Date: _____

Nervous System Investigation

Name: Kim Chi Nguyen **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	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 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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Aim

To determine if response time are affected (increase or decrease) visual stimulus or auditory stimulus.

Variables

Independent variable: Type of stimulus used: visual or auditory.

Dependent variable: Response time of each stimulus on each trail attempts.

Controlled variables:
- Subject age = 17 years old
- Subject gender (sex) = Female
- Subject dominant hand = Right hand
- Environment where tests were done (classroom with same noise distraction level)
- Same computer and mouse used in the tests

Prediction

With each attempts made by the subject, the response time (or reaction time) will decrease as the subject will know what to expect and prepare for it.

The response time for the auditory stimulus will be faster as there are less functions going on in the auditory than visual (the brain).

Hypothesis

The response time of auditory stimulus will be faster than visual stimulus, and with each attempts made the response time will decrease.

Equipment

- 1 computer (including mouse) - where tests will be done
- 5 subjects who is the same age (17 years old), gender (female), and have the same dominant hand (right hand).
- Paper and pen to carefully record the time.

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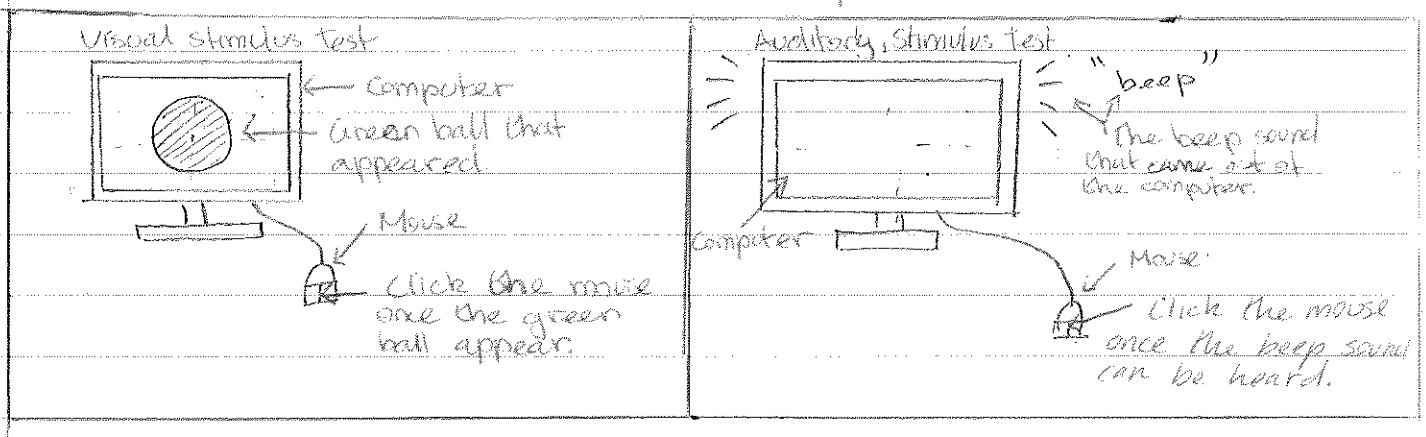
Method

1. Select 5 subjects that are the same age (17 years old), gender (female), and have the same dominant hand (right hand).
2. Go to a computer which the tests will be carried out on. Turn on the computer and go on to the internet. Type in cognitivefun.net/.
3. There, chose the visual stimulus response time test.
4. Have 5 subjects do the test 3 time, one after another.
5. Record the results (response time in milliseconds) carefully.
6. After the visual stimulus response time test, go on to the auditory stimulus response time test and do the same step of 4 and 5 to the auditory test.

* In the visual test, subject must stare at the computer screen until a green ball appear. Once the green ball appears the subject must click the mouse to indicate the time taken to response.

* In the auditory test, subject must listen to a beep sound then click the mouse. Clicking the mouse will indicate the time taken to response to the beep sound.

Diagram



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Tables

The affect of visual and auditory stimulus and numbers of attempts on response time

Stimulus Test	Subject	Response Time (milliseconds)		
		1	2	3
Visual	1	307.064	242.706	237.027
	2	258.524	292.760	275.084
	3	234.124	228.144	393.21
	4	271.721	287.007	312.686
	5	311.376	352.091	379.199
	Average (ms)	276.562	280.542	301.441
Auditory	1	243.669	216.226	294.325
	2	299.606	270.069	307.471
	3	201.147	289.065	181.360
	4	296.940	302.091	284.216
	5	200.855	292.956	221.753
	Average (ms)	248.443	259.681	257.825

Conducting

- Water kept away from computer
- Subjects not stared at computer screen for too long.

Overall there wasn't much safety needed for this experiement as it wasn't dangerous (harmful toward subjects).

The average response time of visual and auditory stimulus on the numbers of attempts.

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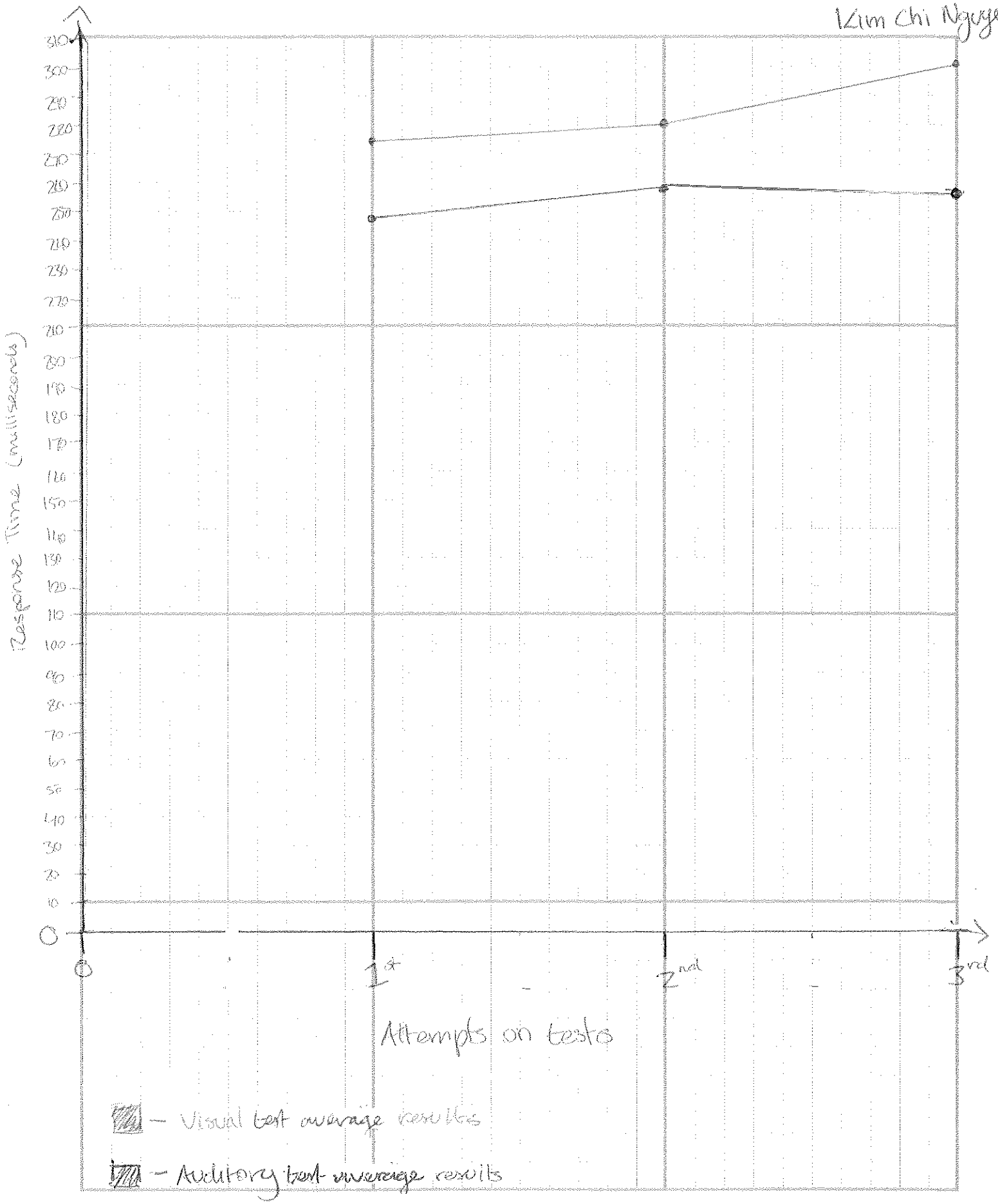

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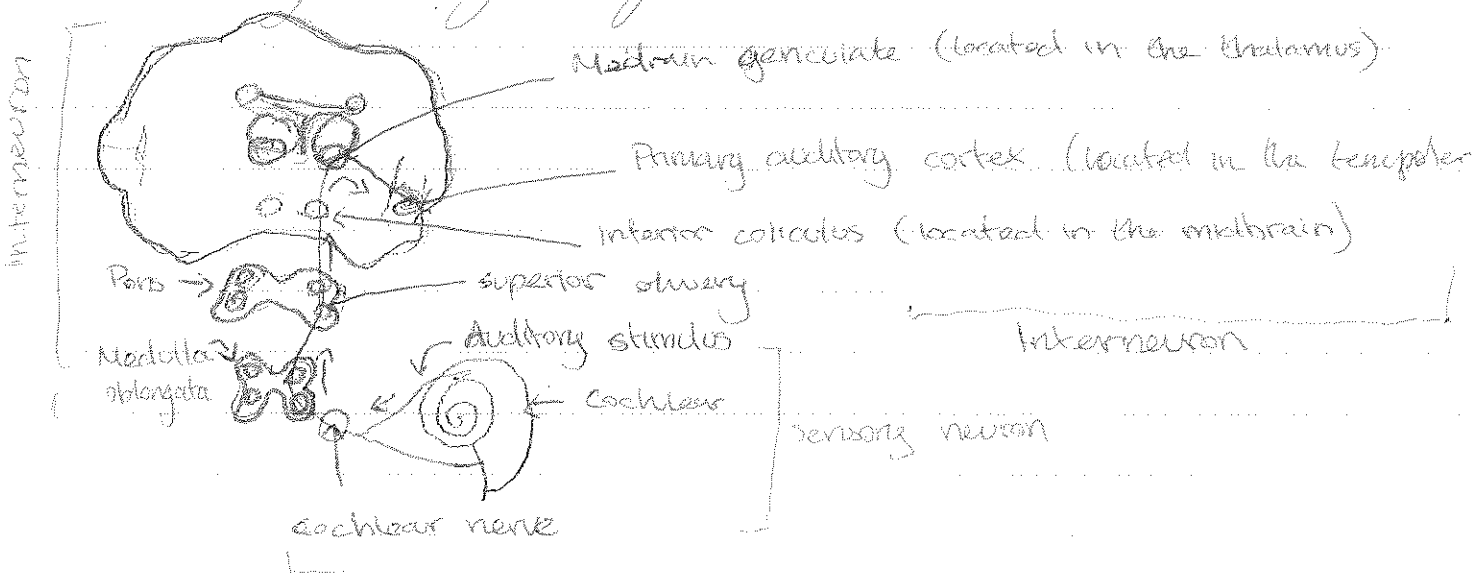
Discussion

The response time for auditory stimulus show that it has a faster response time than visual stimulus. The results of the experiment also show that the average response time for both stimulus increase with each attempt made on the test. The results show that there was a difference of 30-50ms between visual and auditory stimulus. This is because the auditory stimulus travel to the brain faster than the visual stimulus.

Auditory stimulus travel to the brain faster because it have to go through less steps (like cells) and travel a shorter distance to the primary auditory cortex (located in the temporal lobe). Another reason is the auditory stimulus is travelling through myelinated cells which faster.



When sound waves travel through the ear, it causes a vibration (in the eardrum), that vibrate into the middle ear to the inner ear. In the inner ear, there is the labyrinth and on top of it is the organ of corti. The organ of corti contain special sensory cells which are hair cells (tiny - hair like structure). When one is triggered, it open up mechanically sodium channel. The sodium then generate graded potential, leading to action potential (electrical impulses). That electrical impulses travel to the cochlear then up to the medium geniculate (located) into the midbrain the interneuron

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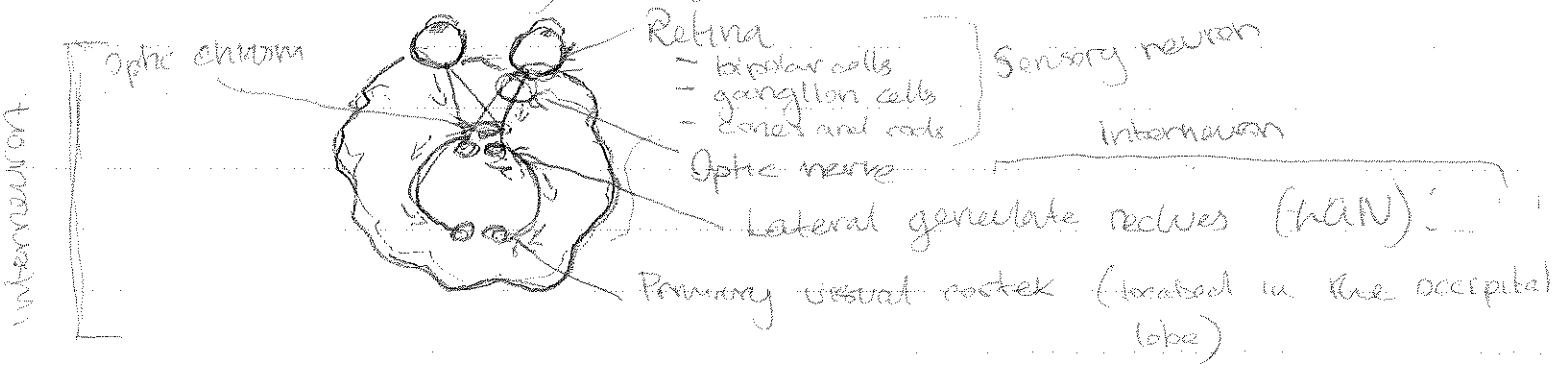
primary auditory cortex (as seen in the above diagram). The brain would then ~~recognised~~, memorised and integrated a voluntary movement. The brain would send the ~~←~~ stimulus down the brain, into spinal cord and into the arm (effector) on the motor neuron.

Visual stimulus travel slower to the brain compared to the auditory because it go through more stuffs and to travel a ~~for~~ further distance. The stimulus also travel on synapses which is slower compared to myelinated fibre, as it's travelling through the cerebral area.



When the light goes into the retina, the retina have a ~~sp~~ sensory cells ~~the~~ called the photoreceptor. The photoreceptor convert the light ~~into~~ energy into a nerve impulses. It then travel through (pass) the bipolar cells, ganglion cells, and cones & rod which are located in the retina. After passing the retina the impulses go into the optic nerve then into the optic chiasm, into the lateral geniculate nucleus (LGN). From there it finally travel to the primary visual cortex (~~o~~occipital lobe) where the brain will process the information then send a stimulus (on the motor neuron) to the arm (effector).

~~P~~ In the results there wasn't really much major inconsistence but there was a tiny one that didn't really affected the overall results much. The inconsistence was that ~~the~~ some of the response

times of the 2nd attempts were higher than the 3rd attempts but it didn't really overall affect the hand results.

The experiement can be classified as valid but not completely. This is because the experiement was testing on girls that were 17 years old and had the same dominant hand (right hand). It's not completely valid as it only test one particular subject. It can also be classified as reliable as many trials was done during the experiements.

During the experiement, there was one major problem that affected the results, it was the more distractions during the auditory test. The noise distractions made it harder for subjects to listen to the beep sound. Ways to improve the experiements: is to wear a headphone for the auditory test or test in a quiet environment, have the subjects do the test at the same time and gather more subjects to do the experiement.

Conclusion

Overall the results found, was that auditory response time is faster than the visual response time, as the auditory stimulus travel through the brain faster than the visual stimulus. It was also discovered that with each attempts made on the test, the response got slower.

The hypothesis was supported but also not supported. It supported that auditory stimulus would be faster, but didn't support that with each attempts made the response will decrease.