# Attention and Distraction.

**Introduction:**

The purpose of this coursework is to investigate the properties of the human idea of attention and distraction. Within psychology there are many ideas surrounding attention and distraction and how the principle of attention may work and many psychologists have gone to great pains in order to study attention and distraction to great depths. For example CHERRY in the early 50's established what he called the 'Cocktail party phenomenon' – suggesting that humans have merely one 'channel' of attention and no more and may only listening to this one channel and no other at any one time. Later in 1954 BROADBENT further supported Cherry's ideas by using what was called the 'filter-theory'. This involved the idea of the human brain's attention model being split into four individual parts and one of these parts, the 'Selective Filter', was the part that selected the 'channel' to listen to. Broadbent believed that the method of selection was not a complicated process, but merely on the basis of simple characteristics such as the direction the sound is coming from. But in relation to our actual experiment as we shall see later on, MORAY (1959) argued that participants would often here their own name in the background if it was called out, suggesting that the non-attended channels are not completely ignored and that there is some awareness in them, and it is through this suggestion that the non-attended channels are not completely ignored that we make our hypothesis.

**Aim:**

Our aim within this investigation is to explore through experimentation, the human properties of attention and distraction and the qualities surrounding them. We will make a suitable hypothesis concerning our investigation from the background knowledge that we have on attention and distraction and then will set to test this hypothesis through appropriate testing and investigation.

**Hypothesis:**

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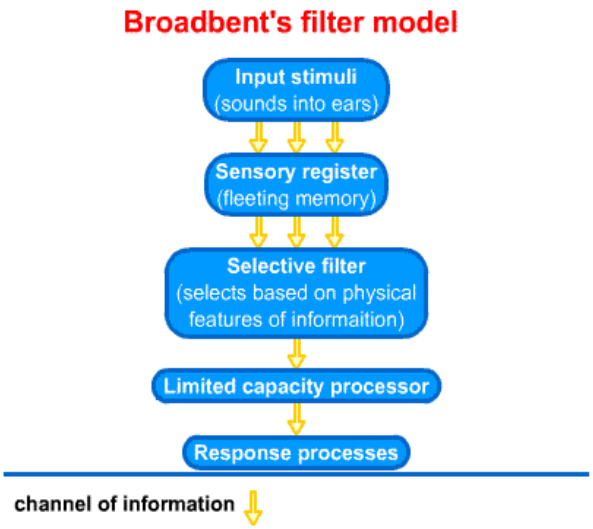
Our hypothesis is that when a participant is asked to calculate a list of twenty sums, the presence of a recording of random numbers played into headphones (which they will be wearing) will result in an increase of incorrect calculations whereas without the presence of the random numbers being played the rate of correct calculations will be higher.

**Previous Research:**

Selective Attention:

This is the theory of how we concentrate on one source of information while ignore another source. An example of this is Broadbents' theory of attention named the 'Filter-Theory'. Broadbent believed that human attention is made up of four individual parts. Each part had a specific role to play in attention and they all worked together in a chain. Below is a diagram of his filter and each part is labelled and explained:




The selective filter is what we are concerned with more at this moment in time. Broadbent believed this part to be somewhat like a television channel selector in the way it can select one 'channel' of information whilst ignore others. He believed that this was not a complicated process in the slightest but merely on the basis of the physical features of the channel, what direction it is coming from, etc. Broadbent

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believed the brain to be completely unaware of the other channels and the 'Cocktail-Party' situation was used to explain it, in that the person would be completely aware of who they were speaking to, but all other voices around them would be completely ignored.

Cherry further supported this theory with his 'Dichotic Listening Experiments', involving a participant being played two separate messages at the same time – one in each ear. The participant was told what ear to listen into and asked to repeat back the message they heard exactly. They were capable of listening and repeating back the message heard in the 'shadowed' ear (the ear that they were told to listen from) but the other message in the 'non-shadowed' ear was not recalled at all.

The conclusion of this experiment was that the participants had no awareness of the non-attended channels at all, therefore supporting Broadbent's theory.

**BUT:**

In relation to our experiment and the fact that we believe that the non-attended channels can actually be a distraction to the attended channel, Moray (1959) argued that participants often heard their own name in the non-attended channels when it was spoken – suggesting that the non-attended channels were not completely ignored and that there is some awareness in them – this is how we came up with our hypothesis. Also a point to make about the attention model TREISMAN'S (1964) model found solutions to Broadbent's disregard and unbelief of the fact that the unattended channel may interfere. It is also an early selection model based on physical characteristics of the information. Treisman's filter attenuates (weakens), rather than eliminates, the unattended information/channels. A second filter processes the information for meaning, which may result in an attenuated channel being selected if it is important, for example: your name or an alarm call like 'help' or, to use Treisman's term, reaches the threshold level of intensity**.** Overleaf is a diagram of Treisman's model explaining what he believed about the attention model:

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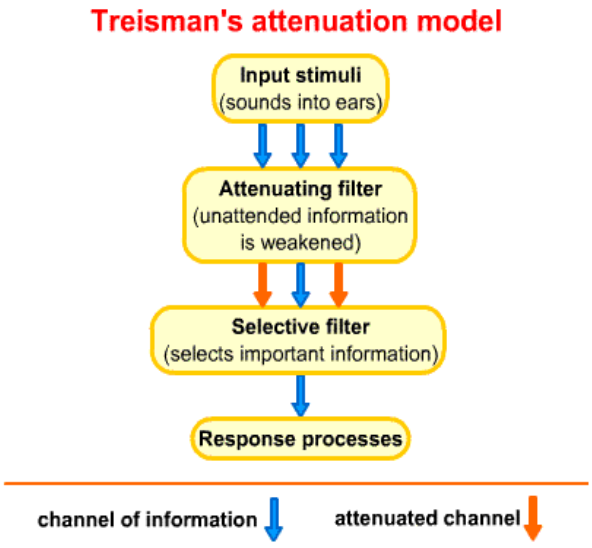


We have based our hypothesis on the fact that we believe that although one channel may only be accessed at any one time, other channels may interfere. In our experiment we are working on the basis that the presence of the random numbers will closely relate to the sums and that will increase confusion.

**Independent Variable:**

The independent variable(s) are listed below:

- The 2 sets of 20 sums.
- The 2 minutes given to complete the test.

**Dependent variable:**

The dependent variable is listed below:

- The amount of sums that are answered correctly by each participant on completing the experiment.

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**Extraneous Variables:**

There are many extraneous variables within our experiment that must be controlled in order to achieve a fair test. They are listed below and also how to control them best is explained:

**Intelligence:**

Since it will be impossible to find a group of participants that are all of equal intelligence and mathematical ability – some participants may turn out to be better than others at solving the problems and this can therefore affect our results. In order to regulate this a well as possible we will be using opportunity sampling in order to select participants as fairly as possible without any bias towards a particular group. Males and females will also be used in equal numbers from the people we select.

**Sampling:**

The most suitable method of sampling that we have came up with for our experiment is OPPORTUNITY SAMPLING. We will actually use the available people at the time the experiment is to be carried out. This will ensure that no bias will be made towards a particular group. We will select an equal number of males and females also to ensure no bias are made in the sex of the participants.

We have chosen opportunity sampling over random sampling due to the fact that random sampling will result in an undeterminable selection of males and females from various ages and educational backgrounds – opportunity sampling will allow us to select participants from the target population and age levels we wish to test since we are using participants from an A-level class.

**Distraction:**

We must ensure that whilst the participants are taking part in the experiment that there is as little distraction as possible in the area. To ensure this, each participant will go individually into a silent room to take part in the experiment whilst the others wait outside.

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**Communication between participants:**

Because we have decided to send each participants in to the experiment one by one, we must ensure that NO communication will take place when one participant leaves and another enters. To prevent this we will keep the participants that have yet to take part in a separate room from the corridor that leads to the testing room. This will ensure that no answers to the test may be passed between participants.

All these factors will be controlled to the maximum level they can be in order to ensure as fair a test as is possible.

**Target Population:**

Our target population will be males and females between the ages of 18 and 21 living in Belfast, Northern Ireland. They will be all be chosen using opportunity sampling from pupils within and A-level psychology class.

**Experimental Design:**

Our experimental design is as follows:

- The participants will first be briefed on the experiment and what they are to do and what they must not do will be explained to them. Questions may be asked but the experimenter will not be allowed to answer questions relating to the purpose of the test until after the test has been carried out, such discussion may lead to an unfair test, in that, any participant in the knowledge of what is expected may actually conform deliberately to these expectations, therefore affecting results.
- The participants will then be taken to their allocated places and asked to wait until their turn. The participants that are to then take part will be lead to the testing room and given instructions on what to do.
- The room that the participant is taking the test will contain only the apparatus needed to complete the test. They will be given two minutes to complete the

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test – a total of 20 sums plus the test again without the recording playing, giving them 6 seconds per sum approx.

**Sampling Methods:**

In this experiment we will be using OPPORTUNITY SAMPLING in order to achieve as fair a method as possible of choosing participants. We will be choosing the participants from whoever is available to take part at the time of the test. An equal number of males and females will be chosen in order to keep the test as representative as possible of the male/female population.

**Materials and apparatus:**

Below is a list of the materials and apparatus we will need for the experiment:

- 20 participants. 10 male and 10 female, chosen by opportunity sampling.
- Two lists of 20 prepared mathematical problems. The same sums on each page but make sure that the second list is rearranged in a different order
- A pen for each participant in order to complete the problems.
- A prepared tape of a recording of random numbers read by the experimenter. The recording will be two minutes long in order to match the time given to the participants for completing the test. The random numbers will be between the range of 1 and 1,000.

**Experimental Procedure:**

Below is a step by step account of the exact procedure that is to carried out in order to complete the experiment:

- First make sure that you have made two lists of twenty sums with one of the lists of the sums rearranged in a different order and the two-minute recording of random numbers between 1 and 1,000. The sums do not have to be of a particular difficulty but it would be wise to use fairly simple and direct

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calculations in order not to result in a narrow margin between correct and incorrect in our results.

- Make 20 copies of each page of sums and also make sure to have twenty biros for the participants.
- Select the participants from whoever is available at that moment in time. Make sure to have 10 males and 10 female and not to choose someone who was involved in setting up the experiment.
- Brief each participant before starting and make sure to explain what he or she is to do upon entering the testing room. Also make sure that you explain to them that they may leave at any time and do not have to continue if they do not want to. (See briefing sheet)
- Bring the participants into the waiting room and have then seated and relaxed. Simply select a participant at random from the group to take their turn in testing.
- Lead the selected participant to the testing room and seat them at the table where they will carry out the test. Explain to them what they are to do.
- Tell them to place the earphones on their ears and when they are ready to begin, press play on the recorder. Tell then to finish writing when the recording has stopped but also make sure to time them also to ensure that they only get 2 minutes to complete the test.
- When they have finished the first selection of sums, ask them to remove the earphones and to attempt to do the second page of sums. Make sure to time them and tell them to stop when their 2 minutes are up.
- When they have finished, ask them to go to the debriefing room where they may relax until everyone else has finished. Also you may provide them with beverages. When everyone has completed the tests, debrief them about what they just have taken part in and thank them for their co-operation (see debriefing sheet). They may now leave.

**Ethical Issues in this experiment:**

There are a number of ethical issues that we may encounter whist carrying out this experiment, they are listed below:

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- The participants are not fully aware of what they are taking part in until they have finished they experiment and are debriefed. Although they are told they may remove themselves from testing at any time, the fact that they do not know what they are actually taking part in is a bad thing and they actually do have the right to know. But since this may affect our results, we have chosen not to inform them and have instead given them the right to withdraw if they please.
- There is a certain amount of stress involved in taking part in this experiment in the fact that the participants must calculate the sums in two minutes whist being played a series of random numbers. Being under this stress combined with being isolated in a room whist testing may result in upsetting some participants. The only method of solving this is informing them of their right to withdraw at any time
- A problem also is the time that each participant will have to wait to be debriefed. Obviously the first few to complete the experiment will have to wait longer but we have solved this by having beverages at hand in the debriefing room so that they may relax whilst waiting to be debriefed. This is also a possibility either way as participants waiting to take part may become impatient – again, the presence of music, beverages, etc will help eliminate this factor.

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**Briefing:**

" Welcome and thank you to you all for agreeing to take part in this experiment. Before we start, I would like to explain a bit about what we are going to do today and then I'm hopefully going to answer some of the questions you may have in regards what you are to do. First I would like to inform you of the nature of this experiment and what will happen. To begin you all will be chosen randomly one by one to take part. Then you will be led to the testing room, where you will find a tape recorder, two sheets of paper and a pen. I would ask you not to touch any of these items until you are told to do so. You wil l then be asked to put the earphones on and to turn over one of the sheets of paper – where you will see a series of twenty sums. When you are ready to begin, simply press 'PLAY' on the recorder and attempt to complete the series of sums. What you will hear from the recorder you are not to pay attention to, but you are to only concentrate on completing the sums. When the recording stops and you are asked to stop writing, please do so.

Take a few seconds to compose yourself if you wish and then attempt the second set of sums. Make sure you do NOT have the recording playing whilst doing this. When you are asked to stop, please do.

You will then be shown to the debriefing room where you may enjoy some refreshments and relax while you wait until all the participants have finished until you are debriefed.

Once again, thank you for your time and co-operation and I must know inform you that you do have the right to remove yourself from the testing at ANY time. If you feel in anyway that you want to leave, then leave immediately, there is no restrain or pressure on you at any time to stay. Thank you. If you have any questions, please raise your hand and I will help you with your enquiry but I regret I cannot answer any questions regarding what we are expecting from testing you – this may affect our results, but all will be explained in the debriefing after you all have finished the experiment. Thank you all."

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**Debriefing:**

" Thank you all for taking part in this experiment. I hope we have not inconvenienced any of you in any way and I will now go about explaining what we have just done.

Each of you were asked to complete two sets of sums, one set with random numbers playing in your ear, one set without them playing. The purpose of this was to see if the presence of the random numbers had any effect on your number of correct answers. We wish to investigate what the effects are of distracting noise on a human's attention and by this experiment today we hope to further our knowledge.

You may have noticed that the two sets of sums were the exact same only rearranged in a different order. This was to help us achieve a fair test. By rearranging the sums, we gave you the illusion that you were doing a new set of sums but in actual fact you were doing the same sums again. If we had have used a new set of sums, it would've been difficult to make a new set that were as easy or as difficult as the first set – by using the same sums, we ensure a fairer test.

Once again I thank you for taking part and for your co-operation in our experiment. If you have any questions whatsoever, please ask. Thank you all.

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**Results:**

| Participant Number | Sums correct WITH recording | Sums correct WITHOUT recording | Difference |
|---|---|---|---|
| 1 | 9 | 15 | **6** |
| 2 | 8 | 15 | **7** |
| 3 | 10 | 14 | **4** |
| 4 | 14 | 16 | **2** |
| 5 | 8 | 12 | **4** |
| 6 | 7 | 17 | **10** |
| 7 | 7 | 17 | **10** |
| 8 | 9 | 16 | **7** |
| 9 | 10 | 19 | **9** |
| 10 | 11 | 13 | **2** |
| 11 | 10 | 16 | **6** |
| 12 | 7 | 15 | **8** |
| 13 | 12 | 15 | **3** |
| 14 | 9 | 16 | **7** |
| 15 | 8 | 17 | **9** |
| 16 | 9 | 13 | **4** |
| 17 | 6 | 18 | **12** |
| 18 | 12 | 19 | **7** |
| 19 | 10 | 18 | **8** |
| 20 | 11 | 16 | **5** |

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**Analysis of results:**

In order to find whether or not we have been correct in our hypothesis, it is essential that we analysis the results that we found in the appropriate manner to find if there is or not, a significant amount of evidence to prove our hypothesis. There are many methods of analysing data but what we are most concerned about in our experiment are MEAN, MEDIAN and MODE.

Below they all have been calculated for our data received:

**Mean:**

The mean is calculated as follows:

$$\text{Mean (N)} = \frac{\text{Total of all data (n)}}{\text{Number of participants (P)}}$$

So:

Below is a table of the mean for all the data received:

| | Correct WITH recording | Correct WITHOUT recording | Difference |
|---|---|---|---|
| **MEAN** | 9.65 | 15.85 | 6.5 |

By looking at these results found, we can see that there is a significant rise across the board in the number of calculations made correctly without the presence of the recording of random numbers – although this is proof that our hypothesis was correct, it is not conclusive.

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**Median:**

The median is calculated as follows:

Median (M) = The middle number of all the results (m)

In order to find the median we must lay out all the results found and find the middle number, but as our experiment involved 20 participants, we must take the $10^{th}$ and $11^{th}$ numbers and find their mean.

So:

$$\text{Median (M)} = \frac{\text{the } 10^{th} \text{ number (T)} + \text{the } 11^{th} \text{ number (E)}}{2}$$

So:

Below is a table for the median of all the data received:

| | **Correct WITH the recording** | **Correct WITHOUT the recording** | **Difference** |
|---|---|---|---|
| **Median** | 9 | 16 | 7 |

We can see from this that our hypothesis are correct, the median difference between correct with the recording and correct without the recording is significant and shows that there is a great difference across the board. Once again our hypothesis is proved correct, but this is not conclusive, as we have to calculate the MODE.

**Mode:**

The mode is calculated as follows:

Mode (MD) = the number that occurs the most in the data.

This is extremely easy to calculate. To calculate the mode we merely find the result that occurs most often in the results.

A table for the mode is below:

| | **Correct WITH the recording** | **Correct WITHOUT the recording** | **Difference** |
|---|---|---|---|
| **Mode** | 9 | 16 | 7 |

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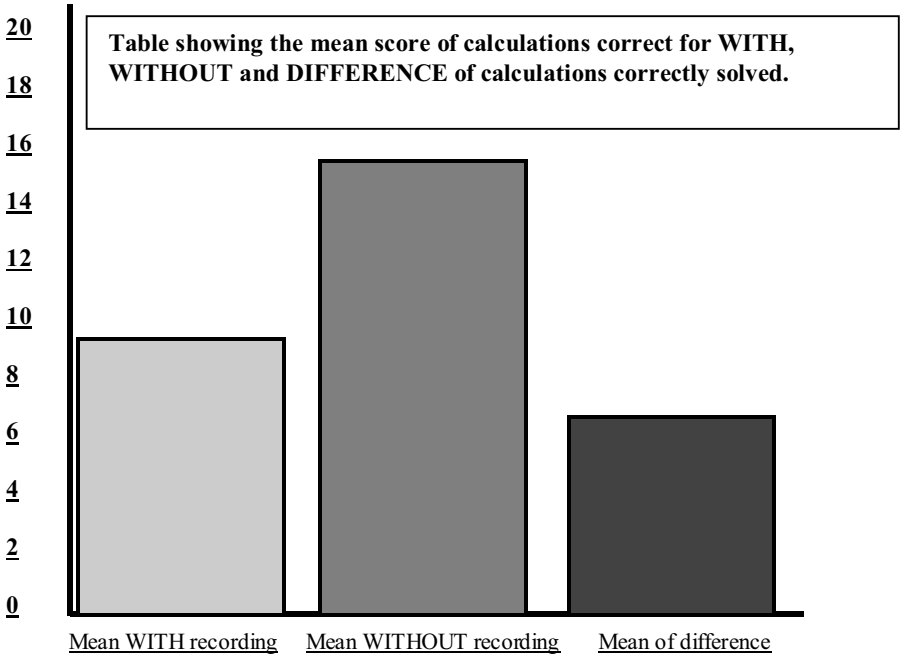
As we can see from this table, the most occurring results in the experiment also show that there is a definite increase in the number of correct calculations when the recording is removed. This again proves our hypothesis to be correct – and combined with the previous calculation – shows our hypothesis to be completely correct.

To make it much easier to read these findings, we have included a collection of charts overleaf to explain our findings – they are labelled and explained in detail.

**Tables:**

Table showing mean of:

- Calculations correct with the recording present
- Calculations correct without the recording present
- The difference between the two.




This table clearly shows that there is a great difference between the number of correct calculations with the recording present and the number of correct calculation without the recording present. The mean of the differences is greatly significant also – therefore supporting our hypothesis.

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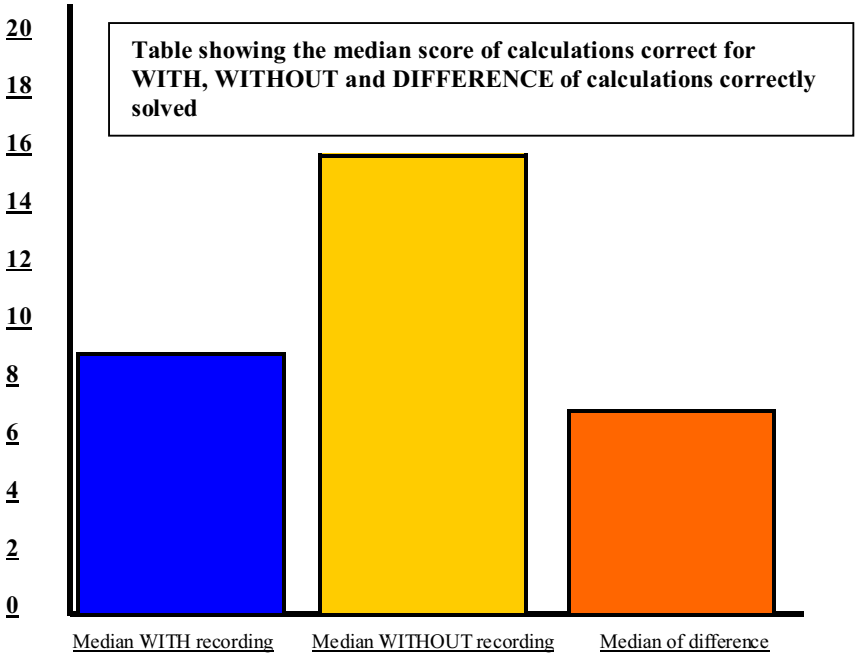
Table showing Median of:

- Calculations correct with the recording present
- Calculations correct without the recording present
- The difference between the two.




With this table there is also a great significance in the difference between the number of correct calculations with the recording present and the number of correct calculation without the recording present. The median of differences 7 and combined with the mean of differences (6.5) shows us that participants scored around 6 or 7 more correct calculation without the recording. This is very significant and supports our hypothesis greatly.

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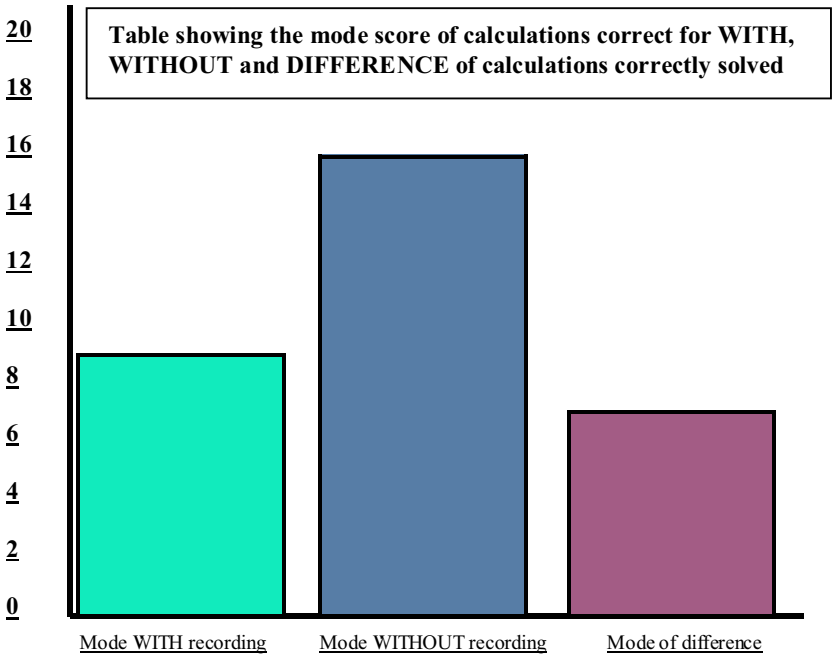
Table showing mode for:

- Calculations correct with the recording present
- Calculations correct without the recording present
- The difference between the two.




With this table there is also a great significance in the difference between the most occurring number of correct calculations with the recording present and the most occurring number of correct calculation without the recording present. The mode of differences 7 and combined with the mean of differences (6.5) also combined with our previous table on the median difference (7) shows us that participants scored again around 6 or 7 more correct calculation without the recording. This significance and supports hypothesis greatly and we will not go on to conclude our experiment.

**Conclusion:**

With the final results carefully analysed and considered, we have come to the conclusion that when a participant is faced with calculating a number of sums with also a recording of random numbers playing in their ear, the number of correct calculations is far less than what the number of correct calculations would be if the recording of random numbers was removed. This in turn supports our hypothesis and

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shows us that the presence of distracting noise in the background channels can and will distract a participant from the channel that they are currently attentive to.

**Relation to Background material:**

In relation to the background material we previously studied in this investigation, our results have shown that Cherry and Broadbent's theories surrounding attention seem to be incorrect or incomplete. Triesman's studies however appear to be more applicable to our results – as we have seen that the distracting noise in the background does seem to interfere with the channel that the participant is tying to concentrate on. Also Moray's studies have some significance with our results as Moray suggested that participants might hear their own name when attempting to concentrate on a particular channel and this may be significant as in our experiment we made use of random numbers being called out and due to the fact that the participant is trying to concentrate on numbers, this may increase that level of distraction from the task more than, say, letters may have.

**Limitations:**

We found that there were many limitations in our experiment when we carried it out. They are listed below:

- The experiment cannot possible be completely representative of the whole population as we only tested 20 people in all.
- Also only A-level students were tested and this brings limitations onto the intelligence levels of the participants tested. We have not be fair in the aspect that we have not selected participants from all levels of intelligence to see what effects the inclusion of those participants will have in our experiment.
- Due to the fact that we held the experiment in decidedly unnatural conditions, this may limit the results we received. But since there is no other alternative way of testing our hypothesis this is an unavoidable factor.

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**Improvements that could be made:**

In hindsight of the limitations of our coursework there are a number of improvements that could be made to our experiment.They are listed below:

- We could use a more representative sample of participants in our experiments in order to achieve a wider range of results and therefore get a better idea of what effects the distracting noise have on participants trying to complete the task.
- We could use further testing with other tasks to do e.g.: tasks involving word skills, puzzles, etc in order to achieve further analysis on attention.
- We could also use better facilities in our experiment and improve on the method of testing in order to possibly achieve better results.

**Further Research:**

The factors surrounding attention and distraction in this experiment show us that although a person may be attempting to listen to one channel, there can be a distracting effect on that by other channels that are added, in this case the presence of the random numbers. Although we came to the conclusion in with the completion of this experiment that other channels can have an effect on the channel that is selected, there is not enough evidence that this is conclusive for all of the population or that the elements such as the use of numbers in our experiment may be a standalone factor in attention and distraction, meaning that if we used letters for example, the participant may not be distracted at all. This could be investigated with further research by us and a new experiment could be drawn up and tested to see what the results may be when other elements may be added.

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