**Supplemental Analyses: Encoding Latencies**

**Experiment 1**

We assessed whether encoding latencies in Experiment 1 differed as a function of Pair Type and Study Group (See Table S1). A 4 (Pair Type: Forward vs. Backward vs. Symmetrical vs. Unrelated) × 2 (Study Group: JOL vs. No-JOL) mixed ANOVA yielded no effect of pair type on encoding latencies,*F* < 1, *pBIC* = .86; however, a main effect of Study Group was found, *F*(1, 76) = 28.96, *MSE* = 9972373, *ηp*2 = .25, indicating that across pair directions, participants spent more time encoding pairs when making JOLs relative to the no-JOL task (4109 ms vs. 2197 ms). A significant interaction was also found, *F*(3, 228) = 4.20, *MSE* = 465778, *ηp*2 = .01. Although encoding latencies were higher following JOLs across all pair types, the JOL versus no-JOL latency differences were similar between forward (4091 ms vs 2122 ms), backward (4253 ms vs 2138 ms), and symmetrical pairs (4147 ms vs 2036 ms), but the difference was smaller for unrelated pairs (3942 ms vs 2490 ms; all *t*s ≥ 3.88, *d*s ≥ 0.87).

**Experiment 2**

Encoding latencies in Experiment 2 were then compared using a 4 (Pair Type: Forward vs Backward vs Symmetrical vs Unrelated) × 3 (Study Group: JOL vs JAM vs No-JOL) mixed ANOVA (Table S1). No effect of pair type was found, *F* < 1, *pBIC* = .90; however, a main effect of Study Group was detected, *F*(2, 98) = 16.26, *MSE* = 27361027, *ηp*2 = .17. Post-hoc testing revealed that across pair direction, encoding latencies were highest in the JAM task (5925 ms), followed by the JOL task (4649 ms), and lowest when completing the no-JOL task (2362 ms). All comparisons were significant, *t*s ≥ 5.08, *d*s ≥ 1.23, exception of the comparison between the frequency and JOL tasks which was marginal, *t*(64) *=* 1.72, *SEM* = 758.07, *p* = .09, *pBIC* = .65. Finally, the interaction between Pair Type and Study Group was not significant, *F* < 1, *pBIC* = .83.

**Experiment 3**

Encoding latencies were again compared using a 4 (Pair Type: Forward vs Backward vs Symmetrical vs Unrelated) × 3 (Study Group: JOL vs Frequency vs No-JOL) mixed ANOVA (Table S1). No effect of pair type was found, *F* < 1, *pBIC* = .99; however, a main effect of Study Group was observed, *F*(2, 115) = 6.72, *MSE* = 1293237782, *ηp*2 = .08, which indicated that encoding latencies were highest in the frequency task (7305 ms), followed by the JOL task (7177 ms), and the least when completing the no-JOL task (3165 ms). All comparisons were significant, *t*s ≥ 3.02, *d*s ≥ 0.68, exception of the comparison between the frequency and JOL tasks, *t* < 1, *pBIC* = .90. Finally, the interaction between Pair Type and Study Group was not significant, *F* < 1, *pBIC* = .99.

**Experiment 4**

Encoding latencies were further analyzed using a 4 (Pair Type: Forward vs Backward vs Symmetrical vs Unrelated) × 4 (Study Group: JOL vs. No-JOL vs. Relational Encoding vs. Shallow Encoding) mixed ANOVA (Table S1). An effect of pair type was found, *F*(3, 489) = 3.71, *MSE* = 2811455, *ηp*2 = .01, in which latencies were highest when participants studied unrelated items (4677 ms), followed by backward pairs (4221 ms), symmetrical pairs (4170 ms), and lowest forward pairs. (4131ms). Post-hoc tests indicated that the effect was driven by differences between the unrelated group and the three types of paired associates (*t*s ≥ 2.53, *d*s ≥ 0.10). All other comparisons were non-significant, *t*s < 1, *p*s ≥ .78, *p*BIC ≥ .93. Next, a significant effect of Study Group was observed, *F*(3, 163) = 8.83, *MSE* = 73332689, *ηp*2 = .13, in which across pair types, latencies were highest in the vowel counting task (7012 ms), followed by the JOL task (4141 ms), the relational encoding task (3511 ms), and the least amount of time in the no-JOL control group (2427 ms). Post-hoc *t-*testsrevealed that all comparisons differed significantly (*t*s ≥ 2.29, *d*s ≥ 0.50), with the exception of the comparison between the JOL and relational encoding groups, *t*(78) = 1.47, *SEM* = 435.82, *p* = .15, *p*BIC = .77. The interaction was not significant, *F*(9, 489) = 1.33, *MSE* = 2811455, *p* = .22, *p*BIC = .64.

**Supplemental Analyses: Standard Deviations of Judgment Scores**

Finally, we assessed whether standard deviations of judgment values (JOLs, JAMS, and Frequency judgments) differed as a function of pair relatedness (See Table S2). Starting with Experiment 1, standard deviations were highest for backward pairs (26.80), followed by symmetrical (26.32), forward (26.03), and lowest for unrelated pairs (21.53). However, this pattern did not extend to the JOL group in Experiment 2, as standard deviations were highest for the backward pairs (30.99), followed by unrelated (30.50), forward (29.07), and symmetrical pairs (28.26). However, the expected pattern was observed in the JAM task, with standard deviations highest for the backward pairs (43.41), followed by forward (37.63), symmetrical (31.57), and unrelated pairs (7.13). This pattern also extended to the JOL task in Experiment 3, such that standard deviations of backward (32.07), forward (31.46), and symmetrical pairs (30.10) were again higher than unrelated pairs (23.05). However, this pattern did not extend to frequency judgments, with standard deviations being highest for unrelated pairs (28.83), followed by backward (27.80), forward (26.77), and symmetrical pairs (24.16). Finally, the JOL group in Experiment 4 showed the predicted pattern of standard deviations, with the highest values being reported for backward pairs (30.53), followed by forward (29.89), symmetrical (28.34), and unrelated pairs (27.52).

Table S1

*Mean Encoding Latencies as a Function of Pair Type and Encoding Task in Experiments 1-4.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Experiment | Encoding Task | Forward | Backward | Symmetrical | Unrelated |
| Exp. 1 | JOL | 4091 | 4253 | 4147 | 3942 |
|  | Read | 2122 | 2138 | 2036 | 2491 |
| Exp. 2 | JOL | 4692 | 4945 | 4478 | 4482 |
|  | JAM | 6393 | 5567 | 6178 | 5562 |
|  | Read | 2202 | 2333 | 2237 | 2677 |
| Exp. 3 | JOL | 6374 | 7250 | 6980 | 7831 |
|  | Frequency | 7380 | 6834 | 6831 | 8171 |
|  | Read | 3045 | 3363 | 3382 | 2868 |
| Exp. 4 | JOL | 3836 | 4126 | 4270 | 4333 |
|  | Relational | 3141 | 3378 | 3262 | 4262 |
|  | Vowel | 7291 | 7054 | 6706 | 6996 |
|  | Read | 2136 | 2216 | 2369 | 2985 |

Table S2

*Standard Deviations of JOLs, JAMs, and Frequency Judgments as a Function of Pair Type and Encoding Task in Experiments 1-4.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Experiment | Encoding Task | Forward | Backward | Symmetrical | Unrelated |
| Exp. 1 | JOL | 26.03 | 26.80 | 26.32 | 21.53 |
| Exp. 2 | JOL | 29.07 | 30.99 | 28.26 | 30.50 |
|  | JAM | 37.63 | 43.41 | 31.57 | 7.13 |
| Exp. 3 | JOL | 31.46 | 32.07 | 30.10 | 23.05 |
|  | Frequency | 26.77 | 27.80 | 24.16 | 28.83 |
| Exp. 4 | JOL | 29.89 | 30.53 | 28.34 | 27.52 |