**Incubation & Divergent Solutions**

Jenna Lee, Krista Falk, & Catya von Károlyi

University of Wisconsin-Eau Claire

**RESULTS**

**Affect State**

As a precaution, we tested the three groups' Affect State-T1 at the start of the study. Unexpectedly, a Group (3) by Affect State-T1 MANOVA revealed significant and near significant group differences:

<table>
<thead>
<tr>
<th>Omnibus F</th>
<th>p</th>
<th>η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>(9,234)</td>
<td>&lt;.001</td>
<td>.353</td>
</tr>
</tbody>
</table>

Post hoc comparisons revealed that, compared to Group 3, Group 1 was significantly more positive in their Affect State-T1. Compared to listening to silence, listening to music was associated with higher Mood T2.

**Incubation and Creativity**

We tested for and found group differences in creativity using a Group (3) by Creativity (2) MANOVA:

<table>
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<tr>
<th>Omnibus F</th>
<th>p</th>
<th>η²</th>
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<tbody>
<tr>
<td>(6,156)</td>
<td>&lt;.001</td>
<td>.487</td>
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Unexpectedly, planned comparisons of the three groups did not reveal significant differences. However, a Group (2) by Low Load (2) Multivariate Analysis of Covariance (MANCOVA) revealed significant group differences:

<table>
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<th>Omnibus F</th>
<th>p</th>
<th>η²</th>
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</thead>
<tbody>
<tr>
<td>(4,158)</td>
<td>&lt;.001</td>
<td>.481</td>
</tr>
</tbody>
</table>

The ANOVAs revealed robust group differences, because the Low Load group significantly outperformed controls for both Divergence and Fluency (Table 2). H1: Participation in low cognitive load incubation activities enhances creative problem solving

**H2:** Music listening during incubation activities enhances positive mood which, in turn, enhances creative problem solving

**BACKGROUND**

Have you ever woken up and known the answer to a problem you had been wrestling with the day before? When trying to solve problems, especially problems requiring creative solutions, doing something else—an incubation activity—can help (Sió & Ormerod, 2009). Furthermore, undemanding (low cognitive load) incubation activities, such as sleeping or listening to music, are particularly effective (Sió & Ormerod). Being in a positive mood also promotes creativity (Davis, 2009) and listening to music can also promote positive mood (Lingham & Theorell, 2009). Integrating these ideas, we examined the relationships between low load incubation, positive mood, and creativity. We invented one of our own measures of creativity, the Divergent Solutions Task (DST) and undertook the present study to test our hypotheses (see above).

**METHODS**

**Participants:** n = 81 (sex at birth: 68 female; 13 male) undergraduate students.

**Measures and Materials**

- **Divergent Solutions Task (DST):** This verbal measure of creativity assesses (1) Divergence (divergent thinking) and (2) Fluency (number of responses), based on solutions to four Zen Koans (similar to the question: “What is the sound of one hand clapping?”). Divergence was rated on a scale from extremely unimaginative (1) to extremely creative (7) and Fluency was rated on the number of solutions.

- **Affect State:** Measures of (1) Mood, and (2) Positive Affect, and (3) Negative Affect (from I-PANAS-sf) tested affective state at two points in time (T1, T2).

- **Procedures:** First, participants simply read the four DST problems, then reported on their Affect states (T1). Two groups engaged in low load incubation activities, then, again, reported on their Affect states (T2). Next, all participants were asked for DST solutions. Based on the ratings of two judges, DST Divergence and Fluency scores were calculated for responses to each of the 12 sets of prompts. Inter-rater reliabilities ranged from r = .37 to r = .501, and averaged r = .713. Consensus ratings were derived through discussion and analyses undertaken using these consensus ratings.

**DISCUSSION**

H1: We hypothesized that listening to music would enhance mood; however our first assessment of mood revealed pre-existing differences between the groups. Controlling for prior mood, we found music-listeners' mood after incubation was more positive than silence-listeners' mood, supporting our hypothesis. The former outcome was inconsistent with our hypothesis; whereas the latter finding was consistent with our hypothesis that music would enhance listeners' moods.

H2: We also hypothesized that low cognitive load incubation activities would enhance creativity (divergence and fluency). Although we expected music-listeners to outperform the other groups, this was not the case. However, music-listeners' responses were higher in divergence, but lower in fluency, compared to silence-listeners. Thus our hypothesis was only partially supported. Nevertheless, the combined low cognitive load groups did evidence more creativity than the control group.

**Hypotheses:** Consistent with the literature and partially consistent with our hypotheses, we found both (a) positive mood and (b) low cognitive load incubation periods enhance creative problem solving on the Divergent Solutions Task. This suggests that suitable incubation activities, especially those that enhance mood, could benefit those seeking creative solutions. In addition, although additional research is needed, our results suggest that the DST may be a viable measure of creativity.