Date: _____

Nervous System Investigation

Name: Ben Battley **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
DISCUSSION Analysis	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	

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The Effect of Stimulus on response times

Aim: To investigate the effect of Dominant vs Non-Dominant hand on response time

Variables:

Independent variable: which hand used for response time (Dominant/Non-Dominant)

Dependent variable: time taken to touch the screen after visual ↑ cue in ms

Control variables:
- height of hand above phone screen
- same app used to measure response time
- same phone used
- same body position in chair relative to the desk
- Dominant hand tested first, then Non-dominant hand after

Prediction:

The Dominant hand will have a faster response time because it is used more so the axons in the nerve pathway will be myelinated.

Hypothesis:

The use of the dominant hand in the response time test will result in a faster response time as opposed to the Non-dominant hand.

Equipment:

- iphone 6
- Desk from science
- chair from science
- internet to load app for response time
- paper and pens to record data
- app to test response time by touching a screen when a visual stimulus (screen changing colour) occurred

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Method:

1- Set up equipment as shown in Diagram 1.1

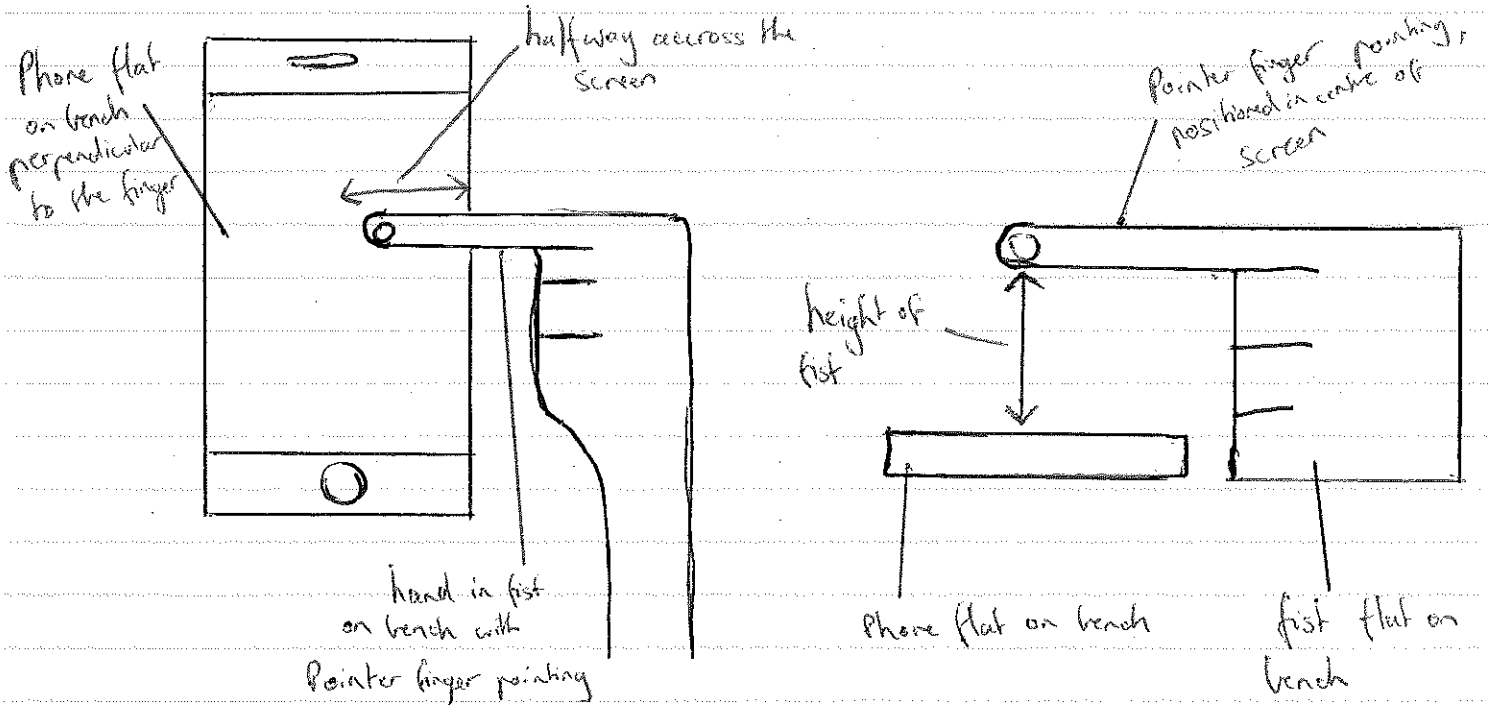
2- Get participant to run through the response test 5 times on the Dominant hand, recording the average after these 5 attempts

3- ~~Get~~ ~~pass~~ refresh the app to ensure Dominant and Non-Dominant results are separate

4- repeat the test with Non-Dominant hand, again taking the average after 5 attempts

5- repeat trials with as many candidates as possible

Diagram 1.1: The effect of Dominant/Non-Dominant hand on response time



(3)

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/ /

Results: The effect of Dominant/Non-dominant hand on response time

Time taken for response (ms)

candidate Name	Dominant hand results	Non-Dominant hand results
Jessica	340.00	345.00
Emma.W	396.00	447.00
Becky	346.00	300.00
Beckly.O	298.00	357.00
Beckly.R	387.00	356.00
Ben	302.00	325.00
Chelsea	298.00	309.00
Emma.C	287.00	305.00
Scarlette	357.00	283.00
Kimchi	316.00	332.00
Anri	347.00	297.00
Avg.	334.00	332.43

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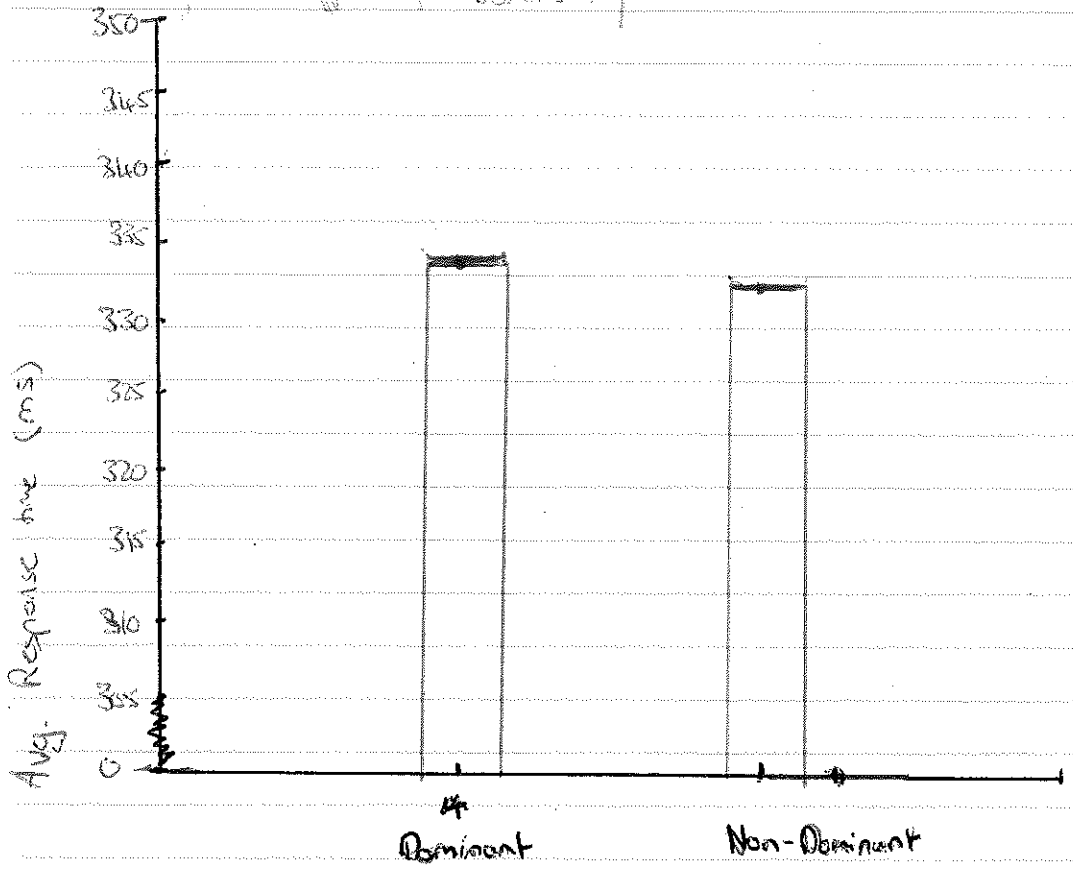
The effect of Dominant / Non-Dominant hand on response time



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Discussion

- on average the non-dominant hand had a faster response time than the dominant hand, this does not match the prediction

- Some inconsistencies were in the data such as how some candidates had a faster non-dominant and some had a faster dominant. This is due to the different degrees to which each candidate uses their non-dominant hand in every day life

- The experiment is classified as invalid but accurate and reliable

  - Its invalid because the results do not truely reflect the aim of the experiment due to a lack of a controlled variable
  - Its accurate because the measurements and procedure were ~~followed~~ done very precisely and with the right equipment
  - Its reliable because the experiment involved a large sample size resulting in the averages reflecting the correct values for the experiment.

- Some problems and difficulties with the design of the experiment are
  1. The height at which the hand begins in the testing, because everyone has a slightly different hand size
  2. Wether the dominant or non-dominant hand should go first in the ~~test~~ testing
  3. Not every candidate understood the rules of the test equally

- Some solutions for these problems are
  1. a measured height for the hand to start at, ie. 10cm
  2. half of the group begin with non-dominant and half of the group begin with the dominant hand to ensure a fair test
  3. a clear prepared set of instructions given to all candidates prior to testing to ensure they all had the same understanding of the ~~test~~ test

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- the results of the experiment did not match the prediction because by the time the candidate did the non-dominant hands testing they had already practiced from the previous dominant hands testing.

- this is because when you practice something your nerve impulses travel faster along the axon as it becomes more myelinated.

- the impulse travels faster down the axon because ~~there~~ instead of going through the middle it can jump from one schwann cell to the next, stopping at the nodes of ranvier.

- this is the response arc for this experiment

Sensory / Afferent neuron in the eye detect stimulus of screen changing colour and send an impulse to the CNS → Interneurons in the spinal cord take the impulse to the brain where the occipital lobes interneurons process the information and send an impulse to the motor neurons in the hand → Motor / Effector neurons in the hand are somatic and carry out the job of telling the hand to touch the screen

- in this experiment the sensory and interneurons are covered in more myelin sheath and are therefore faster during the non-dominant hand testing

Conclusion

- The non-dominant hand had a faster response time due to ~~the~~ the candidate having practiced the test prior to this in the dominant hands testing
- this does not support but neither disproves the hypothesis as the experiment was invalid and therefore this was not a true reflection on the aim of the experiment.

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Question 3

a)

Sensory / Efferent neurons in the eye detect stimulus of screen changing colour

Impulse travels to spinal chord in CNS where it reaches the neurons at the back of the spinal chord to transfer the impulse up to the brain

Impulse gets to the occipital lobe of the cerebrum of the brain where interneurons process information and send out an impulse

impulse travels back down the front of the spinal chord into the PNS

Motor / Afferent neurons which are somatic carry impulse down to the motor unit in the muscle of the hand where the muscles contract to touch the screen

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b)

Sensory neurons detect stimulus and send an impulse to the CNS → Impulse reaches the spinal chord where the interneurons there process the information → Interneurons in spinal chord relay an impulse to the PNS → Motor neurons which are Autonomic respond to the impulse doing what the message has told them to do

c)

- Both pathways have the same Sensory neurons which work in the same way
- Both pathways also reach the spinal chords

- However ~~then~~ in the experiment's pathway the impulse travelled up the spinal chord to the occipital lobe of the cerebrum in the brain where the impulse was ~~reacted~~ processed
- And the ~~message~~ impulse sent out was to somatic motor neurons because the brain consciously made the decision
- where as in the spinal reflex pathway the message only went to the interneurons in the spinal chord where it was processed
- And the impulse sent out went to Autonomic motor neurons because ~~both~~ the brain was not conscious of the impulse being sent out until after it had happened.