Modified Random Order Serial Position Reconstruction: A Paradigm Enabling Cross-Modality Comparison

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Introduction

In the conventional serial order reconstruction task, participants are presented with a sequence of items. At test these items are re-presented in a circular array and participants indicate the order in which they were originally presented (e.g. see Avons, 1998; Smyth et al., 2005). Ward et al. (2005) have argued that this task is characterised by a bowed serial position function (i.e. both primacy and recency) irrespective of stimulus type. However, such cross-modal comparison is precluded by the requirement of simultaneous re-presentation at test. Indeed, Johnson and Miles (2009) have reported some evidence for cross-modal serial position function differences in an alternative order memory paradigm.

Johnson and Miles (unpublished data) trialled a modified reconstruction paradigm wherein items were re-presented sequentially (rather than simultaneously) at test. Participants were required to state the position of each test item. To provide analogy with the conventional reconstruction task, one condition (unbeknown to participants) tested list items in the same order of original presentation. However, superior recall for that condition provided some evidence that participants had learnt the order of testing. The following study trials a modified serial order reconstruction task wherein test items are presented sequentially but in a pseudo-randomised order. Serial position functions are compared to the conventional serial order reconstruction task.

Experiment 1

Conventional Reconstruction Paradigm: A sequence of 7-items was presented (each item presented for 500ms with a 500ms ISI). At test, participants were simultaneously re-presented with the faces in a circular array. Participants were required to identify the order in which those items were originally presented. There were 28 trials.

Random Modified Reconstruction Paradigm: The learning phase was as described above. At test, each of the sequence items is re-presented individually in a pseudo-randomised order (with the proviso that each list position is tested first and last an equal number of times). Following the presentation of each test-item, participants are required to state the position of that item within the preceding list. To enhance methodological congruity with conventional reconstruction, participants are prohibited from changing responses or repeating positions within each trial. There were 28 trials.

Stimuli: A stimulus set of 50 unfamiliar male Caucasian faces with short hair and neutral expression were employed (extracted from the University of Stirling database). Faces were presented using the experimental program Super Lab Pro 4.

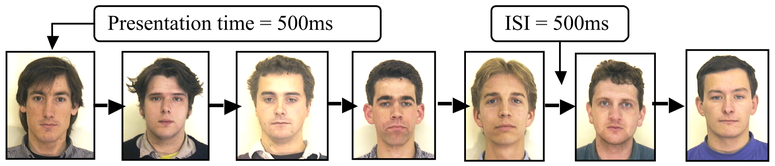

Figure 1: Example of the unfamiliar-face stimuli employed in Experiment 1.

Participants: 24 (14 female and 10 male: mean age 20.13 years) Coventry University volunteer undergraduates participated. They completed both the conventional and random modified reconstruction tasks in a counterbalanced order.

Results: A 2x7 within-participants ANOVA revealed significantly higher performance in the conventional serial order reconstruction paradigm, F(1,23)=14.75, MSe=38.35, p=0.001, partial eta squared = 0.39. There was a main effect of serial position, F(6,138)=55.72, MSe=10.12, p<0.001, partial eta squared = 0.71, wherein post-hoc comparisons revealed significant primacy and recency (see Figure 2). Importantly, there was a non-significant interaction between task and serial position, F=1.12.

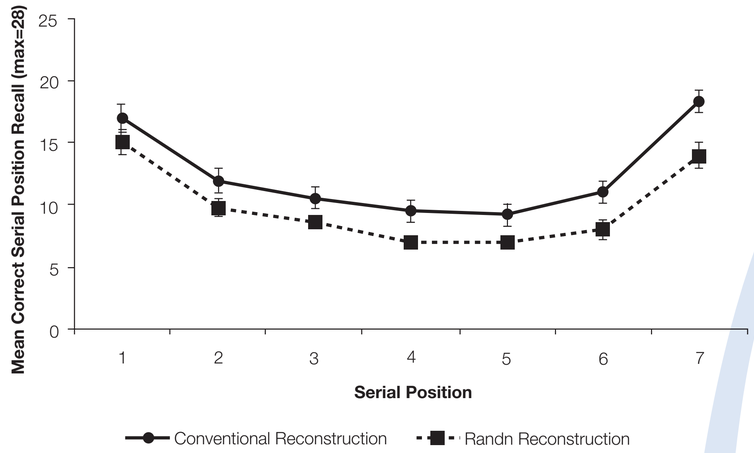

Figure 2: Mean correct recall following conventional serial order reconstruction and random modified serial order reconstruction of unfamiliar-faces as a function of serial position. Error bars denote +/- SEM.

Discussion: Experiment 1 demonstrated qualitatively equivalent serial position functions for the conventional serial order and random modified reconstruction tasks. Due to similar task constraints, one might argue that the tasks utilise analogous memory mechanisms. Superior performance for conventional serial order reconstruction might be explained by simultaneous re-presentation of test-items allowing comparison.

Experiment 2

Tasks: Preliminary pilot data (n=8) for random modified serial order reconstruction of pure-tones and abstract matrices are reported. Serial position functions are compared cross-modally (matrices and tones) and across sequence length (5- and 7-item lists). The four conditions are blocked and counterbalancing has commenced with the current sample.

Stimuli: Visual stimuli comprised 50 abstract 4x4 chessboard matrices (see Figure 2). Auditory stimuli comprised 50 pure-tones (ranging in frequency from 300-2953hz; see Suprenant, 2001).

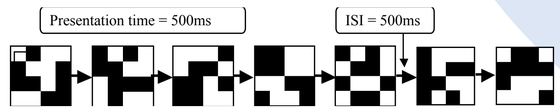

Figure 3: Example of the abstract matrix stimuli employed in Experiment 2.

Participants: 8 (5 female and 3 male: mean age 21.63 years) Coventry University volunteer undergraduates participated. They completed random modified reconstruction of both 5- and 7-item sequences for both pure-tones and abstract matrices.

Results: For sequences of 5-items (see Figure 4a), performance was borderline significantly better for abstract matrices, F(1,7)=4.88, MSe=43.31, p=0.06, partial eta squared = 0.41. There was a main effect of serial position, F(4,28)=77.30, MSe=3.71, p<0.001, partial eta squared = 0.75, and, importantly, no interaction between stimuli and serial position, F<1. For sequences of 7-items (see Figure 4b), performance was significantly superior for abstract matrices, F(1,7)=10.02, MSe=17.22, p=0.02, partial eta squared = 0.59. There was a main effect of serial position, F(6,42)=8.93, MSe=4.26, p<0.001, partial eta squared = 0.56, and importantly no interaction, F<1.

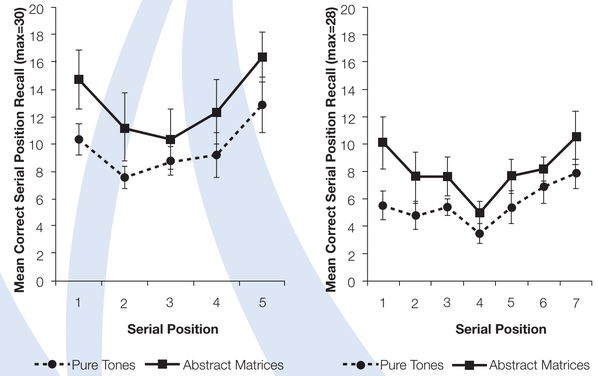

Figure 4 (a-b): Mean correct recall following random modified serial order reconstruction of (a) 5-item sequences and (b) 7-item sequences of abstract matrices and pure-tones as a function of serial position. Error bars denote +/- SEM.

General Discussion

Experiments 1 and 2 have trialled a novel measure of serial order reconstruction that can be applied across a range of stimuli. Experiment 1 has shown that the function is qualitatively equivalent to that produced for conventional reconstruction, i.e. a bowed serial position function (e.g. see Ward et al., 2005). Preliminary data from Experiment 2 suggest that both abstract matrices and pure-tones produce bowed functions for sequences of both 5- and 7-items (consistent with conventional reconstruction of matrices, Avons, 1998). This data is preliminary and although the interaction is non-significant, visual inspection of Figure 4 indicates that primacy may be less pronounced for the auditory non-verbal stimuli.

Key References

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Smyth, M.M., Hay, D.C., Hitch, G.J. and Horton, N.J. (2005). Serial position memory in the visual-spatial domain: Reconstruction of unfamiliar faces. *Quarterly Journal of Experimental Psychology, 58A(5)*, 909-930.
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