The Influence of Individual Differences on the Role of Information Quantity in Statistical Inferences

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It has been argued on statistical grounds that population correlations (ρ) are more readily detected given a small number of paired stimuli (N_s) than given a large N_s (e.g., Kareev, Lieberman, & Lev, 1997). Kareev, et al. (1997, Experiment 1) tested this claim with a prediction task in which participants used a binary cue to predict a binary outcome. The researchers derived subjective correlations (ρ') by computing the correlation between the cues and participants' predicted outcomes. Using working memory capacity (WMC) as an indirect measure of N_s, ρ' was found to be more extreme for participants with low WMC than for those with high WMC, and found to decrease with N_s.

Anderson, Doherty, and Gilkey (2006) manipulated N_s directly. The stimuli varied on two binary dimensions, and were drawn randomly from a population in which the correlation between the two stimulus dimensions was fixed. Participants used the samples to estimate population frequencies for various combinations of the dimension levels; the researchers computed ρ' from participants' estimates. Contrary to Kareev et al. (1997, Experiment 1), ρ' decreased with N_s, and WMC had no effect.

Rationale and Method

Previously, the task used to assess ρ' has tended to vary across experiments, with the potential for extraneous, between-study differences to impact the results. Therefore, the present study was designed to assess effects of task, N_s, and WMC on ρ' within a single experiment that included a prediction task, a frequency estimation task, and a rating task (see Clement, Mercier, & Pasto, 2002) in which ρ' was assessed via a -100 to 100 scale. Participants (N = 107) saw sequences of 3, 6, 12, or 24 stimulus pairs consisting of pictures of brown or white envelopes containing a cash or credit card payment. Each stimulus sample was drawn randomly from a population in which ρ between envelope color and payment was 0, .4, or .8. Each participant's WMC was assessed at end of the experimental session, using a digit span task.

Results and Discussion

WMC was dichotomized via a median split. In the prediction task there was an $N_s \times$ WMC interaction, $F(1, 36) = 8.81$, $p = .005$, and there was a positive effect of N_s on ρ' for participants with high WMC, $F(1, 17) = 14.54$, $p = .011$, but not for those with low WMC. Also in the prediction task, the mean ρ' tended to be greater for those with high WMC than for those with low WMC, but only when ρ was .4, $t(36) = 2.78$, $p = .009$. Both results are inconsistent with the theory of small sample advantages. Similarly, in the rating task, there was an $N_s \times$ WMC interaction, $F(1, 32) = 19.37$, $p < .001$; the effect of N_s on ρ' was positive when WMC was high, $F(1, 14) = 4.87$, $p = .044$, and negative when WMC was low, $F(1, 18) = 8.38$, $p = .010$.

The findings contrast with those of Kareev et al. (1997, Experiment 1). Overall, the study provided a direct comparison of the effects of N_s in three different correlation judgment tasks, demonstrated a small sample advantage for the rating task only, and demonstrated the importance of individual differences in WMC.

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