The stroop effect on automatic and control processes psychology essay

The variation of the Stroop Effect was examined in this experiment by looking at interference between the automatic and control processes when colour-related words are visually written down in conflicting coloured inks, there is another condition which has coloured words for neutral objects. Previous empirical research found that automatic process interferes with the controlled process; the results reported here support the previous research by finding that it takes longer for participants to respond to the colour related words that the neutral. The results are statistically significant with a 0. 50 standard deviation point difference which is a medium effect.

Introduction:

Our senses are exposed to a continuous flow of information, this stimulus is on-going and at the same time the senses are simultaneously receiving other information. How the senses attain the stimuli from the world is called sensation while perception is how stimuli is processed after the sensation, this is an internal cognitive process. This is a two-way process in which the sensory system influences cognitive processes which influence the sensory system; while attention occurs between what has been sensed and what is perceived.

Attention can be looked at as a process by which cognitive processing resources are allocated. As it would be impossible to cognitively process all information, attention therefore is selective on specific information at each time (Edgar, 2007). Kahenman (1973 cited in Edgar, 2007) suggests that there is a ‘ limited-capacity central processor’ within the brain which processes incoming information, analysing and integrating it with information already present in memory. As there is so much information

which is being processed by our senses, this processor has limited capacity and cannot process all information.

The processing of stimuli that involves a cognitive process and that exert conscious control is termed a control process, this is the information that will be processed through the ‘ limited-capacity central processor’; but there is also another process called the automatic process that does not use additional resources while processing stimuli and is not consciously controlled, these two elements to cognitive process have led to the development of a theory called the two-process theory.

An experiment by Stroop (1935, cited in Edgar, 2007) looked into the relationship between the automatic and control process and the possible interference they cause; this is now commonly known as the Stroop Effect. One of the variations of the experiment involved participants being timed to read out words, in the first condition the colour-neutral words were written in a coloured ink, therefore there being no obvious colour that the participants would associate to the word. In the second condition (Stroop Condition) the words were written in colour to a different colour-related written word. The task for the participants was to name the ink colour of the word in both conditions as quickly as possible. Stroop found that for the colour-neutral condition this was easier to do than in the Stroop Condition; the experiment concluded that there was significant interference between the automatic processes of reading and control processes of naming the ink colour (Edgar, 2007).

While the Stroop Effect demonstrated a negative aspect to automatic and control process there are ways to cognitively override the automatic process, to some extent, by focusing on the first letter of the word – in doing so the control process will be stronger. It is this variation of the experiment was replicated in this current experiment. The research hypothesis is that it will take longer for the participants to name the colour related ink words than the colour neutral ink words. This is a one tailed hypothesis. The null hypothesis is that there is not a significant difference in the time it takes to name the ink colour in each condition.

Method:

Design:

The experiment was a within-participants design. The independent variable was the lists of coloured words; there were two conditions in the independent variable, the experimental condition, the list of colour-related words, and the control condition was the list of colour-neutral words. The time it took for the participants to read the ink colour of the words on each list was the dependent variable; this was measured in seconds, to the nearest second by the researcher on a stopwatch, this was recorded on a data table. Half of the participants read the colour-neutral words first and half the colour-related words first this was achieved by odd numbered participant's on the data table starting with condition 1 and even condition 2. The researcher read the same instructions out to the participants and they also read through them at the same time. The participants started each list reading aloud the ink colour from the word on the left of the page and worked down the list. The experiment took place in a small study room, free

from external distractions and all participants had the same procedure. The participants were given a small amount of information on the field of study which they would be participating in but did not know any details of the research hypothesis until the debriefing.

Participants:

Twenty participants took part in the experiment, 16 of whom the Open University provided the data for and 4 were volunteers whom the researcher provided, aged between 18 and 69 years old – 10 were female and 10 were male. All participants could read colours without any issues, were fluent in English, their eyesight was satisfactory to participate in this experiment and consent forms were signed.

Materials:

The two lists of stimuli showing each condition were on A4 paper with the 30 coloured words in two columns. The words in both lists started with the same letter and were the same length. A stopwatch accurate to the nearest second for the researcher to time how long it takes for the participants to read aloud each list; instructions on the experiment and consent forms.

Procedure:

The participants were recruited by asking them if they would like to take part in an experiment on cognitive psychology. A basic overview of this field of psychology and research area was given to the participants but this did not include any hypothesis. They were also told that the experiment would take between five and ten minutes to complete in its entirety; on agreeing to participate they were advised that they could withdraw at any time and

consent forms were signed (Appendix 3). Before the experiment took place the age and sex of the participants was recorded on a data table and they were asked if they had any prior experience of psychology. A written copy of the instructions was handed to the participants as well as the researcher who read the instructions aloud and asked if they understand what they were required to do (Appendix 2). The participants were asked to read the words out loud starting at the top left-hand column working their way down the page then to the top right hand column and down to the bottom, they were asked to do this as quickly as they could. Then depending on which group they had been randomly selected into by starting on either colour related words or neutral related words (experimental condition or control condition), a sheet of A4 paper with the coloured words printed on them was face down on the table in front of them (Appendix 1), when the participant turned the paper over and began the stopwatch started and when they had finished both columns the stopwatch was stopped. This was repeated on their second condition and all data retrieved from both conditions was recorded on the data table (Appendix 4). Once this had been completed the researcher debriefed the participants and explained the purpose of the experiment and asked if they had any questions before they left.

Results:

The research hypothesis is that it will take longer for the participants to name the ink of the colour related word than the ink of colour neutral word. The null hypothesis is that there is not a significant difference in the time it takes to name the ink colour in each condition.

The time it took to name the ink of the words from each list was measured to the nearest second and recorded on the data table.

Table 1 shows a 3. 1 second time difference between the means of condition 1 and condition 2. This equates to a 12. 7% increase in time for the participants to read aloud the colour related words than the colour neutral words. It also shows that the spread of results was greater in the colour condition than in the neutral condition with a standard deviation of 6. 816 compared to 5. 639.

A paired sample t-test was conducted (Appendix 5) on the data which showed that the difference between these conditions was statistically significant and according to Cohen (1988, cited in Course Team, 2007) the effect was medium with a 0. 50 standard deviation point difference (t(19)= 4. 172, p=. 0005, d= 0. 50). On these result a null hypothesis was rejected.

Discussion:

The results indicate that it took longer for the participants to name the ink of the colour-related words than the colour neutral words. This is in support of the previous Stroop (1935, cited in Edgar, 2007) experiments which it took longer for participants to name the ink colour of that was incongruent with the actual word the ink is written. This also supports Schneider and Shiffrin’s (1977, cited in Edgar, 2007) theory on automatic and controlled processes.

In the data collected for this experiment two participants were am exception to these findings (participant 2 & 6), if the experiment was run without these participants the findings would be a 3. 6 second time difference between the mean of the colour condition and neutral condition. This equates to a 14. 6%

increase in time. It also shows that the spread of results was slightly greater in the colour condition than in the neutral condition with a standard deviation of 7. 127 compared to 5. 920. The paired sample t-test (Appendix 6) showed that the difference between these conditions were statistically significant and the effect was medium (t(17)= 4. 959, p=. 000, d= 0. 55). This further supports the reports research hypothesis.

The interference between the automatic process of reading and the control process of naming the ink colour of the words supports the two-process theory although automatic and controlled processes could be seen as on a continuum as the more difficult the stimuli can be associated with an automatic process the more likely that the control process will supersede the automatic response; for example if a participant was shown the word SKY (written in red) depending on the time of year and the participants mood, alternative responses to the correct answer as well as blue could be grey thus the meaning that the participant’s associate to the word is also a confounding variable which will effect response time.

It is worth considering that this experiment did not take into account the participants making any mistakes, so hypothetically the participants could say the ink colour of every word in each list incorrect and the completion time would still be recorded on the data sheet table. An alternative to this could be that the researcher tells the participants to try again, on any incorrect ink colour answer, in doing so the time recorded would show how long it took the participants to get the words on each list correct and the difference in the time would be a more true result of the interference between automatic and the control process.

Another important consideration is that not to only find out if the participants have any psychology experience, but in the debriefing ask the participants if they used a strategy for this experiment and if that they had come across this sort of task before as there are computer games which train the brain to override the automatic process of reading. A questionnaire at the debriefing would provide good data which could affect the results.

In conclusion, the results support that automatic process interferes with control process and is in line with the limited-capacity central processor theory but in further research it may be interesting to remove human error from the experiment, by continuing until the list of words is read correctly for each condition and looking at the continuum for the automatic and control process by finding out where the automatic process is a dominant as the control