Date: 22/02

Nervous System Investigation

Name: Scarlett Gee Investigation: Task 2 / year 12.

response / reaction time

Your Task: Design an experiment to illustrate the effect of stimulus on a ~~somatic reflex~~.

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 ✓	~~5~~	4
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 makes sense.	~~1~~	
CONCLUSION	Major findings are summarised.	1	
	Statement of whether hypothesis has been supported or not	1	
	TOTAL	50	

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Task 2 - NERVOUS SYSTEM INVESTIGATION:

* Aim - to design and conduct an experiment to illustrate the effect of distractions (visual, auditory and touch) on reaction times in response to a visual stimulus.

* Variables -

independent : type of stimulus (visual, auditory and touch): includes illusion / visual distraction, listening to music, and eating.

dependent : the time take (in seconds) to react to visual stimulus of a rolling ball, by clapping.

controlled : person reacting, person creating stimulus or distraction, meters that the ball is rolled, ball used, control group (no stimulus).

* Prediction : I believe that the time taken for a person to react to a visual stimulus will be the longest when a visual distraction is used. This is because my personal research stated that a response time in relation to visual stimulus, on average, is 0.25 seconds, which is longer than both auditory and touch reaction times.

* Hypothesis : the use of various distractions (visual, auditory and touch / taste) will slow down the amount of seconds taken to respond (clap) to a visual stimulus (rolling ball) by an average of 0.3 seconds.

* Equipment :

- 2 people (minimum)
- 3 tennis balls
- 1 large dodgeball
- headphones
- source of music / phone.
- box
- tape
- foodstuff
- recording equipment / phone
- video editing equipment

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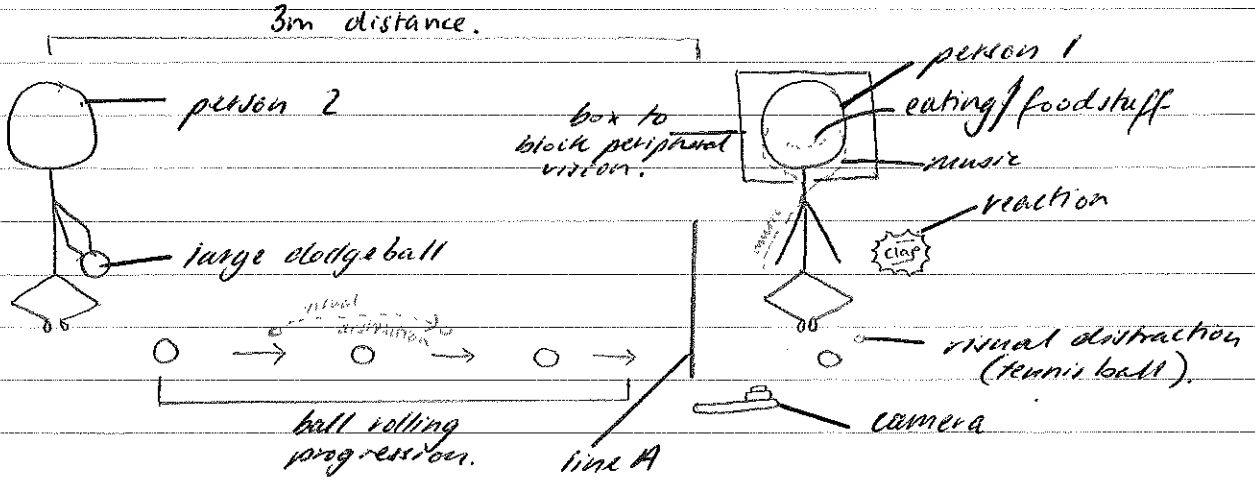
* Method:

1. Collect all equipment listed previously.
2. Seat person 1 (reactor) against line A, mark line A with tape.
3. Place a box over their head to block peripheral vision.
4. Set up camera / recording equipment to capture the time taken for reactions.
5. Seat person 2 (ball roller) 3 metres from line A with the large dodgeball.
6. Begin recording and allow person 2 to roll the ball past person 1; ensure they are ready and clap when they see the ball.
7. Person 2 collects the dodgeball or instructs a helper to do so.
8. Repeat this process twice more with no variations.
9. Repeat this process for each independant variable (music, eating and visual distraction) three times each without altering the equipment layout.
10. Record results in a table and appropriate graph.

* Diagram:



= variable (independant).

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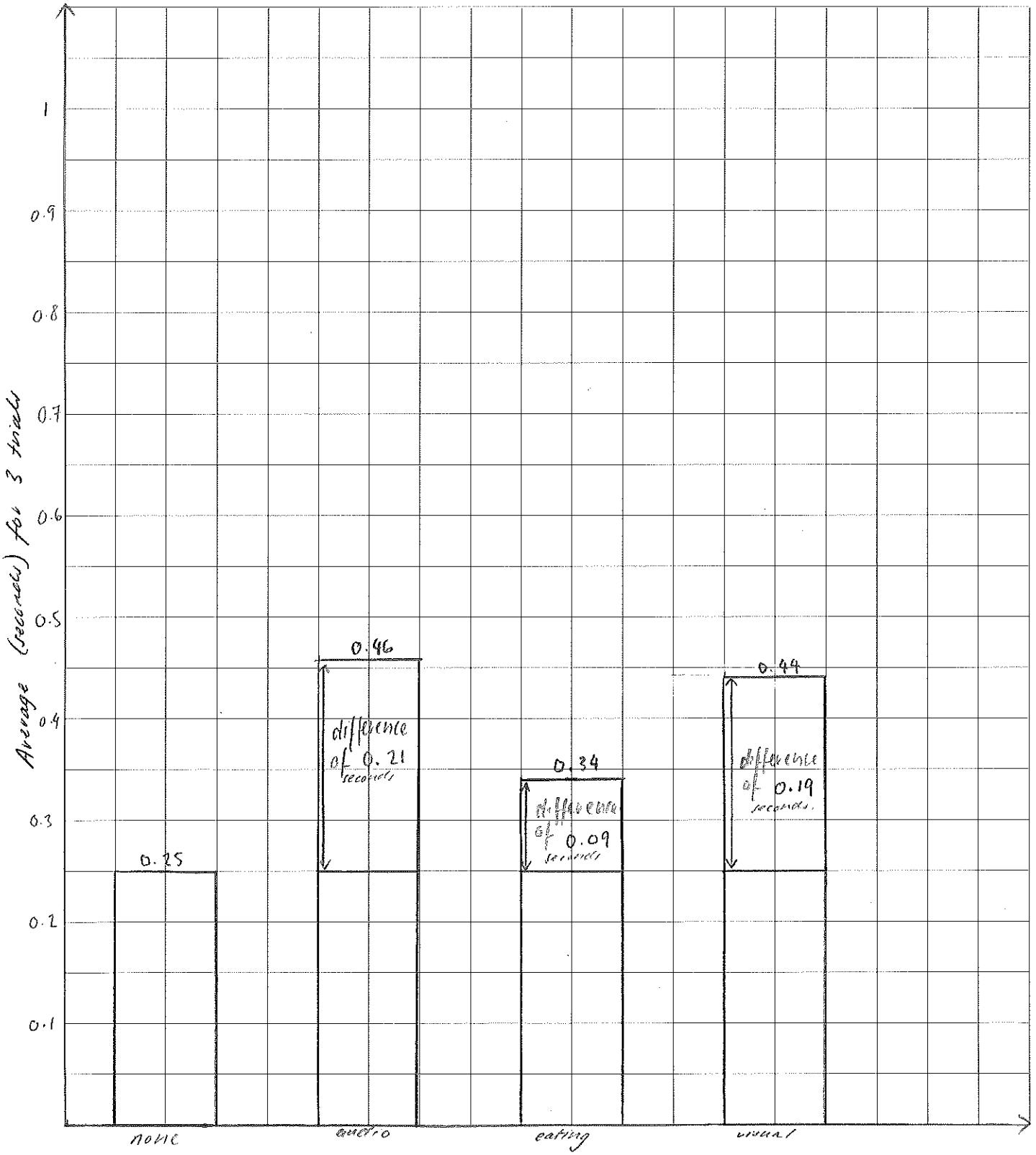
* Results

table -

Independent Variable	Time taken to clap (seconds)			
	Trial 1	Trial 2	Trial 3	Average
none/control	0.23	0.31	0.21	0.25
music/audio	0.40	0.42	0.58	0.46
eating/touch	0.41	0.29	0.32	0.34
balls/visual	0.5	0.42	0.41	0.44
				0.37

*graph - displayed seperately

Average time taken for a physical reaction in response to different distractions.



BEGINNING OF VALIDATION

* Discussion:

In summary, the results recorded in this experiment showed that any form of distraction stimulus will effect the time taken to respond to a visual stimulus with physical movement; ~~#~~ increasing the time taken to clap. Trends in the findings include the use of multiple trials in order to understand if the effects were reliable. The trends seen in the results graph display that the use of visual distraction is always a longer reaction time than eating or consuming foodstuff.

Issues within the investigation included; instruction being spoken throughout the control group trials ~~took~~ taking place, the recording equipment being moved, the removal of the box on person 1's head (change in position) and trials needing to be repeated as a result of a crooked roll of the large dodgeball. To improve, the investigation process may be moved to a secluded area with no sound to combat distraction throughout the process, this would also allow the equipment to remain in place throughout the entire process. Person 1 could ~~attempt~~ attempt the use of different peripheral vision blocking to avoid the movement of the box (perhaps the use of a wall would be more ~~accurate~~ accurate), and the ball could be rolled within ~~narrow~~ narrow confines to avoid having to repeat the trials multiple times.

In order to classify the investigation, one must look at the different classifications; valid, reliable, accurate. Validity is dependant on whether ~~#~~ or not the aim and hypothesis were followed and linked to the experiment, thus this investigation is valid. Reliability is dependant on whether or not a large sample size was included in order to understand the effects outside

of one age or gender, therefore this investigation process is not reliable because the sample size consisted of only one person (female, 17) reacting to the stimulus. Accuracy relates to the observations and recording of results, thus our investigation is not accurate because the use of proper equipment is not maintained and slowing down the video footage is not accurate as scientific equipment in noting the time (milliseconds or seconds) at which the two hands impacted one another for a clap to take place. To improve reliability and accuracy, the investigation could be conducted with a sample size with a wide age and gender range with proper equipment.

According to Hicks law, the use of multiple stimulus at once will mean that a slower reaction time takes place. This is evident in the graph of results where with each column, the difference between that response and the control group is displayed. The use of multiple variations in stimuli changes the reaction from a 'simple' reaction to a 'choice' reaction by the use of making the nerve impulses to the brain slower to be recognised because the brain is already recieving other nerve impulses from visual, auditory and sensory/touch/taste variables.

* Conclusion :

To summarise our findings, the results show a fair increase in the time taken to clap at a visual stimulus when distracted by visual (other balls), auditory (music) and sensory/touch (eating) variable stimuli. The most affected response (increased the most) is that of auditory stimulus by an average of 0.46 seconds, all stimuli together had an average of 0.37 seconds which

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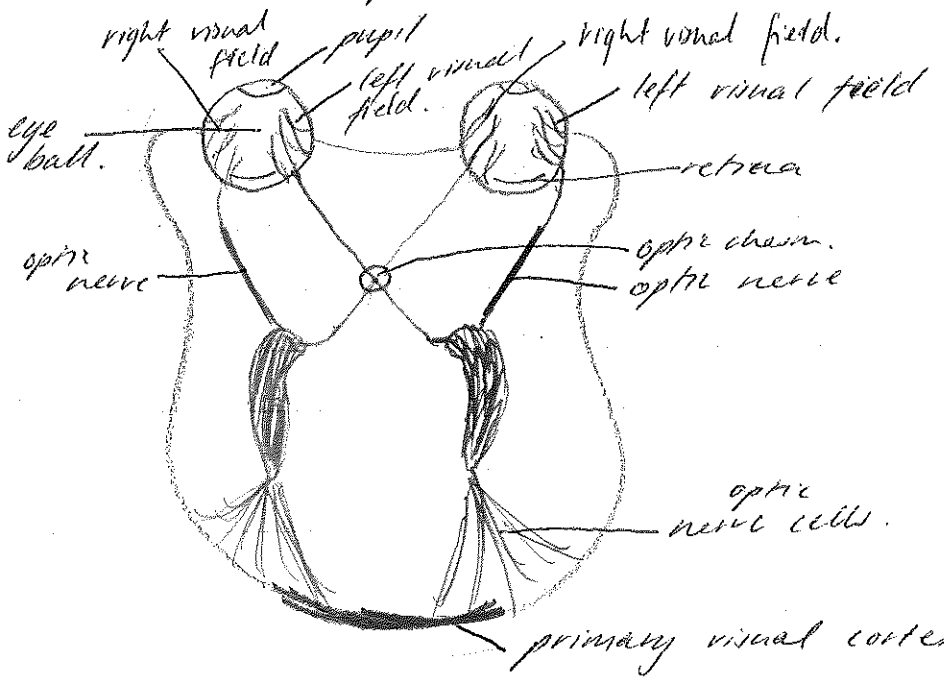
does support the hypothesis given above.

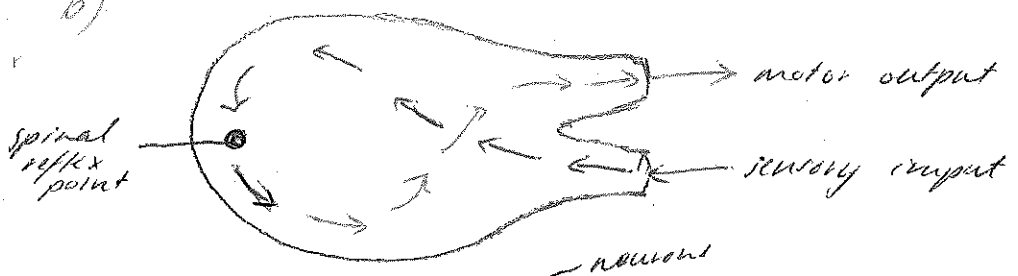
* Validation Questions.

a) the response pathway that controlled the response was that of visual / optic and motor neurons.



- Primary visual cortex sends ~~signals down~~ nerve impulses down the spinal cord into the nerve cells surrounding
- motor neuron as an ~~impulse~~ impulse encourages the movement of arms and hands to produce a clapping reaction to the visual stimulus.

b)



- sensory input → up nerve cells / fibres ~~to the spine~~ → spine → no conscious action or awareness (does not travel to brain (impulse)) → sends motor neurons down nerve cells / fibres → motor output / movement.

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c)

Type of Nervous Control	Similarities	Differences.
Optic nerve function	- motor neurons used (motor output) - sensory input / senses a stimulus	- in brain + spine + peripheral - register then react. → conscious. ~~[illegible]~~ ~~[illegible]~~. - visual stimulus.
Spinal reflex arc.	- motor neurons used (motor output). - sensory input / senses a stimulus.	- in ~~[illegible]~~ spine. + peripheral. - unconscious reaction. - touch stimulus