Situational Frequency Judgments are Influenced by Contextual Diversity

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People are able to judge frequency (FQ), but are they using FQ information only, or are they using other information, such as contextual diversity (CD) as a proxy to estimate FQ? The perceived-FQ-as-CD hypothesis proposes that people do not use frequency counts independently of context to produce judgments of frequency (JOF). That is, the number and type of contexts in which we have seen an event affect our subjective experience of FQ. We present an experiment where we compare items seen in a varied and constant context. Although showing overall underestimation, JOFs correlated .53 with real FQ. But JOFs for varied-context items are higher and hence closer to item FQ than repeated context controls. Surprisingly, CD may be a better predictor of FQ than simple counts, which could mean that people use contextual information in their estimations of FQ.

Word FQ has effects in many cognitive paradigms, including reading aloud, lexical decision, repetition priming, recall and recognition. These effects have been argued to reflect learning (practice) or subjective prior probabilities. However, if subjective priors are based upon likely need in a new situation, then the number of previous contexts of occurrence (contextual diversity, henceforth, CD, Adelman, Brown, & Quesada, in press; Steyvers & Malmberg, 2003) should be more important than number of occurrences per se. The perceived-FQ-as-CD hypothesis proposes that people do not use frequency counts independently of context to produce judgments of frequency (JOF). They may use CD as a proxy to estimate FQ. That is, the number and type of contexts in which we have seen an event affect the subjective experience of frequency for that event. Concretely, controlling for frequency, events that have been seen in many different contexts will be believed to be more frequent. This counterintuitive result may help explain many different experimental results that are currently a puzzle.

We designed an experiment where a collection of words appeared the same number of times in two conditions, with repeated or varied contexts. In the repeated condition, people saw the words appearing in the same context a number of times (e.g., five times), for example: cat-dog, cat-dog, cat-dog, cat-dog, cat-dog. In the varied condition, people saw the word appearing in five times as well but in different contexts, for example cat-mouse, cat-building, cat-girl, cat-shoe, cat-end. The question is: do people produce higher JOF in the varied context condition? Or alternatively: Do people perceive high-CD words as more frequent?

Method. We presented people with pairs of words as described before. Their task was to say if the two words were the same or different with a key press. Participants were not told that a frequency test would follow. We also included some filler items where the words were the same (e.g., cat-cat) and the correct answer was 'same'. The filler pairs were repeated in a range of 1-6. Since the two words in the pair were the same, the actual frequencies experienced by people looking at those pairs were 2, 4, 8, 10 and 12 respectively. These pairs acted as a control condition. When all pairs were presented, a new screen with instructions appeared. Participants were prompted to say how often they thought each word had appeared (from 0 to 10).

Results. Overall participants were pretty accurate at estimating the rank (if not the absolute values) of word FQ (see table 1). A linear model relating the log of real frequencies to the JOF produced an R^2 of .73 ($F[1,6]=16.21$, $p < .01$).If we look at the absolute frequency values all participants underestimated frequency heavily.

Table 1: results from 5 repetitions in a repeated vs. varied context (RC vs. VC).

	Filler		RC	VC		Filler		
Frequency	2	4		5	6	8	10	12
JOF	1.21	2.45	*2.15*	*3.18*	3.72	3.28	4.88	3.83

The perceived-FQ-as-CD hypothesis is tested by comparing the repeated and varied context conditions. The varied context items obtained a higher (and more accurate) JOF ($t [34] = 3.65$, $p < .001$). The difference is small (about one repetition, $3.18 – 2.15 = 1.03$), but it is present in every pair and highly significant, consistent with the hypothesis. People seem to produce higher estimates in the varied context condition. These results are consistent with those of Begg et al. (1986), and inconsistent with others (Hintzman & Stern, 1978). The fast, non-demanding secondary task in our method (saying if two words are the same or different) may have facilitated this result. When the task requires a deeper processing (e.g., a semantic judgment as in e.g., the experiments reported by Hintzman and Stern 1978) a disadvantage for varied context appears. Higher CD may make for better retrieval of instances, increasing JOFs. CD may be a better predictor of FQ than simple counts. More research is needed, but the results here suggest that people may use contextual information in their estimations of FQ.

References

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