Research Lab 2

Schmuckler, Mark A. 1997. "Expectancy Effects in Memory for Melodies." *Canadian Journal of Experimental Psychology* 51 (4): 292–305.

1. What question, or questions, are the researchers trying to address? Is this explicitly stated?

   Experiment#1 which studied melodic expectancy as it related to melodic memory as far as the impact of musical expectancy on memory for melody is concerned, examined the question "*How systematic variation of expectancies on the basis of tonal/pitch information, with rhythmic/temporal information held constant, will influence memory for such information?*".

   Experiment#2 demonstrated the positive correlation between recognition memory and intensity of expectancy formation on melodies, posing the question that how asymmetrical memory confusion is related to perceived expectancy.

2. What hypothesis, or hypotheses, is being tested? Is this stated explicitly?

   The hypothesis of experiment1 is explicit that recognition memory is positively or negatively correlated with confirmed expectancy, with high expectancy information better remembered than low expectancy information or otherwise, and the subsequent memory is related to the estimated tonal coherence of these melodies in the way that better tonality results in better memory.

   Experiment2 hypothesizes that higher expactancy melodies (melodies that cause higher expectancy either confirming their expectation or violating) associate with better recognition memory.

3. What is/are the independent variable(s)?

   In experiment1 the independent variables are
   a. Four variants of each melody with randomized order of the notes in the final two measures used in collecting expectancy ratings for each melody endings. And
   b. expectancy ratings with a scale of 1-7 obtained from phase1 as it relates to the subsequent memory.

   In experiment2 expectancy rank of music stimuli (high, medium and low) and melody (melody 1 through melody 12) are the independent variables.

4. How many levels does each independent variable have?

   Experiment1 has 4 variants of melodic endings as in phase 1, expectancy rating phase, hence there are 4 levels of independent variable in phase 1; It also has a expectancy rating scaled between 1 to 7 used as parameters in phase 2 memory test, hence there are 7 levels for phase 2.

   Experiment2 has 3 levels of expectancy rank: high, medium and low expectancy, and 12 levels of melodies.

5. What is the operational definition of each independent variable? (Whether explicit or implicit.)

   Exp1:
   To create variants of melodic endings it operates with randomizing the order of notes of the last two measures of each melody with the rhythm and the final note remaining the same. (*Thus, these variants alter the contour of these endings and produced subtle changes in their tonal structure, while generally retaining the pitch content and global tonality of the melody, as well as holding temporal and rhythmic expectancies constant.*) In the memory test phase, it's the expectancy ratings from 1 to 7.

   Exp2:
   For each melody, he highest and the lowest rated variant were classified as the "high expectancy" melody and the "low expectancy" melody respectively with the remaining two variants being classified as "medium expectancy". In situations in which two variants received equivalently high or low ratings, both variants were considered high (or low) expectancy melodies, respectively.

6. Is the experimental design within-group, between-group, or a mixed design? If it is mixed, which variables are presented between participants, and which are within participants?

   Experiment1 is a mixed design. **Between participants** different set of variants of 2-meausre melodic endings are tested for collecting expectancy ratings with group1 listening to variant 1 and 2 and group2 listening to 3 and 4. **Within-subjects** variable are the 12 melodies that are played for both groups in the expectancy rating phase and memory test phase.

Experiment2 is a within-group design. The within-subjects factors are expectancy rank(high vs. medium vs. low) and melody (melody 1 through melody 12).

7. What is/are the dependent variable(s)?

   Exp1: Expectancy ratings for each melody; the number of times each melody is correctly recognized as having been heard or not heard.

   Exp2: Whether or not subjects can correctly identify the study melody from 4 test melodies.

8. Are there any control variables?

   Exp1:Tempo, rhythm structure, pitch contents, the length of melodies, the ending notes as well as instrument and timbre picked up for recording, amplifier and volume are kept the same as control variables in making up variants of last two measures; the total content of melodies(12 melodies with 4 variants each) that are played in the memory test for both groups.

   Exp2: the same production for all music stimuli as was the same apparatus as in Exp1.

Note, that in some cases the "control variables" have to do with the way musical stimuli are designed. How is stimuli designed in order to "control" for confounding variables?

Exp1: confounding variables are introduced when *the different set of variants were nested within group* (*group1 listeners heard variants 1 and 2 whereas group 2 listeners heard variants 3 and 4*) and so in the memory test phase, each group heard the other set of variants as the new stimuli in addition to the old heard melodies.
(Note: Although the experiment is set in two groups they are not meant to be contrasted as with experimental groups, the mixed-subjects design here supposedly is intended for a larger data collection of expectancy ratings given the limited number of participants and music stimuli that's been generated.)
To address the issue raised by confounding variables as mentioned above, it's treated through

a. randomizations of various aspects/levels, i.e., the order at which each music stimuli was played in both experiment phases.
b. conducts of a series of two-way and three-way analyses of variance(ANOVAs).

Exp2: confounding variables are controlled by randomization in the order of the test melodies on each trial and the order of the 48 in-total experimental trials.

9. Which variables—main effects *or* interactions—do they conclude are "significant"?

   Exp1:
   According to the results of ANOVAs for expectancy ratings, there was a consistent main effect of melody, suggesting that the endings of the melodies varied in the expectancies they engendered. In addition, there were occasional main effects of variant, as well as significant interactions between melody and variant. Of ANOVAs for memory tests, two significant effects were revealed:1). the significant interaction between variant and melody. This variation is a statistical prerequisite for assessing whether perceived expectancy is related to memory. 2)The three-way interaction between variant, melody, and group. This effect was uninterpretable.

   Exp2:
   There was no main effect for the factor of melody, yet there was a significant main effect of expectancy rank that the recognition of high expectancy melodies was superior to both medium and low expectancy melodies. Also, the two-way interaction between expectancy rank and melody was also significant.