Four Approaches to Modeling Impressions of Social Events

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This research evaluates the relative merits of two established and two newly proposed methods for modeling impressions of social events: stepwise regression, ANOVA, Bayesian model averaging, and Bayesian model sampling. Models generated with each method are compared against a ground truth model to assess performance at variable selection and coefficient estimation. We also assess the theoretical impacts of different modeling choices. Results show that the ANOVA procedure has a significantly lower false discovery rate than stepwise regression, whereas Bayesian methods exhibit higher true positive rates and comparable false discovery rates to ANOVA. Bayesian methods also generate coefficient estimates with less bias and variance than either stepwise regression or ANOVA. Of the four methods, BMS strikes the best balance between sensitivity and specificity in variable selection, while also minimizing bias and variance in estimating coefficients. Methodological choices also have important implications for theory. We find that stepwise regression includes a large number of variables, many of which have no theoretical significance. ANOVA is far more parsimonious but excludes more theorized terms than BMS. While BMA includes more theory-driven effects than either BMS or ANOVA, it includes about twice as many atheoretical terms (though far fewer than the stepwise technique). We therefore recommend using BMS, or some other variant of MC3 BMA, for model specification in affect control theory. These methods perform well in variable selection, coefficient estimation, and the retention of theoretically important variables, while minimizing the inclusion of atheoretical terms. They also methods provide a means of formally leveraging the findings of past studies through the construction of informative priors.

Table 1. Summary of the Methods' Median Performance in Variable Selection and Coefficient Estimation Based on Ground Truth Data

Method	True positive rate	False positive rate	Bias	Variance
Stepwise	.86	.22	.08	.01
ANOVA	.43	0	.14	.02
BMA	.79	.02	.07	.01
BMS	.71	0	.07	.01

Table 2. Theorized and Atheoretical Coefficients Retained by Type

Proportion of effects retained	Stepwise	ANOVA	BMA	BMS
Theory-driven effects	.92	.66	.79	.71
Stability effects	1.00	1.00	1.00	1.00
Behavior effects	1.00	.67	.78	.78
Object diminishment	1.00	.00	1.00	1.00
Consistency effects	1.00	.78	.78	.56
Congruency effects	.75	.25	.75	.50
Balance effects	.67	.33	.50	.50
Atheoretical effects	.18	.05	.08	.04
Ratio of theorized to atheoretical effects	.36	1.00	.71	1.29

Note: Figures are based on the 1978 male data (Smith-Lovin and Heise 1978) and reflect the proportion of coefficients in each category that persisted with a given modeling approach relative to the maximum number of possible occurrences. The ratio of theorized to atheoretical effects is based on the raw number of effects in each broad category.