**PSY 2310 - Homework #2**

By Connor Guarino

The hypothesis posed in Garner’s article “Good Patterns Have Few Alternatives” is that there is a quantifiable way to measure the strength and prevalence of patterning in information, referred to as ‘goodness’, and that goodness is dependent on redundancy. To elaborate, given a set of stimuli some number of subsets can be formed, re: Gestalt principles, with the goodness of a pattern being the ratio between set size and subset size. The size of each subset being proportional to the redundancy within that subset. As the frequency of a pattern in a set of stimuli increases, the sample size needed to identify that pattern decreases, resulting in a pattern becoming more ‘obvious’. An example of this last point can be found in the Fibonacci Sequence, given the sample [1, 2, 3] it would appear as though the pattern follows the formula while a large sample of [0, 1, 1, 2, 3, 5] is required to identify the pattern of . Operating within this framework, the non-obviousness of the Fibonacci Sequence being would be due to the size of sample required to observe it. Note, this example is to be strictly illustrative, as would be an incorrect solution for the sequence.

Garner better explains the correlation between redundancy and goodness with a set of symbols made from permutations of four binary characteristics: rectangular / circular, opening on left / opening on right, vertical dividing line / horizontal dividing line, straight dividing line / wavy dividing line. By taking subsets of these symbols such that a characteristic variant is not represented, i.e. a subset made up of only rectangular symbols, the goodness of the pattern increases as the characteristic of being rectangular becomes a redundant descriptor, it provides no information about the stimuli set.

The first of the two experiments conducted to prove this correlation was the evaluation of pattern goodness of dot matrices. In the first wave of evaluations, participants gave a pattern goodness rating of one to seven for each subset of dot matrices presented. In the second wave, participants were presented with dot matrices that had been rotated 90°. The results of this experiment showed that subsets in which rotation did not disrupt patterns, generally through preservation of symmetry, were rated as highly good. This in turn showed that pattern goodness was related to pattern redundancy; a pattern being redundant proportionally to the quantity of axes of symmetry. Garner also makes the key inference, and namesake of the paper, that pattern goodness is inversely proportional to the number of alternatives that can be generated by a pattern. When rotated 90°, the ‘+’ symbol generates a single variation while the ‘^’ symbol generates four variations.

In the second experiment run by Garner, participants were presented with eight note melodies made up of two sounds. For the sake of testing, the melodies used were ones that could only be represented with eight notes: the pattern XOXOXOXO would fail as it can be described as the repetition of XOXO twice. Each participant had a melody played continuously until they could play or describe the pattern. During analysis, it was seen that melodies that had a greater number of ‘subjective starting points’, referred to as accent points, were more slowly identified by participants than melodies with fewer. To better illustrate, the pattern XXXXXXXO has two accent points, one at the first character and another at the final, while the pattern XXOXOOXO has six points. In the article, Garner explained that the melodies with more accent points were more perceptually difficult to organize because of the number of alternatives generated: each accent point representing an alternative.

Overall, I am unsure of whether these experiments validated Garner’s hypothesis. The first experiment made the assertion that because the prominence and perception of a pattern was not affected by rotation, it was therefore more redundant. But I think it can also be said that by rotating the dot matrices, rotational symmetry was introduced as a new characteristic. And in that line of thinking, patterns with high rotational symmetry were not higher in goodness; the other subsets were simply lower in goodness. I also felt the methodology of the second experiment significantly affected the results. The removal of melodies that could be described as repetitions almost guaranteed that pattern recognition would be inversely proportional to the number of accent points. If you were to include patterns that could be described as repetitions, the data would follow a binomial distribution as the pattern XOXOXOXO, with 8 accent points, and similar would be exceptionally quick to recognize. In the analysis, Garner described how the patterns could be organized with ‘runs’ or chunks of the same note but removed any instances where a heterogenous chunk could be observed.

# Bibliography

Garner, W. R. (1970, January-February). Good Patterns Have Few Alternatives: Information theory's concept of redundancy helps in understanding the gestalt concept of goodness. *American Scientist*, pp. 34-42.