On the role of retrieval processes in the survival processing effect: Evidence from ROC and ERP analyses

Glen Forester¹, Meike Kroneisen², Edgar Erdfelder³, & Siri-Maria Kamp¹

University of Trier¹, University of Koblenz-Landau², University of Mannheim³

Introduction

Survival Processing Effect
- Encoding words in the context of an imagined survival scenario enhances memory, but only when words are high in imageability.
- This interaction may reflect that the survival processing effect is due to richer elaborative encoding.

Retrieval Mode
- Dual process theories maintain that there are two distinct processes that can contribute to recognition memory retrieval: familiarity and recollection. Recollection is sensitive to elaboration at encoding.

Hypothesis
- If the survival processing effect is the result of increased elaboration at encoding, then it should be associated with increased recollection of high-imageability words at retrieval.

Methods

Design
- 36 participants: 18 in survival group and 18 in moving group
- 2 x 2 (Scenario x Word Imageability) mixed factor design

Procedure
1. Participants imagined one of two scenarios:
   - (1) survival scenario or (2) moving scenario
2. Incidental encoding task: rate relevance of words to scenario
3. Recognition test: rate words as “old” or “new” along confidence scale.

Trial Structure

Behavioral Analysis
- Memory performance: Pr scores (hits – false alarms)
- ROC curve estimates of familiarity (d') and recollection (Ro)

Even Related Potential (ERP) Analysis
- ERP Old/New effects: ERPs that distinguish between “old” (previously encoded) and “new” items during recognition.
  1. Early (300-500ms) frontal correlate of familiarity
  2. Late (500-700ms) centro-parietal correlate of recollection

Results

Recognition Performance & ROC Parameter Estimates

ROC Curves

Figure 1. Behavioral Results

Figure 2. Event Related Potential Results

Statistical Analysis
- Mixed factor ANOVAs and follow up t-tests
- All listed results are significant at \( p < .05 \).

Recognition Performance
- Recognition performance was better in the survival group than the moving group for high-imageability words.
- Recognition performance was better for high-imageability words than low-imageability words in general.

Retrieval Mode: Behavioral Measures
- Survival group: greater recollection for high-imageability words and reduced recollection for low-imageability words compared to moving group.
- High-imageability words: greater familiarity than low-imageability words.

Retrieval Mode: ERP Measures
- Survival group: stronger magnitude and wider spatial distribution of old/new effects for high-imageability words during both the familiarity and recollection time windows.
- Words high, but not low, in imageability were associated with an early (familiarity) old/new effect.
- Low-imageability words lead to late (recollection) old/new effects only in the moving group.

Discussion

- Survival Processing increased recollection of high-imageability words.
- Survival processing increases elaboration at encoding.
- Survival processing increased ERP familiarity signal, but not behavioral familiarity estimate.
- Survival processing also increases familiarity, but recollection is used to make recognition judgements.
- Extended scalp distribution for familiarity and recollection.
- Survival processing may recruit a wider network of brain areas during encoding and retrieval.