

Diagnosing Short-Term Memory Scanning Using Systems Factorial Technology: A Conceptual Replication.

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Townsend and Fific (2004) published an influential short-term memory (STM) study in which they observed individual differences in serial and parallel STM scanning. This is the first replication that has been performed, although it is a conceptual replication. The original study used more sessions per participant with a small subject pool, while this study used fewer sessions per participant on a larger subject pool. Rather than assessing the data individually, aggregate data across all participants was collected and examined. The authors employed systems factorial technology (SFT)—a novel methodology that provides strong diagnostic tests of cognitive structuring—and presented a new method of manipulating probe-to-memory item processing speed for memory loads ($N=2$).

SFT was used to determine whether participants utilize parallel or serial processing when making decisions. We used a computerized task in which participants were presented with two items followed by an interstimulus interval of 700 or 2,000 milliseconds followed by a target item that was either part of the previous set (target present) or not (target absent). Participants were asked to quickly decide whether the target item was part of the original set or not. The presented items could be from one of three phoneme sets: fricatives (ex: FAS, SAF, VAS), nasals (ex: NAL, MAL, LAM), or plosives (ex: PAK, KAP, DAK). Manipulated factors include the dissimilarity of the first memorized item to the target item ($N=2$; high or low), the dissimilarity of the second memorized item to the target item ($N=2$; high or low), whether the target item was present or absent ($N=2$), and the length of time between the memorized items and the target item ($N=2$; 700 or 2,000ms). For the purpose of this experiment, only the target absent cases were analyzed in order to control for stopping rules. In only using target absent cases, we force the participants to engage in exhaustive (analyzing all elements before making a decision) rather than self-terminating (stopping after the target item is found) stopping rules. Reaction times between the presentation of the target item and the participant's decision were measured.

In the original study, 10 subjects each participated in 20 sessions. The present study serves as a conceptual replication in which 261 subjects each participated in 1 session and a novel memory load condition was included. Previous research has shown that serial and parallel exhaustive processing show distinct patterns in the survivor interaction contrast, as seen on the top of “SFT models predictions.” The results contributed converging evidence in testing serial/parallel processing in short-term memory scanning. Similar to the original 2004 study, the results from our aggregate data indicated a pattern of serial exhaustive processing in these

conditions.

However, this data will be further analyzed using the target-present conditions to examine potential self-termination stopping rules with more advanced statistical methods, such as hierarchical Bayesian modelling. Additionally, further study will include more sessions per participant to better assess individual differences in processing.