University of Illinois at Urbana-Champaign

Selecting representative subsets of vignettes for investigating multiple facets of moral judgement

Documentation

Erin K Molloy
emolloy2@illinois.edu
Dept. of Computer Science

Michael D Kruepke
kruepke2@illinois.edu
Dept. of Psychology

Last modified: December 28, 2018

This work was supported by the NSF IGERT Fellowship, Grant No. 0903622.

Please cite this repository as
Molloy, E. K. and Kruepke, M. D., (2017). Selecting representative subsets of vignettes for investigating multiple facets of moral judgement: Documentation and MATLAB Code. GitHub repository, `https://github.com/ekmolloy/select-vignette-subsets`.

Also consider citing
Kruepke, M. D., Molloy, E. K., Bresin, K. W., Barbey, A. K., and Verona, E. (2017). A Brief Assessment Tool for Investigating Facets of Moral Judgment from Realistic Vignettes. *Behavior Research Methods* 50(3):922–936. doi:10.3758/s13428-017-0917-3

Contents

1 Ecologically valid moral vignettes

In 2010, Knutson et al. published a collection of 312 ecologically valid moral vignettes rated on 13 features: emotional intensity, emotional aversion, harm, self-benefit, other-benefit, pre-meditation, illegality, social norm violations, socialness, frequency, personal familiarity, general familiarity, and moral appropriateness. These vignettes were adapted from first-person episodic memories solicited via a cue word (Escobedo, 2009). In particular, each vignette was condensed down to two or three sentences of 28-59 words (mean word count = 43 words). Ratings on a scale of 1 (low) to 7 (high) were then collected from 30 normal healthy adults via a "computer-based" survey. A principal components analysis (Anderson and Rubin, 1956; Bartlett, 1937) using 10 of the 13 rated features (emotional intensity, emotional aversion, harm, self-benefit, other-benefit, pre-meditation, illegality, social norm violations, socialness, and moral appropriateness) was performed on the survey data to resolve factors most likely to represent "underlying moral components" in the *collective set* of moral vignettes (Knutson et al., 2010). To date, only two published studies have utilized these realistic vignettes (Vranka and Bahnk, 2016; Simpson and Laham, 2015). This is despite numerous articles referencing and encouraging researchers to use these stimuli (Kahane, 2015; Gold et al., 2014; FeldmanHall et al., 2012; Bzdok et al., 2012; Ugazio et al., 2012).

2 Practicality of using all 312 moral vignettes

Even with the application of well documented web survey design techniques (Couper et al., 2001, 2004), web surveys still face problems with subjects producing disengaged/random responses or dropping out of the survey altogether (Villar et al., 2013; Galesic and Bosnjak, 2009). Of particular interest to us is survey length, which has been shown to increase subject dropout rate and negatively influence data quality (Galesic and Bosnjak, 2009). For example, answers to questions near the end of a survey tend to be,"faster, shorter, and more uniform than answers to questions positioned near the beginning" (Galesic and Bosnjak, 2009) possibly due to fatigue, frustration, boredom, and/or distractions (Rathod and LaBruna, 2005).

The original survey of ecologically valid moral vignettes requires the subject to read 312 vignettes and make a total of 4056 ratings. Knutson et al. (2010) do not report the average length of time subjects required to complete the survey. We **estimate the survey length as 79-202 minutes** using the following logic. If we assume reading rate for comprehension to be 200-300 words per minute (Carver, 1990) and the average word length (43 words) across all 312 vignettes, then the reading portion of the survey alone requires 45-67 minutes. The rating portion of the survey would take an additional 34-135 minutes assuming each individual

rating requires 0.5-2 seconds. Indeed, when it was piloted as a web-based survey within the laboratories of Edelyn Verona and Aron Barbey, members complained that the full survey took approximately 3 hours (∼180 minutes) to complete. In order to study the "underlying moral components" of the vignettes in a larger population online or administer the survey as part of a functional neuroimaging task, a small but representative subset of the moral vignettes was needed.

3 Selecting subsets of moral vignettes

For our specific study design, we wanted to create several different 30-minute surveys that when combined had no duplicate moral vignettes. A subset of 40 questions would require 6-9 minutes of reading and 4-17 minutes of rating dimensions. This would put the estimated total survey time at 10-26 minutes leaving 4 minutes for demographics questions, reading instructions, and "clicking through" the survey. The number of combinations for selecting k elements from n elements is

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}, \quad k \leq n$$

Thus, choosing 40 questions from a survey with 312 questions results in $5.2461763e + 50$ different combinations! Searching all of these combinations for "representative" subsets would be impractical. Instead, we used a simple heuristic to reduce the search space to a handful combinations that were likely to be "representative" and had no moral vignettes in common and then tested these subsets for desirable features, such as, their ability to replicate analyses on the full set of 312 vignettes. Specifically, we wanted the factor analysis on a subset of moral vignettes to reflect the factor analysis performed by Knutson et al. (2010) on the full set of 312 vignettes.

For our heuristic approach, we labeled vignettes as "low," "medium/neutral," or "high" for each feature (e.g., harm, self-benefit, pre-meditation, illegality) based on this average rating across all subsets. Specifically, "low," "medium/neutral," or "high" were defined as the intervals $[min, \mu-\sigma]$, $(\mu-\sigma, \mu+\sigma)$, and $[\mu+\sigma, max]$, where min was the minimum rating for the feature, μ was the mean feature rating, σ is the standard deviation of feature ratings, and max was the maximum rating for the feature. For our study, we selected one "low," one "medium/neutral," and one "high" vignette for each of the 13 features to get a total of $3 \times 13 = 39$ vignettes. Notably, vignettes have ratings for all 13 features, so adding a single vignette to the subset changed the overall feature composition in an "unconstrained" way. We performed a factor analysis on subsets of vignettes generated using this heuristic as well as subsets generated randomly; results are in the next section. Instructions and MATLAB code for generating these subsets of vignettes is also provided.

3.1 Comparison of results

Dimensions	a	b	c	d
Social norm violations	1.27	2.65	5.62	6.47
Harm	1.30	2.16	4.84	6.07
Illegality	1.13	1.35	4.33	6.73
Other-benefit	1.20	1.58	4.73	6.57
Moral appropriateness	1.30	2.24	5.42	6.83
Emotional intensity	1.77	3.26	5.38	6.63
Socialness	2.43	4.44	6.06	6.57
Emotional aversion	1.60	2.79	4.90	6.47
Pre-meditation	1.63	3.44	5.57	6.53
Self-benefit	1.53	3.00	4.94	5.87

Table 1: Ranges for dimension categorization

Dimensions	mean	standard deviation	total in $[a, b]$	total in (b, c)	total in $[c, d]$
Social norm violations	4.14	1.48	67	194	51
Harm	3.50	1.34	68	185	59
Illegality	2.84	1.49	21	233	58
Other-benefit	3.15	1.57	33	213	66
Moral appropriateness	3.83	1.59	56	187	69
Emotional intensity	4.32	1.06	59	204	49
Socialness	5.25	0.81	52	226	34
Emotional aversion	3.85	1.05	61	196	55
Pre-meditation	4.51	1.07	62	197	53
Self-benefit	3.98	0.97	50	208	54

Table 2: Summary statistics on full survey

3.1.1 Surveys generated with our heuristic

3.1.2 Subset 1

Dimensions	mean	standard deviation	total in $[a, b]$	total in (b, c)	total in $[c, d]$
Social norm violations	3.95	1.65	12	20	7
Harm	3.41	1.45	11	22	6
Illegality	2.77	1.56	6	24	9
Other-benefit	3.52	1.83	5	21	13
Moral appropriateness	4.06	1.73	6	21	12
Emotional intensity	4.10	1.09	9	26	4
Socialness	5.20	0.92	7	28	4
Emotional aversion	3.56	1.15	13	18	8
Pre-meditation	4.68	1.02	7	24	8
Self-benefit	3.93	0.91	4	29	6

Table 3: Summary statistics on Survey 1 = {8, 30, 32, 55, 59, 65, 67, 74, 84, 85, 98, 103, 107, 108, 117, 128, 133, 144, 145, 146, 153, 166, 180, 182, 186, 199, 217, 222, 228, 230, 236, 255, 271, 272, 288, 293, 294, 296, 311}

	Components					
	Full Survey			Survey 1 (heuristic)		
Dimensions	1	2	3	1	2	3
Social norm violations	0.947	0.154	0.144	0.948	0.176	0.112
Harm	0.803	0.473	0.009	0.853	0.437	-0.008
Illegality	0.737	-0.288	0.115	0.740	-0.337	0.242
Other-benefit	-0.883	0.046	0.051	-0.876	-0.009	-0.024
Moral appropriateness	-0.956	-0.102	-0.120	-0.948	-0.123	-0.116
Emotional intensity	0.024	0.896	-0.066	0.262	0.882	-0.047
Socialness	-0.115	0.763	0.154	-0.176	0.715	0.091
Emotional aversion	0.336	0.762	-0.258	0.533	0.727	-0.098
Pre-meditation	-0.002	0.175	0.859	-0.030	0.380	0.814
Self-benefit	0.244	-0.304	0.772	0.251	-0.212	0.841

Table 4: Rotated Component Matrix from Survey 1

3.1.3 Subset 3

Dimensions	mean	standard deviation	total in $[a, b]$	total in (b, c)	total in $[c, d]$
Social norm violations	4.22	1.56	8	23	8
Harm	3.54	1.40	8	22	9
Illegality	2.55	1.14	1	34	4
Other-benefit	3.17	1.60	3	27	9
Moral appropriateness	3.72	1.66	8	22	9
Emotional intensity	4.33	0.91	7	27	5
Socialness	5.44	0.67	4	28	7
Emotional aversion	3.86	1.00	6	27	6
Pre-meditation	4.55	1.00	6	26	7
Self-benefit	3.92	1.07	8	22	9

Table 5: Summary statistics on Survey 2 = {3, 11, 12, 20, 21, 36, 41, 50, 76, 81 , 83, 86 , 97, 104, 115, 116, 125, 132, 143, 147, 148, 154, 172, 179, 183, 200, 203, 205, 206, 209, 221, 224, 226, 227, 233, 245, 279, 285, 304}

	Components					
	Full Survey			Survey 3 (heuristic)		
Dimensions	1	2	3	1	2	3
Social norm violations	0.947	0.154	0.144	0.947	0.239	-0.012
Harm	0.803	0.473	0.009	0.869	0.332	-0.143
Illegality	0.737	-0.288	0.115	0.718	-0.265	0.192
Other-benefit	-0.883	0.046	0.051	-0.814	-0.197	-0.249
Moral appropriateness	-0.956	-0.102	-0.120	-0.952	-0.239	0.060
Emotional intensity	0.024	0.896	-0.066	0.126	0.909	-0.143
Socialness	-0.115	0.763	0.154	0.278	0.207	-0.609
Emotional aversion	0.336	0.762	-0.258	0.198	0.878	-0.085
Pre-meditation	-0.002	0.175	0.859	0.174	0.553	0.678
Self-benefit	0.244	-0.304	0.772	0.381	-0.201	0.744

Table 6: Rotated Component Matrix from Survey 3

3.1.4 Subset 4

Dimensions	mean	standard deviation	total in $[a, b]$	total in (b, c)	total in $[c, d]$
Social norm violations	4.16	1.45	9	24	6
Harm	3.30	1.25	10	23	6
Illegality	3.07	1.62	3	26	10
Other-benefit	3.24	1.60	6	25	8
Moral appropriateness	3.83	1.54	7	24	8
Emotional intensity	4.25	1.20	9	23	7
Socialness	5.24	0.87	8	27	4
Emotional aversion	3.63	1.09	10	22	7
Pre-meditation	4.60	1.02	7	23	9
Self-benefit	4.37	1.00	4	22	13

Table 7: Summary statistics on Survey 3 = {1, 4 , 18, 29, 35, 42, 58, 61, 64, 75, 90, 105, 118, 120, 121, 127, 129, 163, 164, 176, 184, 187, 190, 194, 204, 219, 225, 238, 240, 242, 244, 249, 251, 257, 261, 267, 270, 276, 278}

	Components					
	Full Survey			Survey 4 (heuristic)		
Dimensions	1	2	3	1	2	3
Social norm violations	0.947	0.154	0.144	0.967	0.064	0.129
Harm	0.803	0.473	0.009	0.877	0.339	0.040
Illegality	0.737	-0.288	0.115	0.696	-0.357	0.301
Other-benefit	-0.883	0.046	0.051	-0.882	0.253	0.128
Moral appropriateness	-0.956	-0.102	-0.120	-0.974	0.049	-0.121
Emotional intensity	0.024	0.896	-0.066	-0.105	0.919	-0.030
Socialness	-0.115	0.763	0.154	-0.175	0.824	0.180
Emotional aversion	0.336	0.762	-0.258	0.233	0.864	-0.151
Pre-meditation	-0.002	0.175	0.859	-0.020	0.267	0.899
Self-benefit	0.244	-0.304	0.772	0.272	-0.340	0.810

Table 8: Rotated Component Matrix from Survey 4

3.1.5 Surveys generated randomly

3.1.6 Subset 1

Dimensions	mean	standard deviation	total in $[a, b]$	total in (b, c)	total in $[c, d]$
Social norm violations	4.39	1.55	8	24	7
Harm	3.62	1.34	7	22	10
Illegality	3.02	1.46	4	27	8
Other-benefit	3.20	1.70	3	26	10
Moral appropriateness	3.56	1.62	10	21	8
Emotional intensity	4.40	1.08	10	23	6
Socialness	5.43	0.72	4	28	7
Emotional aversion	3.71	0.98	9	27	3
Pre-meditation	4.84	0.87	2	30	7
Self-benefit	4.10	0.86	4	30	5

Table 9: Summary statistics on Survey 1 = {2, 9, 14, 29, 31, 39, 44, 52, 62, 89, 107, 110, 151, 152, 162, 165, 169, 173, 181, 184, 193, 196, 203, 210, 219, 225, 227, 231, 236, 245, 246, 254, 283, 284, 288, 298, 303, 305, 312}

	Components					
	Full Survey			Survey 1 (random)		
Dimensions	1	2	3	1	2	3
Social norm violations	0.947	0.154	0.144	0.972	0.082	0.045
Harm	0.803	0.473	0.009	0.778	0.533	-0.008
Illegality	0.737	-0.288	0.115	0.710	-0.329	0.007
Other-benefit	-0.883	0.046	0.051	-0.900	0.097	0.099
Moral appropriateness	-0.956	-0.102	-0.120	-0.979	-0.015	-0.034
Emotional intensity	0.024	0.896	-0.066	-0.021	0.858	-0.120
Socialness	-0.115	0.763	0.154	-0.228	0.826	0.259
Emotional aversion	0.336	0.762	-0.258	0.354	0.681	-0.488
Pre-meditation	-0.002	0.175	0.859	-0.157	0.142	0.840
Self-benefit	0.244	-0.304	0.772	0.265	-0.182	0.800

Table 10: Rotated Component Matrix from Survey 1

3.1.7 Subset 2

Dimensions	mean	standard deviation	total in $[a, b]$	total in (b, c)	total in $[c, d]$
Social norm violations	4.10	1.64	9	21	9
Harm	3.51	1.54	12	19	8
Illegality	2.80	1.53	4	28	7
Other-benefit	3.43	1.76	4	24	11
Moral appropriateness	3.89	1.74	9	20	10
Emotional intensity	4.39	1.06	4	28	7
Socialness	5.44	0.83	6	25	8
Emotional aversion	3.80	1.12	9	21	9
Pre-meditation	4.52	1.21	10	19	10
Self-benefit	4.00	0.95	5	28	6

Table 11: Summary statistics on Survey 2 = {11, 12, 38, 40, 46, 48, 53, 56, 65, 72, 81, 84, 103, 115, 117, 120, 126, 127, 143, 159, 168, 171, 174, 175, 188, 204, 213, 215, 229, 240, 255, 260, 263, 264, 276, 281, 285, 286, 296}

	Components					
	Full Survey			Survey 2 (random)		
Dimensions	1	2	3	1	2	3
Social norm violations	0.947	0.154	0.144	0.950	0.165	0.205
Harm	0.803	0.473	0.009	0.834	0.386	0.208
Illegality	0.737	-0.288	0.115	0.691	-0.480	0.133
Other-benefit	-0.883	0.046	0.051	-0.916	0.074	-0.075
Moral appropriateness	-0.956	-0.102	-0.120	-0.963	-0.102	-0.183
Emotional intensity	0.024	0.896	-0.066	0.257	0.858	-0.210
Socialness	-0.115	0.763	0.154	-0.135	0.891	0.195
Emotional aversion	0.336	0.762	-0.258	0.591	0.645	-0.303
Pre-meditation	-0.002	0.175	0.859	0.245	0.195	0.780
Self-benefit	0.244	-0.304	0.772	0.142	-0.338	0.822

Table 12: Rotated Component Matrix from Survey 2

3.1.8 Subset 3

Dimensions	mean	standard deviation	total in $[a, b]$	total in (b, c)	total in $[c, d]$
Social norm violations	4.24	1.47	8	23	8
Harm	3.71	1.37	8	23	8
Illegality	2.77	1.46	3	29	7
Other-benefit	2.82	1.45	8	25	6
Moral appropriateness	3.70	1.59	9	22	8
Emotional intensity	4.28	1.02	9	27	3
Socialness	5.17	0.81	6	30	3
Emotional aversion	3.75	0.99	6	26	7
Pre-meditation	4.32	1.15	11	20	8
Self-benefit	4.15	1.02	4	25	10

Table 13: Summary statistics on Survey 3 = {8, 13, 18, 23, 25, 35, 41, 42, 51, 54, 55, 71, 73, 76, 77, 86, 92, 98, 121, 123, 129, 134, 144, 146, 167, 170, 186, 195, 209, 217, 228, 250, 259, 265, 270, 299, 301, 302, 306}

	Components					
	Full Survey			Survey 3 (random)		
Dimensions	1	2	3	1	2	3
Social norm violations	0.947	0.154	0.144	0.959	0.096	0.161
Harm	0.803	0.473	0.009	0.875	0.401	-0.044
Illegality	0.737	-0.288	0.115	0.617	-0.252	0.413
Other-benefit	-0.883	0.046	0.051	-0.815	0.134	0.207
Moral appropriateness	-0.956	-0.102	-0.120	-0.956	-0.095	-0.156
Emotional intensity	0.024	0.896	-0.066	-0.176	0.895	-0.018
Socialness	-0.115	0.763	0.154	0.173	0.753	0.086
Emotional aversion	0.336	0.762	-0.258	0.120	0.841	-0.185
Pre-meditation	-0.002	0.175	0.859	0.005	0.215	0.885
Self-benefit	0.244	-0.304	0.772	0.096	-0.333	0.837

Table 14: Rotated Component Matrix from Survey 3

4 Instructions

1. Download data (excel format) provided in the `Supplementary Materials` Knutson et al. (2010).
2. Open the excel file in Google spreadsheets.
3. Insert a column of question ID numbers (integers).
   (a) Select row 1 (header) and copy (control-c).
   (b) Select row 1 (header), right click, and select *Delete row.*
   (c) Select column S, right click, and select *Sort sheet A -¿ Z.*
   (d) Select row 1, right click, and select *Add 1 above.*
   (e) Select row 1 and paste (control-v).
   (f) Select column A, right click, and select *Insert 1 left.*
   (g) Enter 1 into cell (2, A).
   (h) Enter "= A2 + 1" in cell (3, A).
   (i) Drag the lower right corner of cell row (3, A) down to cell (313, A).
   (j) Enter "QuestionID" into cell (1, A).
4. Delete columns B (Main Cue), C (Story), Q (Norm Violation Component), R (Social Affect Component), S (Intention Component), and T (Word Count).
5. In row 1, convert any spaces and hyphens to underscores e.g., "Emotional Intensity" → "Emotional_Intensity".
6. Select *File → Download as → Comma-separated values (.csv, current sheet).*
7. Run MATLAB commands.
   (a) seed = 12345;
   (b) nlow = 1; nmid = 1; nhigh = 1;
   (c) breakdown = [nlow, nmid, nhigh];
   (d) survey_reduction('SuppData.csv', 'subQ', [], breakdown, 3, 'heuristic', seed);
   (e) survey_reduction('SuppData.csv', 'subQ', [], breakdown, 3, 'random', seed);

5 MATLAB Code

```
function select_vignette_subset(ifile, oname, limits, breakdown, nsurvey, heuristic, seed)
%
%   ifile : string
%   oname : string
%   limits : 1 x 4 array of floats
%   breakdown : 1 x 3 array of integers
%   nsurvey : integer or 'inf'
%   heuristic : string {'random', 'heuristic'}
%   seed : integer to seed random number generator
%
%   Copyright 2014, Erin K. Molloy
%   mailto://emolloy2@illinois.edu


    % Set seed for random number generator
    rng(seed)

    % Import full survey data
    Q = importdata(ifile);
    X = Q.data;
    [m, n] = size(X);
    header = Q.colheaders;

    % Define bins: low [a,b], neutral (b,d), high [d,e]
    l = size(limits);
    if (l(2) == 4)
        a = repmat(limits(1), 1, n);
        b = repmat(limits(2), 1, n);
        d = repmat(limits(3), 1, n);
        e = repmat(limits(4), 1, n);
    else
        a = min(X);  e = max(X);
        c = mean(X); s = std(X);
        b = c - s;   d = c + s;
    end

    if strcmp('random', heuristic)
        order = randperm(m);
        nq = (n - 1) * size(breakdown,2);
    else
        % Create selection masks
        low_mask  = zeros(m, n);
        mid_mask  = zeros(m, n);
        high_mask = zeros(m, n);
        for i = 2:n
            low_mask(:,i)  = [X(:,i) >= a(i)] .* [X(:,i) <= b(i)];
            mid_mask(:,i)  = [X(:,i) >  b(i)] .* [X(:,i) <  d(i)];
            high_mask(:,i) = [X(:,i) >= d(i)] .* [X(:,i) <= e(i)];
        end
        masks = cat(3, low_mask, mid_mask, high_mask);
    end

    % Create vignette subsets
    i = 1;
    while (i <= nsurvey)
        Y = [];

        if strcmp('random', heuristic)
            [X, Y] = create_subset_random(X, Y, i, nq, order);
            onamei = strcat(oname, '_', int2str(i), '_random');
        else
            [X, Y] = create_subset_heuristic(X, Y, breakdown, masks);
            onamei = strcat(oname, '_', int2str(i), '_heuristic');
        end

```

```
        save_survey(Y, header, onamei, a, b, d, e);
        i = i + 1;
    end
end


function [A, B] = create_subset_random(A, B, i, nq, order)
    st = (i-1) * nq + 1;
    en = st + nq - 1;
    if (en < size(A, 1))
        B = A(order(st:en),:);
    else
        error('Error: too few elements.')
        error('Unable to create survey!')
    end
end


function [A, B] = create_subset_heuristic(A, B, breakdown, masks)
    [m, n] = size(A);

    levels = cat(2, ones(1,breakdown(1)), ...
                    ones(1,breakdown(2))*2, ...
                    ones(1,breakdown(3))*3);
    order = randperm(size(levels,2));
    levels = levels(order);

    for i = levels
        if (i == 1)
            mask = masks(:,:,1);
        elseif (i == 2)
            mask = masks(:,:,2);
        else
            mask = masks(:,:,3);
        end

        order = randperm(n-1);
        factors = order + 1;
        for j = factors
            subset = A(:,1) .* mask(:,j);
            subset(subset==0) = [];

            % Identifies and adds question to subset
            l = size(subset,1);
            if (l ~= 0)
                randsel = randi([1,l]);
                question = subset(randsel);

                % Add question to B
                B = cat(1, B, A(question,:));

                % Remove question from A
                A(question, 1) = 0;
            else
                error('Error: empty set.')
                error('Unable to create survey!')
            end
        end
    end
end


function save_survey(B, header, oname, a, b, d, e)
    % Save subset of vignettes
    outfile = strcat(oname, '.csv');
    T = array2table(B, 'VariableNames', header);
    writetable(T, outfile, 'Delimiter', ',');

```

```
134     % Compute and save associated metrics
135     n = size(B, 2);
136     average = mean(B,1);
137     stddev = std(B,1);
138     minimum = zeros(1,n);
139     maximum = zeros(1,n);
140     total = zeros(3,n);
141     for i = 2:n
142         minimum(i) = min(B(:,i));
143         maximum(i) = max(B(:,i));
144         total(1,i) = sum([B(:,i) >= a(i)] .* [B(:,i) <= b(i)]);
145         total(2,i) = sum([B(:,i) >  b(i)] .* [B(:,i) <  d(i)]);
146         total(3,i) = sum([B(:,i) >= d(i)] .* [B(:,i) <= e(i)]);
147     end
148     ancillary = cat(1, average(:,2:n), stddev(:,2:n), ...
149                        minimum(:,2:n), maximum(:,2:n), total(:,2:n), ...
150                        a(:,2:n), b(:,2:n), d(:,2:n), e(:,2:n));
151
152     outfile = strcat(oname, '_info.csv');
153     rownames = {'mean'; 'stddev'; 'min'; 'max'; ...
154                 'nlow'; 'nmid'; 'nhigh'; ...
155                 'a'; 'b'; 'd'; 'e'};
156     T = array2table(ancillary, 'VariableNames', header(2:n), ...
157                                'RowNames', rownames);
158     writetable(T, outfile, 'Delimiter', ',', 'WriteRowNames', true);
159 end
```

References

Anderson, T. W. and Rubin, H. (1956). Statistical inference in factor analysis. In *Proceedings of the Third Berkeley Symposium on Mathematical Statistics and Probability, Volume 5: Contributions to Econometrics, Industrial Research, and Psychometry*, pages 111–150, Berkeley, CA. University of California Press.

Bartlett, M. S. (1937). The statistical conception of mental factors. *British Journal of Psychology*, 28(1):97–104.

Bzdok, D., Schilbach, L., Vogeley, K., Schneider, K., Laird, A. R., Langner, R., and Eickhoff, S. B. (2012). Parsing the neural correlates of moral cognition: ALE meta-analysis on morality, theory of mind, and empathy. *Brain Structure and Function*, 217(4):783–796.

Carver, R. P. (1990). *Reading rate: A review of research and theory*. Academic Press, San Diego, CA.

Couper, M. P., Tourangeau, R., and Kenyon, K. (2004). Picture This!: Exploring Visual Effects in Web Surveys. *Public Opinion Quarterly*, 68(2):255–266.

Couper, M. P., Traugott, M. W., and Lamias, M. J. (2001). Web Survey Design and Administration. *Public Opinion Quarterly*, 65(2):230–253.

Escobedo, J. R. (2009). *Investigating Moral Events: Characterization and Structure of Autobiographical Moral Memories*. PhD thesis, California Institute of Technology, Pasadena, CA.

FeldmanHall, O., Mobbs, D., Evans, D., Hiscox, L., Navrady, L., and Dalgleish, T. (2012). What we say and what we do: the relationship between real and hypothetical moral choices. *Cognition*, 123(3):434–441.

Galesic, M. and Bosnjak, M. (2009). Effects of Questionnaire Length on Participation and Indicators of Response Quality in a Web Survey. *Public Opinion Quarterly*, 73(2):349–360.

Gold, N., Pulford, B. D., and Colman, A. M. (2014). The outlandish, the realistic, and the real: contextual manipulation and agent role effects in trolley problems. *Frontiers in Psychology*, 5:35.

Kahane, G. (2015). Sidetracked by trolleys: Why sacrificial moral dilemmas tell us little (or nothing) about utilitarian judgment. *Social Neuroscience*, 10(5):551–560.

Knutson, K. M., Krueger, F., Koenigs, M., Hawley, A., Escobedo, J., Vasudeva, V., Adolphs, R., and Grafman, J. (2010). Behavioral norms for condensed moral vignettes. *Social Cognitive and Affective Neuroscience*, 5(4):378–384.

Rathod, A. and LaBruna, A. (July 2005). Questionnaire Length and Fatigue: Does size really matter? Paper presented at the ESOMAR Conference on Panel Research, Budapest.

Simpson, A. and Laham, S. M. (2015). Individual differences in relational construal are associated with variability in moral judgment. *Personality and Individual Differences*, 74:49–54.

Ugazio, G., Lamm, C., and Singer, T. (2012). The role of emotions for moral judgments depends on the type of emotion and moral scenario. *Emotion*, 12(3):579–590.

Villar, A., Callegaro, M., and Yang, Y. (2013). Where Am I? A Meta-Analysis of Experiments on the Effects of Progress Indicators for Web Surveys. *Social Science Computer Review*, 31(6):744–762.

Vranka, M. A. and Bahnk, S. (2016). Is the Emotional Dog Blind to Its Choices? *Experimental Psychology*, 63(3):180–188.