**SOUTHERN RIVER COLLEGE**

**Human Biology**

**Unit 3**

**TASK 2 - Validation**

**Reflexes Investigation (5%)**

**TYPE:** Investigation Validation: **/40** Scientific report: **/10  
CONTENT:** Nervous systemTotal: **/50**

When the gun goes off to start an Olympic race in Tokyo in 2020, you won’t see any hesitation on the part of the athlete before they leave the start blocks.

In sprinting, a sport reliant on solely speed, even the shortest of pauses could be the difference between winning and losing. In the men’s 100m sprit in the 2012 London Olympics, bronze medal winner Justin Gatlin, ran 9.79 seconds while the fourth-place finisher Tyson Gay ran 9.80 seconds.

1. **Identify what a reflex is and describe the importance of this response. (2 marks)**

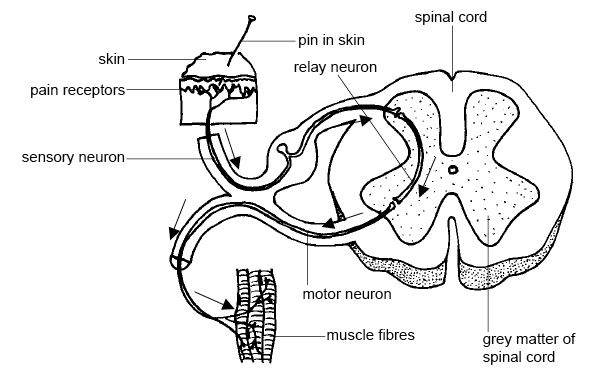
|  |  |
| --- | --- |
| **Description** | **Mark** |
| Fast, involuntary response to a stimulus (must have all) | 1 |
| Protects the body from damage/harm | 1 |

1. **Describe a basic spinal reflex arc. (5 marks)**

|  |  |
| --- | --- |
| **Description** | **Mark** |
| Receptor detects the stimulus | 1 |
| Sensory/afferent neuron conveys the sensory information to the spinal cord | 1 |
| Interneuron relays the message (to the motor neuron) | 1 |
| Motor/efferent neuron conducts the motor output/message to the periphery/effector | 1 |
| Effector: the muscle or gland which responds | 1 |

1. **Describe the auditory reflex pathway which Justin and Tyson experience at the start of the race to begin leaving the blocks.**
2. **Label A to D of the diagram below. (4 marks)**

|  |  |
| --- | --- |
| **Description** | **Mark** |
| 1. Grey Matter | 1 |
| 1. Dorsal root ganglion | 1 |
| 1. Ventral root | 1 |
| 1. White Matter | 1 |



D)

C)

B)

A)

The auditory reaction times of the 18 to 25 year old 100m Men’s World Champions were measured and compared against male non-athlete auditory reaction times.

1. **Complete the following**

**(1 mark)**

**Aim:**

|  |  |
| --- | --- |
| **Description** | **Mark** |
| To investigate the auditory reaction times of 18-25 year old 100m Men’s World Champions compared to male non-athletes. | 1 |

**(2 marks)**

**Hypothesis:**

|  |  |
| --- | --- |
| **Description** | **Marks** |
| The auditory reaction times of the 100m Men’s World Champions will be faster than the male non-athletes.  OR  The auditory reaction times of the male non-athletes will be faster than the 100m Men’s World Champions.  *1 mark answer:*  The auditory reaction times of the 100m Men’s World Champions will be better. | 2 |

**Variables: (4 marks)**

Independent:

|  |  |
| --- | --- |
| **Description** | **Mark** |
| 100m Men’s World Champions/athletes and non-athletes | 1 |

Dependent:

|  |  |
| --- | --- |
| **Description** | **Mark** |
| Auditory reaction times (milliseconds)  Must include units. | 1 |

Controlled:

Any three of the following:

|  |  |
| --- | --- |
| **Description** | **Marks** |
| 18-25 year old participants.  Male gender  Auditory stimuli type  How reaction time is measured eg. Online test/time leaving the blocks after the gun goes off (any suitable example must be included).  Sample size of athletes and non-athletes (3 of each).  Same volume of auditory stimuli  Same distance from auditory stimuli  Must be specific ie. Do not accept “age group” or “gender” or “type of response”  Any suitable controlled variable. | 2 |
| If only two controlled variables. | 1 |
| If one controlled variables. | 0 |

1. **Complete the results tables below: (5 marks)**

|  |  |  |  |
| --- | --- | --- | --- |
| Athlete | Trial 1 (milliseconds) | Trial 2 (milliseconds) | Average (milliseconds) |
| 1 | 149 | 155 | 152 |
| 2 | 130 | 181 | 155.5 |
| 3 | 129 | 135 | 132 |
| Overall Average (of athletes) | | | 146.5 |

|  |  |  |  |
| --- | --- | --- | --- |
| Non-Athlete | Trial 1 (milliseconds) | Trial 2 (milliseconds) | Average (milliseconds) |
| 1 | 255 | 267 | 261 |
| 2 | 343 | 352 | 347.5 |
| 3 | 289 | 297 | 293 |
| Overall Average (of non-athletes) | | | 300.5 |

**1 mark –** Average (milliseconds)

**1 mark –** Overall Overage

**1 mark –** Athlete averages correct

**1 mark –** Non-athlete averages correct

**1 mark –** Overall averages correct (with follow through)

1. **Are there any outliers in this data? List them and provide a possible explanation for this. (2 marks)**

|  |  |
| --- | --- |
| **Description** | **Mark** |
| Yes – Athlete 2, trail 2/ athlete 2 181 milliseconds. | 1 |
| Recording error eg. Computer/internet issue or incorrect start times recorded.  Human error eg. the athlete was distracted and did not perform as expected.  Other suitable expectation. | 1 |

1. **Graph this data. (5 marks)**

|  |  |
| --- | --- |
| **Description** | **Mark** |
| Labels X axis: (Male) athletes and (male) non-athletes.  Y axis: Overall average auditory reaction time (milliseconds). | 1 |
| Units (milliseconds) | 1 |
| Scale | 1 |
| Title eg. Average male (100m world champions) auditory reaction times when compared to male non-athletes.  Must say “male”. | 1 |
| Plotting   * Column graph (with gaps between the bars) * Correct values plotted  (overall averages of 3 individuals of athletes vs non-athletes) | 1 |

1. **Provide a brief description of these results. (2 marks)**

|  |  |
| --- | --- |
| **Description** | **Mark** |
| The overall auditory reaction time for the athletes was much higher than the non-athlete auditory reaction time. | 1 |
| Include data. | 1 |

1. **Write a conclusion for these results. (2 marks)**

|  |  |
| --- | --- |
| **Description** | **Mark** |
| Hypothesis was supported or disproved (based on individual hypothesis). | 1 |
| Refer to results to support statement.   * Must include values. | 1 |

1. **Was this investigation valid and reliable? How could this be improved? (6 marks)**

|  |  |
| --- | --- |
| **Description** | **Mark** |
| Reliability   * This experiment was not reliable. | 1 |
| * There were only 2 trails and 3 individuals for each group (athlete and non-athlete). * Increase sample size: 30+ for each experimental and control group/ athlete and non-athlete. * Increase trails to at least 3 per person. | 2 |
| Validity   * This experiment was valid (must provide explanation to get this mark). * The controlled variables were maintained/only one variable was changed in the experiment. * Provide an example of a variable which was controlled.   OR   * The experiment was not valid (must provide explanation to get this mark). * Not enough information about the investigation was provided OR Provide suitable example of one variable not controlled   ie. Age was not controlled: only 18-25 year old male athletes, non-athletes age was not provided   * Provide one improvement. | 3 |

**Validation /40  
Scientific Report / 10**

**TOTAL /50**

**Scientific Report – Marking Key**

**Discussion**

|  |  |
| --- | --- |
| **Description** | **Mark** |
| Describes the trends and patterns in the processed data. | 1 |
| Explains data using scientific knowledge  [students should have used an online platform to record participants reaction time to either visual or auditory triggers and researched this]   * Discussion of reaction times of gender/age/prior exposure to such experiments * Auditory reflex time is fast as it reaches the motor cortex (brain) quickly/myelinated fibers OR * Visual reflex time is slow as it takes longer to reach the motor cortex (brain)/unmyelinated fibers | 1  1 |
| Comments on reliability using correct terminology eg. Repeat trials or sample size | 1 |
| Comments on validity using correct terminology eg. Controlled variables | 1 |
| Describes a limitation in the investigation | 1 |
| Describes two or more improvements for the investigation   * One mark per improvement | 2 |

**Conclusion**

|  |  |
| --- | --- |
| **Description** | **Mark** |
| States the hypothesis is supported or disproved (see individual hypothesis). | 1 |
| Refers to results to support. | 1 |

/10