

Ability to efficiently  
process local stimuli  
psychology essay



**ASSIGN  
BUSTER**

This study is a replication of Navon's third experiment in his 1977 paper 'Forest Before Trees'. Participants are shown a large letter (the global stimulus) made up of smaller letters (the local stimuli). The small and large letters are either consistent or contradictory. Participants were asked to identify the local stimuli. The aim was to determine whether global stimuli affected the reaction time of identifying local stimuli when the two are incongruent. 51 undergraduate students took part in the study, which was an opportunity sample. This was a laboratory experiment of a repeated measures design. It was found that a contradicting global stimulus significantly affects the reaction time of identifying the local stimulus. From the results collected, it can be concluded that global processing does affect local processing when the two figures are inconsistent and that incongruent stimuli cause a significantly delayed response to identifying the local stimuli.

Is our ability to perceive and recognise local stimuli affected when local and global stimuli are incongruent? According to the theory of bottom-up processing, the whole is built up from its individual components. This would suggest that we first identify the local stimulus before perceiving the global one, implying that our ability to recognise the local stimulus should not be affected by the global one. However, the Gestaltist law of common fate contradicts this by suggesting that we perceive the global stimulus as all of the local stimuli are positioned together to form it. Navon (1977) suggested in his paper 'Forest Before Trees: The Precedence of Global Features in Visual Perception' that we initially perceive the global structure and proceed to break it down to identify its components. He tested this by showing participants a large letter composed of smaller letters arranged to form the

shape of the large letter. The small and large letters were either congruent or incongruent, and participants had to identify the small letter as quickly as possible. In this study, Navon's original experiment was replicated to test whether the global letter affects the time taken to identify the local letter, comparing between when these letters are congruent or incongruent. The purpose of this study was to compare our findings to those already existing from Navon's experiment to either corroborate or contradict his findings, and then discuss the possible explanations for the manner of global and local processing and how this can be applied to the real world and implicate possible future research. This study looks at whether global or local stimuli are perceived first and whether incongruence between them affects the speed at which they are recognised. Based on Navon's findings, we expect that there will be an effect on reaction time when the local and global letters are incongruent, with it taking a significantly longer time to identify the local stimuli compared to when all stimuli are congruent.

## Method

### Design:

This experiment was a laboratory experiment with a repeated measures design, in that the same group of participants performed the task a number of times in a row. The independent variable was the congruence of the stimuli, and the dependent variable being measured was the participant's reaction time in seconds. The independent variable is nominal and the dependent variable is linear. All participants were tested at the same time

under the same conditions, in the same setting; however this cannot account for personal factors such as attention or fatigue.

#### Participants:

A group of 51 undergraduate psychology students aged between 18 and 23 were used for this study, forty female and eleven male. The mean age was 18.75 years, with a standard deviation of 0.91. This was an opportunity sample. There were no specific characteristics of the participants; they were a range of ethnicities, but all within a small age range and all of a certain intelligence level, as they were university students.

#### Apparatus:

Apple Mackintosh computers were used, running the experiment through the PsychoPy programme. Stimuli were two-dimensional capital letters, either 'S' or 'H' formed from smaller letters, again either 'S' or 'H'. The letters were white on a plain black background, all the small letters being the same size, and all the big letters being the same size also, as seen in figure 1.

#### Procedure:

Participants were initially shown clear written instructions for the task on a computer screen and instructed to read this thoroughly before beginning the task. Instructions were printed in white on a black background in Arial font, clearly and spaciouly laid out. Participants were initially shown a small white cross in the centre of the screen for one second to draw their attention to the screens centre. This cross was shown again for one second in the centre in

between each stimulus. The purpose of this was to draw their attention away  
<https://assignbuster.com/ability-to-efficiently-process-local-stimuli-psychology-essay/>

from the area of the screen in which the stimulus was presented so they were not able to train themselves to focus on a particular area of the screen. Participants were shown one of the four possible stimuli (figure 1). This stimulus was presented on a computer screen for 0.2 seconds. The stimulus would be randomly positioned on the screen in either a top left, top right, bottom left or bottom right position so that participants could not prepare themselves for the apparition of the stimulus. Participants were asked to press either the 'S' key or the 'H' key on their Qwerty keyboard to signal whether they believed the global stimulus (the large H or S) had been made up of local H or S characters. After 0.2 seconds, the stimulus was blocked by a mask (figure 2). They had 7 seconds in order to respond. Participants were asked to respond as efficiently as possible, giving the correct answer in the quickest possible time.

Figure 1: The four stimuli shown in the experiment (not to scale).

C: UsersEmilyDownloadsmask (1). png

Figure 2: The mask shown in the experiment (not to scale).

## Results

It was found that participants were significantly slower in the time taken to give an answer when the stimuli were incongruent ( $M = .74$ ,  $SD = .13$ ,  $SE = .18$ ) compared to when they were congruent ( $M = .69$ ,  $SD = .13$ ,  $SE = .18$ ). A dependent means t-test was carried out for statistical significance ( $t(50) = -5.8$ ;  $p < .01$ , two-tailed test). This proved that the results obtained were significant at the .01 level of probability.

Figure 3: The average response times for the congruent and incongruent stimuli.

Incongruent

Discussion

It was found that congruent stimuli took, on average, less time for participants to respond to compared to the incongruent stimuli. The results obtained are significant, with the calculated t value being -5.76, lower than the tabulated t value of 2.68, thus showing significance at this level of probability. These findings support the hypothesis that there will be a significant difference between times taken to identify the stimuli in the congruent and incongruent conditions and so the null hypothesis is rejected.

These results could be due to the manipulation of the independent variable, but there are other factors which must be considered. The stimuli were presented in a random order, mixing up the congruent and incongruent figures, so it is unlikely that boredom or fatigue as the experiment went on was a factor in affecting just one of these conditions. However, had participants been paying more attention it may have been easier for them to identify the local stimuli in the incongruent conditions. It is most likely that this finding was due to the manipulation of the independent variable, with participants having to process both the global and local stimuli and separating them from each other before identifying the letter of the local stimulus. It is therefore suggested that participants perceived the global stimulus before the local one, and the global figure can't be fully ignored even if the participant is trying to focus on the local figures.

<https://assignbuster.com/ability-to-efficiently-process-local-stimuli-psychology-essay/>

Our results corroborate those found by Navon; that processing of local figures is affected by the global figure and time taken to identify the local features when they contradict with the global figures is significantly longer than when there is no contradiction. Hughes, Fendrich and Reuter-Lorenz (1990) also found similar results; that global processing affected local processing. They called this 'global precedence', agreeing with the idea that it is impossible to ignore the global figure even when intentionally focussing on the local one. On the other hand, Lamb and Robertson (1989) found that the larger stimuli were actually identified more quickly than smaller stimuli at larger visual angles, and there was no difference in reaction time at the smaller visual angles, suggesting that maybe we can identify local stimuli before global ones and build up the image of the whole, contradicting our findings.

In regards to the implications for future research, it could be investigated as to whether certain factors affect the likelihood of participants to focus on either global or local stimuli. Research in this area by Gasper and Clore (2002) tested the effect of mood, finding that participants in a lower mood were less likely to focus on the global figure. Other effects that could be tested might be age or IQ level. On a more biological level, future research could involve the specific parts of the brain involved in local and global processing using brain scans. If different areas are used for each level of processing, it could be questioned as to why studies have found local processing to be unable to occur without global identification.

Summary

This study examined the ability of participants to identify local stimuli when the associated global stimulus was either congruent or incongruent.

Participants were instructed to identify local stimuli in a series of figures as quickly as possible. The results obtained were significant, showing that it takes longer for participants to identify the local stimuli if they contradict the global one. This study was a replication of a study by Navon in 1977, and the results match those which he found. It can be suggested that local processing is unable to occur without some level of global processing, even when the intention is to focus on the local figure.