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**Can visual objects be accessed in rapid counting without their positions being encoded?**

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**Abstract**

Previous research has shown that “subitizing”, i.e., the process of enumeration when there are fewer than 4 items, is accurate and relatively rapid (70 ms/item) whereas “counting”, i.e., the process of enumeration when there are more than 4 items, is slow (300 ms/item), and error-prone. Trick & Pylyshyn (1994) have hypothesized that subitizing requires preattentive individuation and access by a visual index, as assumed to be provided by the FINST indexing mechanism (Pylyshyn 1989). Their assumption is that subitizing relies on a process of enumerating indexes without the need to encode object locations. Slower counting, on the other hand, relies on scanning attention to each of the objects in the display, and thus may result in the encoding of the objects' locations. To explore this proposal we presented observers a total of 10 objects (small rectangles). A subset of 3, 4, or 5 of these (the “targets”) were a different color from the rest of the objects (they were either red or green), and all objects were present for 300 ms before they changed to a neutral gray. Subjects were instructed to count the number of objects of the specified color as fast as possible. After indicating how many targets there were (by pressing keys marked 3, 4 or 5), observers selected the targets by clicking on the objects that had been the target color. If the rapid counting involved in this procedure (135 – 300 items/sec) does not require accessing the objects by scanning the display, then observers may be able to enumerate objects without the opportunity to encode their locations. Hence they may be able to count objects without correctly locating them or to locate objects without having counted them. Errors in counting need not be accompanied by errors in locating objects. We found that when subjects made counting errors there was only a 0.19 probability that they would also make a location error. The large difference between expected and observed errors will be discussed.

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