New Zealand Norms for a Subset of Battig and Montague's (1969) Categories

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How people classify words has continued to be of interest in several areas of psychological enquiry. The development of category norms representing American adults' responses to 56 verbal categories (Battig and Montague, 1969) provided researchers with normative data that have been of considerable value in studies involving verbal behaviour. However, the validity of these norms, both with respect to research involving New Zealand subjects and to their relevance 25 years on, is the central issue addressed by the current investigation. Normative data are presented for 329 adult New Zealanders' responses to 10 common concrete categories (cf. Rosch, 1975). The data include the number of times each response was given within a category, the number of times each response was given first, and the mean rank of each response. The present data confirm the merits of having access to category norms from a New Zealand sample when undertaking research on verbal behaviour.

B attig and Montague's (1969) category norms, representing 442 American subjects' responses to 56 verbal categories, have been used extensively in studies requiring normative data concerning adult verbal behaviour. Broadbent and Gathercole (1990), for example, employed Battig and Montague's norms when selecting target and non-target stimulus words for a recent investigation of attentional phenomena in which exemplar (item) prototypicality was an important variable. Similarly, Fisk, Hertzog, Lee, Rogers, and Anderson-Garlach (1994) used six exemplars from each of seven categories from Battig and Montague's (1969) norms (furniture; 4-footed animals; fruit; weapons; kinds of money; types of cloth; weather phenomena) in a study of age-related retention of verbal stimuli.

The major purpose of the present study was to develop verbal category norms that could be used by contemporary New Zealand researchers employing verbal stimuli in their investigations. Two issues seemed particularly relevant for

current New Zealand researchers likely to draw on Battig and Montague's normative data. The first issue concerned geographical and cultural differences. That is, we were interested in improving the validity for New Zealand researchers when drawing on normative data concerning membership of common categories since the norms frequently used in western countries are based on responses from an American sample. The second concern is again one of validity, in this case, the potential threat to validity being time. Everyday use of language is dynamic and therefore continually changing over time. A reasonable assumption is that category norms developed over 25 years' ago for use as verbal stimuli may be less valid in today's investigations than they were in 1969. In other words, we assumed that category norms developed with a New Zealand sample in the 1990's could provide a tool of considerable value to researchers working in relevant fields, notably cognitive psychology.

The present study employed Battig and Montague's (1969) methodology to develop norms for a subset of the 56 categories used in the 1969 investigation. The 10 categories chosen from the 56 in the original Battig and Montague study were those used by Rosch (1975) in her work on categorization. The categories represent a set of concrete nouns in common usage in English. Rosch's (1975) criteria for selecting these particular concrete noun categories was determined by drawing all concrete nouns with a word frequency of 10 or greater from Kucera and Francis' (1967) sample of written English. Where 5 or more items from a category appeared in the list, the category was considered "in common usage". Where the items could be clearly represented by pictures, the category was considered "concrete". Given that the aim of our study was to develop category norms for use in cognitive studies employing verbal stimuli where typically stimuli are drawn from a handful of categories (e.g., Fisk et al., 1994), we considered it appropriate to select categories with exemplars that are "in common use" and "concrete" (Rosch, 1975, p.192). Further, we selected verbal categories with which there has been relatively extensive investigation into aspects of their internal

structure such as the prototypicality of particular exemplars in the category (e.g., Rosch, 1975). In other words, an already established knowledge base pertaining to the nature of the cognitive representation generated by the 10 semantic categories used in the present study should increase their usefulness as a research tool.

Method

Subjects

329 adult New Zealand residents who considered English to be their first language participated in the study. Age range was 17 - 46 years, and the sample included 132 males and 197 females. The subjects were first-year psychology students at Victoria University of Wellington.

Materials

Booklets containing 10 pages, each page headed up with one of the 10 possible noun categories, were prepared. The 10 noun-category headings taken from Battig and Montague (1969) and Rosch (1975) were: Sport; Toy; Fruit; Furniture; Vegetable; Clothing; Carpenter's Tool; Bird; Vehicle; and Weapon. Fifteen different random sequences of the 10 categories were prepared.

Procedure

The present procedure was as similar as was possible to that used by Battig and Montague (1969). Subjects were tested in groups of approximately 20 during the first 15 minutes of a scheduled laboratory class. The following instructions were read to subjects:

"The purpose of this experiment is to find out what items or objects people commonly give as belonging to various categories or classes. The procedure will be as follows: First, at the top of each page you will be given the name or description of a category. Then you will be given 30 seconds to write down as many items included in that category as you can, in whatever order they happen to occur to you. For example, if you were given the category "seafood" you might respond with such items as lobster, shrimp, claw, oyster, herring, and so on. The words are to be written under the category, using a different page for each category. When you hear the word "stop", you are to stop writing and turn over immediately to the next page. You will then be given the name of another category, and again you are to write the names of as many members of that category as you can think of. This procedure will be continued through a total of 10 categories, and you are to use a different page for each category. Now please open to the first page and get ready for the first category."

Thirty seconds per category were permitted for subjects to write down as many items for that category as they could. Timing was accomplished by the experimenter using a stopclock. After completion of the tenth category, completed booklets were collected by the experimenter. Subjects were thanked for their participation and asked not to discuss the task with students attending subsequent laboratory sessions.

Results and Discussion

All legible responses made by each subject for each category were tallied. No attempt was made to exclude those responses that appeared inappropriate to the category name. Neither was any attempt made to separate different forms of the same response, so that some of the responses include more than one grammatical form or spelling of that response.

The basic data, presented in Table 1, consist of the three measures described by Battig and Montague (1969). All responses given with a total frequency of 10 or more are included in Table 1. In the first column of Table 1 is the total frequency of occurrence of that response for the entire sample (N = 329). For each category, the responses are ordered from most to least, with the responses numbered as to rank order in this total frequency measure. To the right of the total frequency measures are the numbers of times each response was given *first* in the response sequence (this number being omitted where the response was never given first). In the third column is given the mean rank position (R) of the response in the response sequence for each subject who gave that response. The mean rank rating provides information concerning the combined effects of the previous two measures. That is, the derivation of mean rank takes into account all reportings of that exemplar, the number of times it was reported first, as well as the frequency with which it was reported second, third, and so on, by each respondent. In other words, mean rank discriminates between exemplars within a category by providing a measure of the relative "availability", or ease of retrieval, (cf. Tversky & Kahneman, 1973) of each category member.

Some general comments about these results would seem to be in order before comparative statements relate the present results to those of Battig and Montague (1969). Table 1 shows some variation among categories in terms of the numbers of exemplars occurring with frequency of 10 or more, ranging between 30 exemplars (Vegetable) and 46 exemplars (Bird). The total number of unique exemplars produced for each of the 10 categories, including those that were produced with a frequency of between 1 and 9, and the mean number of exemplars produced by subjects for each category, are provided in Table 2.

Variation among categories in the actual frequencies with which the exemplar ranked 1 (often considered the 'ideal' or prototypical category member in probabilistic models of categorization) was reported by the 329 participants can be seen in Table 1. The range was between 319 for 'apple' in the 'Fruit' category and 205 for 'doll' in the 'Toy' category. The categories also differed with respect to the frequency with which one exemplar was ranked *first*. For four categories, a large number of the 329 subjects rated a particular exemplar first (189 rated 'apple' first in 'Fruit'; 172 rated 'chair' first in 'Furniture'; 236 rated 'car' first in 'Vehicle'; 193 rated 'gun' first in 'Weapon').

On the other hand, in several other categories the distribution of responses demonstrated that there was no one exemplar that the majority of subjects clearly represented as the 'ideal' or most 'typical' member of the category (Rosch, 1975, p. 194). For example, the exemplar rated first most often in 'Toy' was 'doll' which was rated first by 41

respondents only, and 'sparrow' was rated first in 'Bird' by 48 respondents. The finding that some members of a category appear to be more 'typical' members than others continues to be controversial in theoretical accounts of human categorization (e.g., Armstrong, Gleitman, & Gleitman, 1983) but supports Rosch's (1975) theory concerning a family resemblance structure within natural categories. Rosch's family resemblance structure allows for some exemplars to be closer than others to the prototypical or ideal category member, the most 'typical' vehicle or fruit, for example. Rosch has argued that 'typicality' refers to the way in which exemplars of a category can be seen as differentially representative of the meaning of the category. She has shown, for example, that 'typicality' ratings of exemplars within a category are predictive of subjects' reaction times in sentence verification tasks involving the exemplar and category name (Rosch, 1973).

There was a reasonable degree of internal consistency within the categories: In all categories except that of 'Toy', the most frequently reported exemplar was also reported first more times than any other exemplar in that category. In the category 'Toy' however, the exemplar reported first most frequently (teddy bear) had a lower overall frequency (147) than 'doll' which was reported with a frequency of 205.

Comparison with Battig and Montague's (1969) norms

Although the present New Zealand subjects' responses are similar in some respects to those of Battig and Montague's American subjects, there are also some notable differences. For example, in the category 'Bird', the most frequently-mentioned exemplar by Battig and Montague's subjects, 'robin' (with 377 responses), was not even in the top 10 exemplars with respect to frequency in the present study. Similarly, with respect to 'Sport', the 10 most frequently reported American exemplars include several that were either not mentioned at all in the present study, or were mentioned relatively infrequently (e.g., 'lacrosse'; 'golf'; 'track'; 'baseball'). In several other categories, such as 'Weapon' and 'Vehicle', the lists of category members have marked similarities despite differences across time and geographical distance. An inportant point that is exemplified by these data concerns category prototypicality: If prototypicality of an exemplar is of relevance to an investigation (such as when response times to particular words are of interest), the particular categories chosen from Battig and Montague's (1969) norms as the stimulus set need careful consideration when investigating New Zealanders' responses. In other words, it is clear from the data provided that the validity of Battig and Montague's (1969) norms when selecting verbal stimuli for use with New Zealand subjects could be a matter of concern in some situations. In such a case, the norms provided by the present study could guide the researcher's choice of stimuli more appropriately than can the American norms of 25 years' ago.

Apart from the above rather global comparative statements, no attempt was made to quantify differences between the American responses of 25 years' ago and the current New Zealand responses. A more fine-grained quantitative analysis was not considered appropriate since the current investigation does not permit separating out the degree to which each of two presumably influential variables, namely time (25 years) and geographical location (U.S.A. vs N.Z.), have contributed to any differences found. The present study was not designed to ascertain *why* particular differences in classifying commonly used English words may occur, either across time or across physical distance. Presumably any differences reflect cultural and geographic factors, as well as the dynamic aspects of language over time. The aim of the current investigation was to provide appropriate category norms for New Zealand researchers studying verbal behaviour in the 1990s. In doing so we acknowledge a limitation with respect to the degree to which these findings can be generalized to all New Zealanders: Further research could investigate contextual variables, that is, whether the norms provided by the present study also hold for those residing in other New Zealand geographical locations, for differing age and ethnic groupings, and so forth.

Table 1. Total frequency of occurrence (Total F), the number of times the response was given first (1st), and the mean rank position (Mean R) of each response in the response sequence for responses occuring with a total frequency of 10 or more in each of the ten categories.

SPORT

Response	Total F	1st	Mean R
1. rugby	274	69	2.941
2. soccer	211	43	3.175
3. tennis	203	36	4.266
4. netball	191	28	3.827
5. cricket	151	25	3.839
6. hockey	121	26	4.182
7. swimming	111	3	5.928
8. squash	100	5	5.470
9. basketball	94	9	4.787
10. badminton	79	10	5.203
11. volleyball	69		6.029
12. running	64	4	5.625
13. golf	51	7	4.941
14. softball	45	5	5.378
15. rugby league	45		4.689
16. skiing	39	3	4.744
17. athletics	37	2	6.459
18. cycling	26	1	5.346
19. waterpolo	26		6.346
20. aerobics	25	2	5.680
21. table tennis	21	1	5.667
22. underwater hockey	21	2	5.429
23. football	20	5	3.050
24. baseball	20		6.250
25. polo	19	1	7.000
26. boxing	18	3	5.056
27. rowing	17	1	6.059
28. gymnastics	17	1	5.000
29. horseriding	17		5.500
30. ball	16	3	3.667
31. bowls	14		6.786
32. jogging	13	1	5.692
33. croquet	13		6.308
34. motor racing	11	1	5.545

Table 1 continued

TOY

Response	Total F	1st	Mean R
1. doll	205	41	2.815
2. teddy bear	147	70	2.418
3. cars	132	25	3.091
4. trucks	81	17	2.852
5. lego	73	6	3.712
6. blocks	72	6	3.917
7. ball	65	23	3.200
8. barbie doll	48	4	3.708
9. train set	34	3	3.676
10. soft toy	34	9	2.853
11. train	32	8	2.906
12. guns	30	8	3.200
13. games	27	2	3.296
14. matchbox cars	26	4	3.000
15. dolls house	25		4.480
16. books	24	1	4.833
17. rocking horse	22	3	3.190
18. rattle	21	5	3.571
19. bike	20	1	4.750
20. jigsaw	20	2	3.750
21. plane	19	3	3.579
22. Ninja turtle	17	2	4.235
23. children	17	7	2.588
24. soldiers	15	3	3.800
25. action man	14		5.214
26. puzzles	14		4.143
27. buzzy bee	14	7	2.500
28. board games	13		4.385
29. computer games	13	2	4.077
30. GI Joe	13	2	3.692
31. fun	13	2	3.385
32. play	12	2	4.333
33. boat	11	2	3.182
34. figures	10		3.400
35. bat	10		4.500
36. cuddly	10	2	4.300

FRUIT

Response	Total F	1st	Mean R
1. apple	319	189	1.852
2. banana	262	30	3.412
3. orange	262	40	3.440
4. pear	214	10	3.573
5. grape	137	4	5.606
6. peach	135	7	5.156
7. apricot	85	3	5.906
8. nectarine	84	2	6.274
9. plum	82	3	5.634
10. kiwifruit	79	3	5.430
11. pineapple	79	3	5.620
12. lemon	71	3	5.507
13. grapefruit	59	1	5.678
14. tomato	55	14	4.291
15. mango	55	2	5.509
16. strawberry	46	1	5.935
17. watermelon	40	1	6.825
18. Nashi	39	1	5.718
19. passionfruit	35		6.400
20. melon	32		6.406
21. avocado	25		6.000
22. papaya	25	1	5.720
23. raspberry	23		6.783
24. mandarin	23		6.652
25. feijoas	21		6.095
26. cherry	20	1	6.250
27. guava	15		5.867
28. lime	12		6.917
29. healthy	11	2	5.727
30. blackberries	10	1	6.900
31. tangerine	10		7.50

VEGETABLE

Response	Total F	1st	Mean R
1. carrot	266	123	2.506
2. potato	219	42	3.307
3. cabbage	194	26	3.781
4. peas	161	9	4.236
5. beans	140	4	4.971
6. lettuce	134	15	3.985
7. cauliflower	123	14	4.415
8. tomato	119	26	3.513
9. pumpkin	90	1	5.156
10. broccoli	86	5	4.860
11. kumera	73	4	5.904
12. onion	55	4	4.496
13. corn	55	2	5.673
14. silverbeet	51	2	5.392
15. cucumber	48	3	4.792
16. spinach	44	4	5.455
17. zucchini	40	1	5.225
18. leek	39	4	5.128
19. parsnip	31	3	4.742
20. celery	31	1	5.267
21. brussels sprouts	28	1	5.429
22. turnips	26	4	5.500
23. beetroot	26	1	5.154
24. radish	16	2	5.375
25. mushroom	15	1	5.600
26. spud	13	2	3.308
27. courgette	13	2	5.000
28. spring onions	12		6.917
29. greens	11	1	5.545
30. beansprouts	11		6.455

FURNITURE

Response	Total F	1st	Mean R
1. chair	308	172	1.814
2. table	288	40	2.778
3. bed	200	25	3.995
4. couch	129	28	3.178
5. desk	119	10	4.345
6. sofa	115	24	3.035
7. stool	58		4.672
8. coffee table	55		5.690
9. television	53		5.547
10. cabinet	48		5.625
11. bench	46		5.783
12. suite (lounge)	42	4	3.571
13. lamp	42		4.786
14. wardrobe	41		6.073
15. dresser	37		5.351
16. drawers	33		5.939
17. dressing table	30		5.533
18. armchair	29	2	4.207
19. bookshelf	29		6.310
20. settee	26	2	3.923
21. sideboard	26		5.808
22. dining table	21		4.190
23. cupboard	20		6.400
24. chest of drawers	18		5.778
25. lazy-boy	16	2	4.375
26. shelves	16		5.938
27. seat	14	1	3.714
28. stereo	14		6.357
29. footstool	12		5.917
30. lounge	12	1	3.667
31. carpet	12		5.750
32. video	11		6.545
33. comfortable	10	3	3.600
34. tallboy	10		5.000

Table 1 continued

CARPENTER'S TOOL

Response	Total F	1st	Mean R
1. hammer	298	206	1.566
2. saw	239	42	3.257
3. nails	196	2	3.240
4. chisel	130	30	2.876
5. screwdriver	106	1	4.160
6. plane	99	12	3.949
7. drill	67		4.836
8. ruler	60	2	4.800
9. wood	59	3	5.034
10. screws	47		5.255
11. file	45		4.889
12. bench	39	1	4.744
13. level	38		5.026
14. sandpaper	33	1	4.788
15. pencil	32		5.594
16. vice	30	3	4.533
17. sander	28	1	5.071
18. saw horse	26		4.962
19. measuring tape	24		5.042
20. mallet	22	4	3.591
21. spanner	18	1	3.889
22. lathe	17	2	3.588
23. square	17	1	4.588
24. axe	15	3	4.067
25. glue	15		5.400
26. jigsaw	15	1	4.733
27. wrench	13	1	4.154
28. knife	11	1	3.364
29. punch	11		5.727
30. skill saw	10	1	4.100
31. pliers	10		5.000

VEHICLE

Response	Total F	1st	Mean R
1. car	280	236	1.305
2. truck	205	9	3.172
3. motorbike	183	6	4.202
4. bicycle	164	3	4.628
5. bus	140	3	3.993
6. plane	108	1	5.374
7. train	103	1	4.874
8. van	97	2	4.474
9. boat	58	1	5.707
10. scooter	38		5.921
11. ship	33		6.212
12. Ford	28	5	4.036
13. tractor	24		5.792
14. moped	23	1	4.870
15. ute	23	1	5.696
16. skateboard	23		6.087
17. taxi	19		4.895
18. transport	18	1	4.333
19. Mini	18	2	4.833
20. Mazda	18	3	3.667
21. Porsche	17	2	5.000
22. BMW	17	3	4.059
23. trailer	17		4.882
24. lorry	16		4.688
25. wheels	15	4	4.400
26. helicopter	15		8.067
27. tram	15	1	5.467
28. Mitsubishi	14	1	4.000
29. Honda	14	4	3.929
30. tricycle	12		6.833
31. Ferrari	11	3	3.455
32. VW	11	2	4.273
33. Toyota	11	1	4.636
34. station wagon	10	1	5.200
35. Mercedes	10	1	4.600

CLOTHING

Response	Total F	1st	Mean R
1. shirt	217	60	3.176
2. socks	196	7	5.635
3. jeans	186	53	3.505
4. shoes	165	21	4.921
5. trousers	144	11	4.111
6. skirt	135	10	4.451
7. T shirt	124	13	4.363
8. jersey	118	13	4.838
9. jacket	99	11	5.265
10. dress	96	21	4.438
11. shorts	86	7	4.826
12. hat	80	20	4.475
13. sweatshirt	71	5	4.437
14. underwear	71	3	6.648
15. pants	69	6	4.290
16. blouse	56	1	4.964
17. tie	53	1	5.830
18. coat	48	3	5.674
19. scarf	40	1	6.675
20. bra	40	1	7.000
21. underpants	38		6.079
22. singlet	38		6.684
23. waistcoat	34	1	6.765
24. cardigan	32	3	6.098
25. top	30	10	3.467
26. jumper	28	5	5.107
27. suit	25	1	5.080
28. belt	22		6.545
29. warmth	19	2	5.421
30. stockings	17		7.471
31. skivvy	16		6.000
32. fashion	13	4	3.846
33. vest	11	1	4.909
34. boots	11		4.636
35. sweater	11	1	6.000
36. JAG	11	4	2.455
37. trackpants	10	1	6.000

BIRD

Response	Total F	1st	Mean R
1. sparrow	215	48	3.121
2. kiwi	112	22	3.857
3. seagull	104	23	3.394
4. tui	95	23	3.389
5. blackbird	76	17	3.592
6. eagle	74	7	4.338
7. fantail	74	11	3.892
8. budgie	71	12	3.718
9. pigeon	68	5	3.940
10. parrot	62	8	4.355
11. hawk	61	5	4.475
12. canary	52	19	3.538
13. magpie	51	3	4.686
14. duck	45	7	4.222
15. robin	41	9	3.805
16. moa	41	3	4.585
17. kea	35	5	4.314
18. chicken	35	1	5.171
19. finch	34	2	4.941
20. kakapo	29	4	4.310
21. feathers	26	9	2.923
22. thrush	25	1	4.500
23. ostrich	25	1	5.560
24. flying	25	8	3.360
25. albatross	24		4.750
26. pukeko	23	1	5.304
27. emu	23	2	4.652
28. nest	21	4	3.095

Table 1 continued

29. swan	21	2	4.905
30. owl	21	1	4.762
31. starling	21	2	4.857
32. penguin	20	5	4.450
33. heron	19	5	4.474
34. bellbird	18	1	5.167
35. bluebird	17	2	4.000
36. hummingbird	17	2	4.118
37. peacock	17	6	3.529
38. kingfisher	17	1	3.882
39. wings	16	4	2.938
40. dove	16	2	4.125
41. raven	16	2	4.467
42. weka	15	11	4.733
43. cockatoo	15	1	4.733
44. falcon	15	3	4.800
45. swallow	14	2	4.214
46. morepork	13		4.846

WEAPON

Response	Total F	1st	Mean R
1. gun	273	193	1.473
2. knife	235	46	2.660
3. sword	90	8	3.378
4. rifle	81	15	3.086
5. pistol	55	4	3.927
6. bomb	53	1	4.509
7. spear	51	7	3.961
8. tank	42	1	5.095
9. arrow	40	2	4.500
10. machine gun	33	2	4.303
11. axe	33	2	4.182
12. bow	32		4.406
13. missile	32	2	4.500
14. batton	32		4.344
15. club	31	1	4.419
16. cannon	30	1	4.567
17. dagger	30	2	4.414
18. fists	27	1	5.111
19. stick	26	1	4.500
20. grenade	26		5.077
21. baseball bat	24		4.125
22. bullet	23	1	3.652
23. machette	22	1	3.727
24. war	17	1	4.118
25. numchucks	17		3.882
26. death	17	1	4.941
27. scud	15	2	4.333
28. bat	13		4.538
29. hammer	13		3.923
30. rope	12		5.750
31. wood	11		5.273
32. plane	11		5.091
33. shotgun	11	1	4.091
34. AK 47	10	4	3.600
35. chains	10		4.500
36. glass	10		5.300
37. stones	10		5.600
38. M 16	10	4	2.500

Table 2. Total number of unique exemplars produced for each category, and mean number of exemplars produced by the 329 respondents for each of the 10 categories.

Category	Total Number of Unique Exemplars	Mean Number of Exemplars per subject
Sport	182	7.94
Toy	191	5.34
Fruit	148	7.90
Furniture	180	6.79
Vegetable	135	7.30
Clothing	198	8.48
Carpenter's Tool	139	6.08
Bird	136	6.68
Vehicle	276	7.30
Weapon	308	6.10

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