Marks	Mark allocated
PLANNING	Aim:	1	
	Variables		
	Independent Variable:	1	
	Dependent Variable:	1	
	Controlled Variables: at least 5 are listed	5	
	Prediction: The student states what they thought would happen and why	2	
	Hypothesis: A hypothesis is presented that states the effect of the independent variable on the dependent variable	2	
	Equipment: Listed correctly	1	
	Method: Detailed numbered steps are written. Instructions are clear and can be followed exactly at another time. Variables are clearly controlled. A diagram is used and labelled appropriately that clearly enhances the method	5	
RESULTS	Results: Displayed appropriately. Tables are used observations are adequately documented. Figures written to the same decimal place. Repeats or replicates are used. The mean is shown in the table. Units are used.	5	
	Graphing (if applicable): Results are graphed on the correct axis and the scale is correct. The correct type of graph has been used without any aid from the teacher. Labelling of units is correct and the graph is easy to interpret	5	
CONDUCTING	Practical Application: Safety, behaviour, laboratory skills and application during the investigative process can not be faulted	4	3.5
DISCUSSION	The results are summarised in a mature manner and pattern/trends in the results are identified and commented on.	2	
Evaluation	Inconsistencies in the results are identified and explained.	2	
	The experiment is classified as: valid; accurate; reliable. Valid reasons are given for the classification.	3	
	Problems and difficulties within the experimental design are identified and the student describes improvements.	4	
	The results of the experiment have been explained based on sound scientific principles taught in class or by doing extra research.	4	
	The discussion must make sense.	1	
CONCLUSION	Major findings are summarised.	1	
	Statement of whether hypothesis has been supported or not	1	
TOTAL		50	



Nervous System Investigation – Brooklyn Royce

How Fast the Body Reacts to a Visual Stimulus

Aim

To determine if one's somatic response time to a visual stimulus differs between their dominant and non-dominant hand.

Independent variable

Hand (dominant/non-dominant)

Dependent variable

The seconds taken for the body to react to a visual stimulus

Controlled variables

- Colour of stimulus
- Brightness of screen
- Laptop used
- Website
- Starting position of participant
- Size of stimulus
- Time of day
- Age of participant

Prediction

I predict that when a participant uses their dominant hand to react to a visual stimulus, the response time will be faster compared to their non-dominant hand. I predict that this will occur because during sports and everyday activities, one will use their dominant hand to conduct these movements. This increases one's hand-eye coordination causing their dominant hand to be more efficient in terms of strength and nerve impulses through their dominant side of the body.

Hypothesis

Someone's dominant hand will have a faster response time to a visual stimulus than if they were to use their non-dominant hand.

Equipment

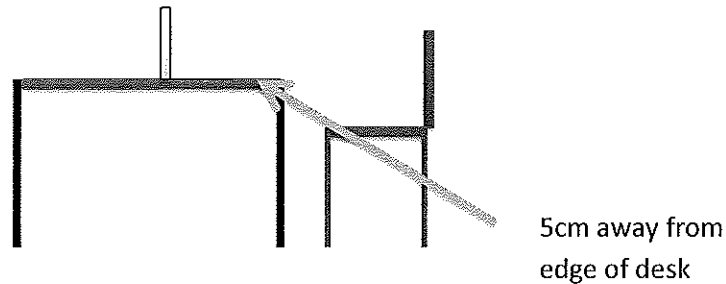
- Laptop (MacBook Air)
- Desk
- Chair
- Paper
- Pencil or pen

Method

1. Chose a number of participants who are dominantly right handed from the same age group of 16-17 years of age, male or female.
2. Inform the participants of the basis of the experiment and what their contribution is to the investigation considering ethics towards the participants.

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- Individually the participants will conduct the online test one at a time on the same computer (MacBook) between the hours of 11:00pm – 1:00pm.
- Sit the participant on the chosen chair at the particular desk where they will proceed in the online test.
- Their hand must be in a fist and on their thighs at the beginning of each trial with the laptop placed 5cm away from the edge of the desk. They must sit with their back upright on the back of the chair with a decent posture.



- Website: <https://faculty.washington.edu/chudler/java/redgreen.html>
- The brightness of the screen is maintained at exactly halfway of the setting available on the MacBook. The same website to conduct the test must be used for every participant on the same setting referring to the colour and size of the stimulus on the test.
- The website allows 5 trials each being recorded through the laptop. An average of the 5 trials is calculated as well.

Secure | <https://faculty.washington.edu/chudler/java/redgreen.html>

RED LIGHT - GREEN LIGHT Reaction Time Test

Instructions:

- Click the large button on the right to begin.
- Wait for the stoplight to turn green.
- When the stoplight turns green, click the large button quickly!
- Click the large button again to continue to the next test.

Test Number	Reaction Time	The stoplight to watch.	The button to click.
1			
2			
3			
4			
5			
AVG.			

Start Over

Hints:

- The stoplight may take up to seven seconds to change.

Visual stimulus – will change from red to green

Where average is recorded

- For each participant, they will conduct the 5 trials twice. One being on their dominant right hand and the other being their non-dominant left hand. All results must be recorded on a results table correctly.

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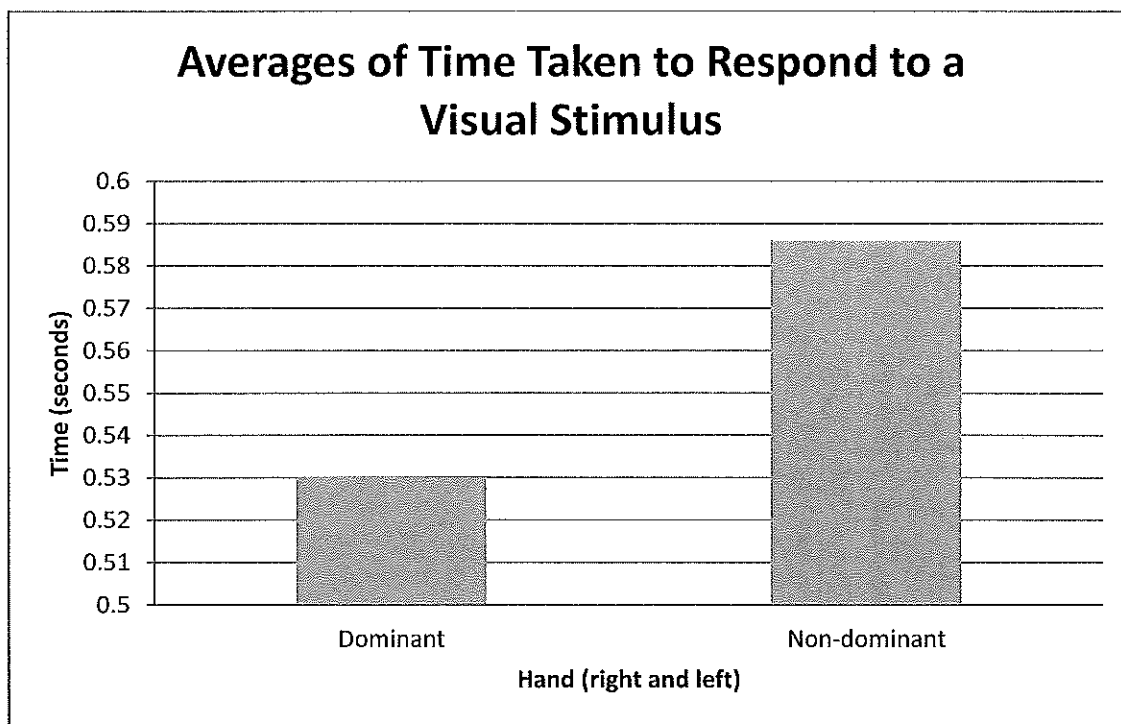
Results

Results and Averages from all Participants Trials

Participants		Trials (seconds)					
		1	2	3	4	5	AVERAGE
A.	DOM.	0.476	0.514	0.469	0.491	0.494	0.489
	NON.	0.565	0.654	0.578	0.531	0.497	0.565
B.	DOM.	0.434	0.455	0.484	0.432	0.454	0.452
	NON.	0.478	0.489	0.514	0.501	0.541	0.505
C.	DOM.	0.624	0.562	0.566	0.481	0.537	0.554
	NON.	0.588	0.623	0.617	0.649	0.620	0.619
D.	DOM.	0.442	0.458	0.882	0.583	0.531	0.579
	NON.	0.631	0.562	0.608	0.653	0.590	0.609
E.	DOM.	0.584	0.483	0.610	0.594	0.602	0.575
	NON.	0.669	0.597	0.599	0.584	0.708	0.631

	OVERALL AVERAGES (seconds)
Dominant	0.530
Non-dominant	0.586

Graph



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(4)

As displayed in the results, it is shown on average a dominant right handed person has a faster reaction time to a visual stimulus than if they were to use their non-dominant left hand. The fastest time recorded was 0.432 seconds by participant B, trial 4, on their dominant hand. The slowest time recorded was 0.882 seconds by participant D, again on the dominant hand. On average, it took a dominant right handed person 0.530 seconds while the non-dominant resulting in 0.586 seconds. This demonstrates that on average the dominant hand was 0.056 seconds faster than the non-dominant.

Through all the participants it is shown that their individual average resulted in their dominant being quicker than the non-dominant.

An inconsistency that ^{known as outlier.} occurred was participant D, trial 3 result, 0.882, on their dom. hand. This is highly above the average and has most likely effected the overall averages. Another inconsistency identified is that some of the participants non-dominant trials were faster than their dominant. This opposes the overall averages.

This experiment may be considered as valid due to the fact that the experiment does investigate the entitled purpose of the experiment. The aim states that the purpose is to determine if ones somatic response to a visual stimulus varies between dominant and

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non-dominant hand. The results do in fact demonstrate that there is a ~~different~~ difference in response times of a right handed dominant and left handed non-dominant.

This experiment may not be considered as accurate as there are factors that oppose this idea. The investigation only studied the difference between an dominant right handed person and their non-dominant hand and didn't not take trials from people who are dominantly or left handed and non-dominantly right. If this factor was added to the experiment, it may have resulted with different averages and results.

This experiment can be considered reliable as repetition within the trials was present by conducting 5 trials per person. Replication was also present as at the end of each participants averages their ~~dominant~~ dominant hand always resulted in a lower average than their non-dominant.

A major difficulty that occur while collecting results was the number of participants. Due to the controlled variables, it caused it to become difficult to have a large participation group. This effected the overall reliability of the experiment. Another difficulty may have been that the computer was not accurate with recording the response times. Finding alternate way of conducting would improve the experiment.

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During a response or reaction to a visual stimulus, the body goes through a specific pathway to conduct the required actions. Depending on the size and colour, this pathway may vary. The body first recognises the stimulus through the sensory organ of the eyes through photoreceptors. The midbrain, motor area of cerebrum and ~~new~~ cerebellum then work together to send an ~~in~~ nerve impulse down the spinal cord. The nerve impulse travels through the medulla oblongata and down the spinal cord via interneurons. These interneurons then branch into afferent and efferent nerve fibres. For this particular stimulus, the nerve impulse travels through the ventral dorsal root where efferent nerves are present. Here there are no synapses or ganglion. The efferent pathway meets an effector. This case, the skeletal muscles of the arm. Where the nerves and muscles meet is called a neuromuscular junction where the neurotransmitter acetylcholine is present to stimulate to voluntary action of the skeletal muscle. In this case the bicep, tricep, hand finger flexors / extensors, phalanges etc.

Right hand side is dominant as there are more nerve endings at the particular muscle of the right hand side.

In conclusion, it is demonstrated that a dominantly right handed person has a faster response time than the left handed side. The hypothesis can be supported.

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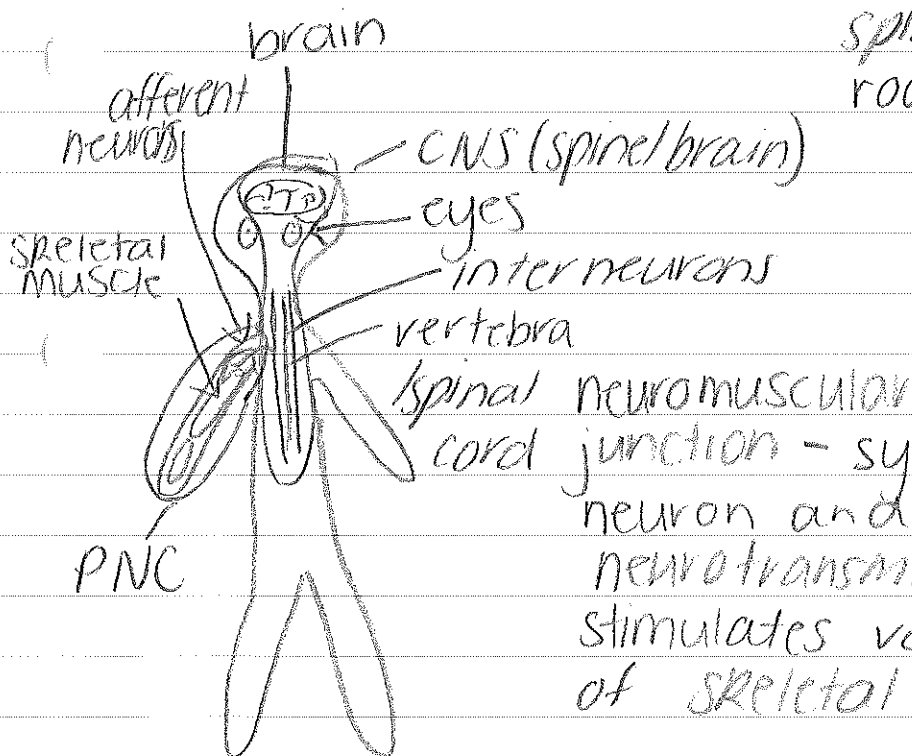
as it states that dominant right person will have a faster response time than their left. The results have shown this.

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stimulus
sensory organ
→ eyes where
photoreceptors
are presents

brain interprets stimulus.
midbrain, cerebrum, cerebellum
work together to release
nerve impulse.

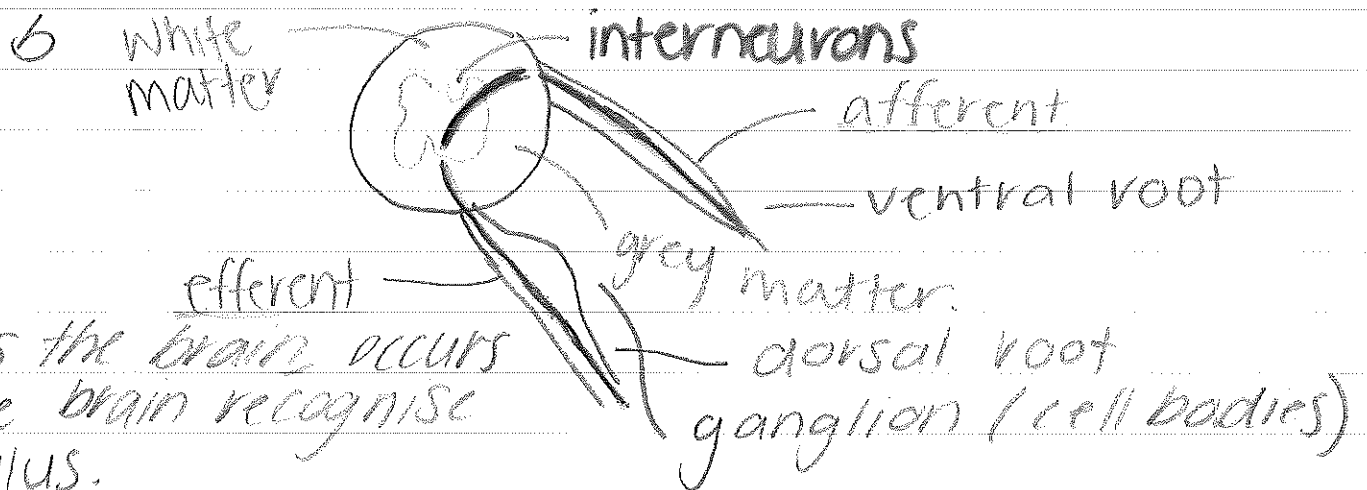
interneurons transport
nerve impulse through
spinal cord to ventral
root (afferent present)



synapse between
neuron and muscle fibres.
neurotransmitter acetylcholine
stimulates voluntary movement
of skeletal muscle.



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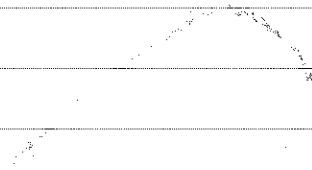
C. The afferent division, at front of spine (vertebrae) while the efferent is at the back. Dorsal meaning back, ventral meaning front.

- The dorsal root also consist of ganglion and synapses while the ventral doesn't.
- The afferent division carries nerve impulses away from central nerve system to peripheral nervous system.

The efferent division carries nerve impulses from peripheral nervous system, to central nerve system.

- afferent neurons are generally multipolar while efferent are other structures of neurons.

11.11.11



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