Small Set Enumeration: The Subitizing Boundary, Laterality and Sex Differences.

By

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This thesis is presented in partial fulfilment of the requirements for the degree of Bachelor of Arts (Honours), Murdoch University.

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Natalie Jackson
Abstract

Previously, the ability to subitize (i.e. to immediately quantify a small set of items without counting) was thought to occur for sets of up to seven items and was explained using a developmental canonical pattern recognition approach. Unfortunately, this approach was unable to account for the ability to subitize linear or random arrays of items, thereby, inspiring a pattern learning and recognition (through stimulus repetition and systematic variation of a base pattern) approach. The latter approach, however, suggests that subitizing is not an independent psychological process and simply occurs as the result of pattern recognition. Contrary to this view, a recent study by Dehaene and Cohen (1994), employing a condition that did not introduce a pattern recognition confound and using a simultanagnosic patient sample, provided sound evidence to suggest that subitizing is, in fact, a separable psychological process. In addition, and importantly for past research into the localisation of subitizing within the hemispheres (which has usually involved the testing of larger sets), a subitizing boundary of two and possibly three items, much lower than originally expected, was found. Furthermore, and in contrast to previous research, recent evidence from Butterworth (1999), drawn from acaulic patients, has suggested that subitizing is a left hemisphere process. This possibility, in light of possible sex differences in laterality and the previous use of the lack of a right hemisphere advantage to indicate abnormal perceptual asymmetry, suggests some cause for concern. The present study was, thus, carried out in order to determine a subitizing boundary and to investigate the possibility of hemispheric and sex differences in laterality. As such, it provided the first comprehensive
investigation into the ability to subitize using randomly generated and presented patterns, and a normal adult sample.

A divided visual field task, involving the enumeration of purely random sets of between 2 and 5 items, randomly presented to the left and right visual fields, was employed. Thirty-two undergraduate psychology students (ie. 16 male and 16 female subjects) volunteered to participate. Based on Dehaene and Cohen’s (1994) results it was hypothesised that the subitizing boundary would occur at two and possibly three items. Furthermore, in line with Butterworth’s hypothesis, the present study predicted that subitizing would show a left hemisphere advantage. Finally, based on previous research into performance on nonverbal visual tasks, a female subitizing advantage was expected.

The results supported the first hypothesis, indicating a subitizing boundary of two items, thereby, extending Dehaene and Cohen’s (1994) research using a normal sample. The second hypothesis, however, was not supported, with the results indicating a strong right hemisphere advantage for subitizing. Finally, the third hypothesis was not supported, with no sex differences found in the ability to subitize. These findings were considered both in the context of Butterworth’s hypothesis and in the formation of number systems within remote hunter-gatherer societies. Future research involving young children and a cross-cultural perspective, were suggested.
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