Dominance and typicality norms for properties: Convergent and discriminant validity

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Sensory properties of verbally depicted items, such as those of color or shape, were indexed for dominance (frequency of output) and typicality (perceptual "goodness"). Participants (total $N = 193$) served in one of four conditions. The most dominant property response was computed for 105 nouns by one group. A second group rated these properties for typicality, relative to a constituent property (i.e., given one's idea of yellow, how typically "yellow" are the following items: butter, canary, daffodil, . . .). A third group produced as many properties as possible for each of 65 nouns. Dominance was computed for all 459 properties so produced. The last group rated these 459 properties for typicality relative to the parent noun (i.e., Given your image of an apple, how typically round is it? How typically soft is it? etc.). A multimethod-multitrait analysis indicated that both typicality and dominance were reliable, and that both exhibited convergent and discriminant validity. Typicality measured relative to an ideal property exhibited greater discriminant validity from dominance than when measured relative to the parent noun. Selected uses of these norms in studies of semantic memory, metaphor judgment, and concept identification were discussed.

People understand and store in memory knowledge about the sensory properties of objects. For instance, upon hearing the word APPLE, one knows the object being referred to is round, small, moderately soft, red, yellow, or green in color, and so on. Indeed, many current models of semantic memory conceptualize object knowledge in terms of a collection of such features (e.g., Glass & Holyoak, 1975; Kintsch, 1974, Chapter 10; McCloskey & Glucksberg, 1979; Norman & Rumelhart, 1975, Chapter 2; Smith, Rips, & Shoben, 1974). One issue that all such models must consider is the differential accessibility found with different properties of an object. Given the word MINNOW, for instance, people much more readily access the property "small" than they do the property "slimy," although both smallness and sliminess are equally plausible descriptors.

The question of accessibility has been conceptualized in different ways by different models of semantic memory: in terms of criterialities (cf. Collins & Loftus, 1975), the definingness of a property (cf. Smith et al., 1974), the order of search (cf. Glass & Holyoak, 1975), and so on. Despite the conceptual differences posited by theorists, the same variable has been used to operationalize differential access. Various labels as frequency (Conrad, 1972), association production frequency (Glass & Holyoak, 1975; Glass, Holyoak, & O'Dell, 1974),

and property dominance (Ashcraft, 1978a, 1978b, Note 1), this variable is defined by the normative frequency with which a given property is output as a descriptor of a noun object. Thus, in the example given above, "small" would be a more accessible property of MINNOW than would "slimy" because "small" is the more frequently produced sensory property (the frequency of response output being 64% and 6%, respectively, of the normative sample; see Ashcraft, Note 1).

While property dominance has proved to be a powerful indicator of differential access, at least one other variable of import has been suggested. This variable depends on differences in the perceptual quality of the property. Consider, for instance, the words APPLE and DIME. "Round" is an equally dominant property of both these items (the relative frequency of output being 14% and 12%, respectively). However, when people are asked to consider which of these two words represents objects that better exemplify the concept of roundness, DIME is overwhelmingly and consistently chosen (Katz, 1978). Moreover, this "goodness" of a feature (as distinct from its dominance) has been shown to predict accessibility on a wide variety of tasks: concept identification (Katz, 1978), verification of sentences of the form "An object has the property" (Katz, 1981; Kosslyn, 1976a, 1976b), in recognition memory (Denis, Note 2), and in judgments of sentence metaphoricality (Katz, 1982).

Although norms are available for the dominance of properties (Ashcraft, 1978b, Note 1), no such norms are available for property goodness. Indeed, while dominance and goodness have been shown to have independent effects on several tasks (Katz, 1978, 1981,

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1982; Kosslyn, 1976a), the two variables have not yet been shown to meet psychometric criteria of construct independence.

The purpose of this paper is, first, to provide a set of object-property relationships giving normative data on both property dominance and property goodness, and, second, to evaluate the construct independence of dominance and goodness using the multimethod-multitrait approach developed by Campbell and Fiske (1959). This approach necessitates the gathering of data on dominance and goodness ("traits") using more than one normative technique. In the present case, two techniques are discussed. The first employs single-response dominance and the evaluation of goodness with respect to that common sensory property. The second technique involves multiple-response dominance and the evaluation of goodness for different properties of discrete nouns.

In all cases, dominance and goodness of the property are computed only for sensory properties, that is, properties that describe a perceptual aspect of an object, such as its size, color, or shape. Examination of the Ashcraft (1978b, Note 1) norms indicates that such properties are output as descriptors about one-third of the time and, consequently, are relatively available for use. Two major considerations dictated limiting the scoring to sensory properties. First, and foremost, such items can be non-ambiguously classified as true properties of an object. The same cannot be said for many nonsensory "properties." Examination of the Ashcraft norms, for instance, indicates numerous instances when so-called properties are either nondescriptive associates (such as calling "Jack Benny" a property of "violins") or are semantic associates that do not obviously indicate a property relationship (such as calling "tent" a property of "canvas"). The second consideration was that the use of sensory properties has a long history of employment in a wide range of cognitive tasks: concept learning (Underwood & Richardson, 1956b), memory (e.g., Hudson & Austin, 1970), release from proactive interference (e.g., Kroes, 1973), studies of semantic memory (e.g., Smith et al., 1974, p. 19), and others. Thus scaling for sensory properties is of direct importance to a wide range of cognitive tasks.

TECHNIQUE 1

Property Dominance: First Output (D1)

The property dimensions of dominance and goodness were obtained on 105 concrete nouns selected from Underwood and Richardson (1956a) such that 15 different nouns depicted each of seven different target properties (big, round, small, smelly, soft, white, yellow). Two groups of 22 introductory psychology students at the University of Western Ontario were employed. Instructions and stimulus nouns were presented in mimeographed booklets. Each page contained one stimulus noun, repeated 15 times in a column, and subjects

were given 30 sec to write as many descriptions appropriate to each word as possible. The stimulus words were randomly arranged in booklets containing a total of 60 stimuli. The property measures reported here for each of the 105 items are based on the scores obtained from at least 22 subjects. Fifteen of the stimuli within each booklet were common to all 44 subjects, which allowed a reliability measure to be taken.

The probability with which the target sensory property was produced as the first sensory property was calculated for each of the 105 items. Thus, for example, 80% of the subjects output the property "yellow" as the first sensory property to the stimulus CANARY, whereas only 27% gave "soft" as the first property to the stimulus KITTEN. This measure is analogous to the traditional measures of dominance shown to be effective in semantic decision tasks (e.g., Conrad, 1972; E. Loftus, 1973; see also Katz, 1981).

Property Goodness: Typicality (T1)

Rosch (1975) has shown that some instances are considered to be better or more typical of a category than are others. Katz (1978) has shown that properties of items can be similarly scaled. In the present task, Rosch's (1975) scaling procedure was employed. Twenty-seven additional students chosen from the same subject-pool population served as subjects. The normative sample was presented with each of the seven target properties and, with each property, the 15 corresponding stimulus nouns. Thus, for instance, subjects would see a concept, such as "yellow," and a list of nouns, such as BANANA, BUTTER, CANARY, and DAFFODIL. The participants were instructed to rate, on a 7-point scale (1 = best example; 7 = poorest example), each instance on how well it represented the target property. The mean typicality rating for each item was computed. Results were similar to those obtained by Rosch, inasmuch as there was high agreement that in some items the property represented was highly typical, whereas in other items the property was less typical.

Thus, for both dominance and typicality, ratings are based on single properties given to many nouns. Given a property, one can find its dominance of production for 15 different nouns and its typicality rating. Since typicality ratings were demanded in the context of these 15 nouns, it is possible that the ratings reflect, to some degree, relative goodness.

Results

The normative data on property dominance and typicality for the 105 items (15 nouns for each of seven target categories) are presented in Appendix A. These tables permit one to find, for the seven target sensory categories, property dominance and typicality ratings for a set of different nouns.

Reliability. For dominance, reliability was estimated from the 15 items common to all subjects. The mean

dominance value was calculated for each item for each of the two subgroups of $N = 22$. The subgroup item score reliability was $r = .88$. Reliability was computed slightly differently for typicality, since, in this case, scores were available for each of the 105 items for each participant. The respective samples were randomly divided into two approximately equal-size groups ($N_s = 14$ and 13), and the mean typicality values were computed for each of the 105 items for each subgroup. The subgroup reliability across subgroups for property typicality was $r = .90$, which, when corrected by the Spearman-Brown formula, gives a reliability of $r = .95$ for the sample size used in the study.

TECHNIQUE 2

Property Dominance: Total Output (D2)

In this technique, people were given unlimited time to produce as many sensory properties as possible to each of a set of nouns. Dominance was calculated as the frequency with which a given property was output, regardless of order in the hierarchy of responses. For example, given the noun DIME, it would be possible that the responses "small" and "round" would both achieve dominance values of 100%, since all participants could output both properties (albeit not necessarily in the same order). Indeed, it is conceivable, although unlikely, that properties produced for a given noun as the first associate (as in Technique 1) would not prove to be the most dominant property overall when calculated in this second manner.

Two groups of introductory psychology students served in the study. One group ($N = 30$) was presented a subset of 65 nouns employed in the earlier scaling tasks. A second group ($N = 22$) received only 10 of the items as a reliability check. There was virtually no difference in the scores between the two groups, and consequently, the dominance measures to be reported are based on percentages collapsed across groups. (The percentages for 55 items are based on $N = 30$, and for the other 10, on $N = 52$.)

Each noun was typed onto a sheet of paper, and space was left for the participants to write down as many sensory descriptors as they could think of for each item. Unlimited time was provided, with most people completing the task in less than 1.5 h.

Property Typicality: Total Output (T2)

We compiled the total number of different sensory descriptors given to each of the 65 nouns discussed above. For instance, the item DOUGHNUT was described with the following four descriptors (each adjective being given by at least one respondent): greasy, round, soft, sweet.

Two booklets were constructed such that 32 of the nouns were represented in one booklet and the other 33 in the second. Each noun was typed on a page with the

list of descriptors next to it. The task was to form an image to each noun and to rate each of the appropriate descriptors along a 7-point typicality scale (1 = very atypical; 7 = best example). Thus, for the item DOUGHNUT, the task would be to image the item and rate the item for roundness (i.e., How good an example of a round object is a doughnut, of a soft object, etc.). One should note that the scaling was reflected in this task compared to the typicality technique discussed above. Thus a negative correlation between the two techniques would indicate convergent validity.

All participants ($N = 70$) were selected from the same subject pool. Thirty-two subjects responded to one booklet and 38 to the second. This task took between 30 and 45 min to complete.

Results

The normative data on property dominance and typicality for the 459 items (65 nouns $\times$ an average of about 7 properties/noun) is presented in Appendix B. These tables permit one to find properties for 65 different concrete nouns. The norms are read as follows: The target noun (e.g., ANCHOR) is centered above the set of sensory descriptors output for that noun (black, hard, etc.). Beside each descriptor are typicality (goodness) and dominance (normative output frequency) values. The number in parentheses beside each target noun represents the proportion of the associates output that were sensory descriptors. As can be seen, some nouns are much more likely to elicit sensory descriptors than are others. In the present case, the range runs from a high of .85 (for the noun BOULDER) to a low of .09 (for the noun CROWN).

Reliability. Reliability was based on mean data for both dominance and typicality. The total number of respondents for each item was randomly divided into two approximately equal-size groups, and the mean dominance and typicality scores were computed for each subgroup. Split-half reliabilities were $r = .83$ and $r = .94$ for typicality and dominance, respectively. Spearman-Brown corrections indicated reliabilities of $r = .91$ and $r = .97$ for typicality and dominance, respectively, given the sample sizes employed here.

MULTIMETHOD-MULTITRAIT ANALYSIS

Campbell and Fiske (1959) point out that before a construct such as "goodness" or "dominance" can be considered valid, it must meet two criteria. First, the construct must meet a convergent criterion, in which the construct (e.g., goodness) is confirmed by two or more measurement procedures. In the present case, convergent validation would occur if high correlations obtained between (1) the two measurement techniques used to index dominance and (2) the two measurement techniques used to index goodness. Second, it must meet a discriminant criterion, in which the measure of a con-

Table 1
Correlations for Typicality and Dominance Measures

Variable	Variable			
	Technique 1		Technique 2	
	T1	D1	T2	D2
T1	.90			
D1	-.46	.88		
T2	-.65	.48	.83	
D2	-.47	.81	.60	.94

Note—The convergent validity diagonal is depicted by italics. The reliability diagonals are the two sets of values in boldface type. T1 = typicality, D1 = first output dominance T2 = typicality based on total output, and D2 = total output dominance.

struct (e.g., goodness) does not correlate too highly with a measure of a conceptually distinct construct (e.g., dominance). For this second criterion to be met, the discriminant relationships (such as those between the measures of dominance and goodness) must be lower than those obtained for the convergent relationships (such as those between the two measures of goodness and between the two measures of dominance). Thus in order to determine convergent and discriminant validation, a construct must be indexed by more than one measure (multimeasure validation) and be shown to be distinct from at least one other construct (multitrait validation).

The multimethod-multitrait matrix is presented in Table 1. Examination of the heterotrait-monomethod triangles indicates the reliability coefficients (which, uncorrected by Spearman-Brown, range from $r = .83$ to $r = .94$) are substantially higher than the heterotrait figures ($r = .46$, $r = .60$). Two conclusions can be drawn from these data. First, the typicality and dominance measures are quite reliable, irrespective of shared method variance. Second, shared method variance is somewhat higher in Method 2. That is, when people are asked to rate for typicality a set of properties associated to a given noun, dominance effects are more salient than when people are asked to rate a single property for a set of different nouns.

Examination of the heterotrait-heteromethod matrix indicates good convergent and discriminant validity. The diagonal demonstrates acceptable convergent validity ($r_s = .65$ and $.81$ for typicality and dominance, respectively). Moreover, these values are considerably higher than the appropriate discriminant comparisons ($r_s = .47$ and $.48$). Thus discriminant validity is indicated.

In short, the typicality and dominance values are both reliable and valid indexes of conceptually and empirically separable aspects of noun-property relationships.

SELECTED EMPIRICAL USERS OF THE NORMS

It is envisioned that these norms will be employed most frequently as a reference source for studies of

semantic memory, particularly those involving property verification. In the past, less ambitious norms have been used (e.g., Ashcraft, 1978a; Glass et al., 1974; Katz, 1981). Since several of the items represented here are also found in Rosch's (1975) norms for the typicality of categorical instances, the present set of items could be employed to study property/superordinate category interactive effects (cf. Ashcraft, 1978a). Similarly, the properties can be partitioned into more absolute and more relative forms (i.e., one of the differences between "yellow" and "large" is that "large" is more likely to be interpreted in the context of superordinate categories than is "yellow"). As such, the Smith et al. (1974) arguments for the absolute-relative distinction can be tested and studied in relationship to dominance and typicality variables. Other uses can be easily envisioned: G. Loftus and Loftus' (1974) production task, Hampton's (1981) analysis of category structure, Rosch and Mervis' (1975) family resemblance experiments, Bayesian models of information usage (e.g., McCloskey & Glucksberg, 1979), and so on.

In addition, the norms, especially those presented in Appendix B, can be used to calculate semantic relationships between items. This is of importance both for validating theoretical positions current in semantic memory literature (cf. Smith et al., 1974) and for non-timed decisions on meaning (cf. Ortony, 1979). The Smith et al. model suggests that verification speed is, in part, a function of semantic similarity (defined as the degree of feature overlap between concepts). An obvious index of similarity easily obtained from these norms is determined by computing the number of properties, perhaps weighted by dominance and/or typicality, shared by any pair of items. An analogous index would be of use in featural models meant to determine how people decide on whether or not a sentence is metaphorically true, rather than literally true (see Malgady & Johnson, 1980). With respect to metaphor studies, Ortony's (1979) formulas for similarity and imbalance can also be easily computed from the present normative data.

Finally, the norms should prove useful in studies of concept identification. Dominance (Underwood & Richardson, 1956b), typicality (Katz, 1978), rank (Mednick & Halpern, 1962), and the ratio of relevant to irrelevant properties (Underwood, 1957) are variables already shown to be of importance in the identification literature, and each is present or easily computed from the sets of norms given here.

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Appendix A

Sensory Properties: Normative Dominance and Typicality Ratings for 15 Nouns Within Each of Seven Property Concepts

Noun	Dominance	Typicality	Noun	Dominance	Typicality	Noun	Dominance	Typicality
Property: Big								
anchor	17	4.9	elephant	91	2.1	ocean	37	1.1
ape	33	4.0	forest	13	2.0	stadium	64	2.0
auditorium	79	2.5	hospital	21	2.7	walrus	33	4.5
boulder	86	3.7	limousine	47	3.3	whale	75	2.3
camel	36	4.3	mansion	95	2.2	zoo	43	3.3
Property: Round								
apple	14	4.2	dime	12	1.6	olive	6	3.5
balloon	42	3.1	dome	53	3.0	pineapple	0	5.7
barrel	79	5.3	doughnut	71	2.7	platter	6	4.6
cherry	10	3.5	globe	85	1.4	pot	33	5.0
derby	29	4.8	moon	30	2.0	wheel	100	1.6
Property: Small								
atom	82	1.0	flea	86	1.9	pony	69	5.4
cabin	42	5.2	freckle	13	2.5	puddle	0	5.6
capsule	50	3.2	germ	27	1.3	tweezer	25	4.4
closet	29	4.4	minnow	76	3.4	village	95	5.4
crumb	100	2.1	needle	6	3.1	waist	41	5.3
Property: Smelly								
ammonia	61	1.5	gasoline	74	3.9	sewer	71	1.6
cigar	67	2.7	ginger	11	5.0	skunk	64	1.2
clove	21	4.4	onion	35	3.8	tobacco	58	4.0
garbage	69	2.3	pine	50	4.3	turpentine	68	3.9
garlic	30	2.6	sauerkraut	15	4.3	vinegar	5	4.8

Noun	Dominance	Typicality	Noun	Dominance	Typicality	Noun	Dominance	Typicality
Property: Soft								
bed	53	3.6	fur	73	1.5	pillow	86	2.6
chamois	15	2.9	kitten	27	1.3	silk	47	2.5
cork	13	6.6	lips	19	3.1	skin	41	3.2
custard	0	4.7	moccasin	62	4.4	tongue	6	4.7
flannel	42	2.7	moss	9	3.7	velvet	60	2.1
Property: White								
bandage	33	4.5	ivory	78	2.8	pearl	60	2.8
bone	50	4.0	lard	29	3.4	salt	56	2.2
cauliflower	62	4.4	linen	31	2.2	sheep	33	4.3
frost	20	2.2	milk	67	1.6	sugar	18	1.9
goat	18	5.0	paste	31	4.2	teeth	70	2.7
Property: Yellow								
banana	64	2.7	cheese	25	4.9	grapefruit	27	3.3
bracelet	0	6.0	corn	75	2.4	honey	50	5.4
buckle	0	6.3	crown	0	3.8	lemon	59	1.6
butter	50	2.7	daffodil	65	1.5	peach	25	5.7
canary	80	2.2	dandelion	100	1.4	sulphur	40	3.4

Note—For typicality, 1 = highly typical.

Appendix B
Dominance and Typicality Norms for the Sensory Properties of 65 Nouns

Property	Typicality	Dominance	Property	Typicality	Dominance
ANCHOR (.50)			BANDAGE (.37)		
black	4.36	7	beige	4.34	13
blue	2.09	3	clean	5.47	20
brown	2.38	3	dirty	2.41	3
hard	5.16	3	elastic	4.34	3
heavy	6.00	70	gauzy	4.91	3
large	4.88	27	long	3.44	3
metal	5.47	10	pink	3.33	3
silver	3.19	3	plastic	3.59	3
strong	4.97	3	red	1.97	3
T-shaped	4.88	3	smooth	3.25	3
wet	3.41	3	sticky	4.53	13
APE (.50)			thin	3.49	3
big	5.44	63	white	2.94	27
black	4.19	7	BARREL (.54)		
brown	4.19	10	big	4.69	28
hairy	6.38	67	brown	4.91	7
strong	5.84	13	dark	4.41	4
ugly	4.91	7	hard	4.84	4
wrinkled	3.63	3	heavy	5.00	4
APPLE (.66)			round	4.78	54
cold	4.06	3	wooden	6.25	14
green	4.44	30	BED (.33)		
hard	4.91	30	big	4.66	10
juicy	5.63	17	fluffy	3.82	3
red	5.97	90	hard	3.34	10
round	6.28	23	round	1.92	6
shiny	4.97	10	soft	5.47	50
smooth	4.41	3	warm	6.39	40
soft	2.53	3	BONE (.61)		
sour	3.97	20	brittle	4.19	20
sweet	4.34	23	hard	4.94	23
white	2.47	3	long	3.75	16
BANANA (.46)			shiny	2.13	3
bland	2.97	3	smooth	3.13	7
juicy	1.18	3	stiff	4.00	3
long	4.87	40	strong	5.25	20
mushy	5.58	6	white	4.91	60
smooth	4.51	10	BOULDER (.85)		
soft	3.71	23	cold	3.25	3
sweet	3.21	3	grey	4.50	30
tangy	1.53	3	hard	5.66	33
white	3.05	6	heavy	6.22	50
yellow	6.45	83	irregular	5.13	7

Property	Typicality	Dominance	Property	Typicality	Dominance
large	6.16	90		CUSTARD (.57)	
rock	6.44	13	creamy	5.71	36
rough	4.97	16	goosey	3.61	3
round	1.04	17	smooth	4.76	14
small	1.31	3	soft	3.58	20
	BRACELET (.43)		sweet	4.42	3
gold	5.47	63	warm	3.34	3
hard	3.44	3	watery	2.66	3
round	3.94	20	white	2.92	3
shiny	5.13	10	yellow	5.45	57
silver	4.47	36		DAFFODILS (.36)	
small	3.53	6	delicate	4.88	3
	BUTTER (.38)		green	3.31	13
greasy	5.63	7	long	2.44	10
hard	3.47	10	soft	3.67	3
salty	2.31	7	white	3.00	17
smooth	4.34	10	yellow	5.50	70
soft	4.38	29		DANDELIONS (.33)	
sweet	2.69	3	fluffy	2.89	7
yellow	4.72	53	green(s)	2.92	10
	CANARY (.43)		long	3.42	3
noisy	4.09	10	soft	2.29	3
small	4.34	46	white	2.03	10
soft	3.94	3	yellow	6.32	97
yellow	5.94	90		DIME (.23)	
	CAULIFLOWER (.28)		light	4.66	5
beige	4.11	3	round	5.53	36
hard	3.47	3	silver	6.09	50
large	2.87	3	small	5.03	46
lumpy	4.47	3	thin	5.47	14
round	3.24	3		DOUGHNUT (.28)	
white	4.87	77	greasy	2.24	4
yellow	2.53	3	round	5.84	62
	CHERRY (.71)		soft	3.95	8
black	2.89	4	sweet	5.13	40
juicy	4.63	4		ELEPHANT (.55)	
red	6.13	96	grey	5.82	50
round	5.71	32	heavy	6.61	13
shiny	5.00	4	large	6.47	98
small	5.11	28	pink	1.39	4
smooth	4.39	14	rough	3.68	2
sour	3.29	7	round	2.45	2
sweet	4.76	50	slow	3.87	2
	CLOSET (.45)			FLEA (.27)	
dark	4.97	23	black	4.41	23
deep	3.00	3	dirty	4.59	6
dirty	3.38	3	small	6.03	77
enclosed	4.78	3	white	1.78	7
full	4.97	6		FOREST (.24)	
large	3.44	23	brown	2.58	2
small	3.94	30	dark	3.95	27
stuffy	4.19	3	dense	5.50	14
square	3.47	3	green	5.79	58
	CORN (.31)		large	5.13	23
chunky	3.09	3		FRECKLE (.46)	
hard	2.81	3	brown	5.16	40
long	3.25	3	orange	2.06	6
moist	3.50	3	red	2.16	28
small	3.41	3	round	3.28	19
smooth	2.78	3	small	5.00	36
soft	3.31	3		FROST (.53)	
sweet	4.81	20	brittle	5.16	2
yellow	5.50	77	cold	6.13	88
	CROWN (.09)		crisp	5.00	4
gold	6.13	23	damp	2.75	4
high	3.26	3	hard	3.31	2
large	2.92	3	silver	3.25	2
pointed	4.55	3	sparkling	4.78	2
round	4.84	3	white	5.31	48
silver	3.79	3			

Property	Typicality	Dominance	Property	Typicality	Dominance
	FUR (.54)			LEMON (.67)	
brown	4.22	16	bitter	6.00	36
dirty	2.19	2	fat	1.82	7
fuzzy	4.16	2	juicy	5.00	4
sleek	4.09	2	oblong	3.79	18
smooth	4.81	10	shiny	2.32	4
soft	5.56	71	small	3.13	11
warm	6.00	44	sour	6.29	68
	GERM (.19)		yellow	6.58	100
black	2.66	2		LIPS (.48)	
cold	3.25	13	chapped	4.39	27
dirty	5.00	28	pink	4.71	3
grey	2.75	2	red	5.11	90
small	5.25	28	shiny	3.82	3
	GLOBE (.23)		soft	5.89	36
hard	4.45	2	thin	3.08	3
large	5.18	15	warm	3.47	6
round	6.87	69	wet	4.34	10
	GOAT (.14)			MANSION (.21)	
grey	3.76	2	large	6.34	86
hairy	4.74	17	white	3.69	13
small	2.66	14		MILK (.31)	
smelly	4.37	2	cold	5.78	53
thin	3.32	2	hot	2.00	3
white	4.29	16	sour	2.22	6
	GRAPEFRUIT (.61)		sweet	2.63	3
big	3.50	27	white	6.41	80
bitter	4.79	2	wet	5.06	3
cold	3.42	2		MINNOW (.39)	
juicy	5.97	26	gray	3.74	6
pink	5.00	32	little	6.11	73
round	5.74	38	shiny	4.66	3
soft	2.68	2	silver	4.87	30
sour	5.21	61	slimy	5.16	10
sweet	3.18	13	wet	5.66	10
white	1.95	8		MOCCASIN (.31)	
yellow	5.53	75	brown	5.32	13
	HONEY (.50)		furry	4.63	10
brown	2.42	4	small	3.34	3
clear	3.92	4	soft	4.79	40
creamy	3.37	4	warm	5.13	3
dark	1.82	2		MOON (.51)	
golden	5.87	29	big	4.55	17
smooth	5.03	2	blue	1.71	13
sticky	6.79	30	bright	5.08	33
sweet	6.63	90	crescent	4.55	3
thick	5.76	13	dark	2.32	3
	HOSPITAL (.32)		full	5.32	23
clean	5.94	48	orange	2.19	6
large	5.19	30	round	5.68	33
smelly	4.75	20	yellow	3.11	33
white	5.25	25	white	4.45	6
	IVORY (.35)			MOSS (.52)	
creamy	4.66	10	brown	3.32	3
hard	4.94	14	cool	4.21	3
shiny	3.59	7	damp	5.66	33
smooth	5.31	13	green	6.13	90
white	5.00	67	slimy	4.05	17
	KITTEN (.43)		small	2.89	3
black	3.11	7	soft	4.61	57
fluffy	6.08	10	thick	5.32	3
furry	5.95	47		NEEDLE (.46)	
grey	3.34	7	cold	2.72	3
small	4.87	70	gold	1.94	3
soft	5.95	47	light	4.19	6
warm	5.63	7	long	3.47	20
white	4.55	13	pointed	6.28	30

Property	Typicality	Dominance	Property	Typicality	Dominance
sharp	6.19	67	large	3.84	3
shiny	4.09	6	muddy	3.55	26
silver	4.56	16	round	3.34	6
small	4.59	20	shallow	5.13	3
thin	5.44	20	small	3.50	10
	OCEAN (.55)		wet	6.63	64
blue	5.34	46		SALT (.33)	
cold	4.97	17	crystallized	6.06	23
deep	5.88	20	dry	4.75	7
green	4.00	3	hard	3.91	3
grey	3.22	3	white	5.53	57
large	5.81	66		SILK (.42)	
salty	5.47	43	cool	4.45	13
wet	6.06	13	light	5.13	3
	OLIVE (.53)		shimmery	5.39	3
bitter	4.89	10	shiny	5.68	27
black	4.00	27	smooth	6.32	47
green	5.71	76	soft	5.68	63
round	4.79	30		STADIUM (.17)	
small	5.24	17	large	6.58	57
smooth	4.68	3	noisy	6.37	3
soft	3.03	3	round	4.55	17
	PEARL (.47)			SUGAR (.64)	
hard	5.25	7	brown	4.37	33
opaque	4.75	3	crunchy	2.74	3
round	5.88	50	crystallized	4.58	13
shiny	4.44	7	gritty	3.89	3
small	5.09	13	sticky	3.95	13
smooth	5.59	20	sweet	6.76	93
white	5.47	67	white	6.18	70
	PILLOW (.48)			SULPHUR (.42)	
big	3.41	7	crumbly	4.08	10
fluffy	5.44	13	smelly	6.61	73
lumpy	2.59	3	yellow	5.50	50
oblong	3.69	3		TEETH (.59)	
soft	5.50	90	clean	5.26	17
warm	4.36	3	crooked	3.68	3
white	4.94	23	hard	5.36	30
	PINEAPPLE (.36)		pointed	3.95	3
hard	4.13	16	sharp	4.24	23
juicy	5.89	30	shiny	5.05	3
pointed	4.00	3	strong	5.63	3
prickly	5.58	20	white	6.03	90
rough	4.63	3	yellow	3.16	13
sweet	5.29	30		TONGUE (.50)	
tangy	5.21	14	fat	2.42	13
yellow	4.05	40	long	2.92	27
	PLATTER (.43)		pink	4.50	27
flat	5.26	20	red	3.94	30
glass	3.84	3	rough	2.87	7
heavy	4.00	10	slippery	4.08	10
large	2.55	26	soft	4.11	17
oval	5.55	10	warm	4.53	7
round	4.26	10	ugly	2.92	3
silver	5.79	47		TWEEZER (.35)	
small	2.66	10	cold	3.16	3
	POT (.33)		long	2.91	3
black	4.19	21	pointed	4.03	20
deep	3.53	4	sharp	3.59	17
hard	4.78	14	shiny	3.81	3
heavy	4.03	11	silver	4.88	30
large	3.97	14	small	3.84	20
little	3.25	4	thin	3.47	3
round	4.47	28		VELVET (.47)	
shiny	4.06	7	plush	6.11	3
strong	4.06	4	purple	4.03	23
	PUDDLE (.59)		smooth	5.29	16
brown	4.08	10	soft	5.74	86
cold	4.42	3	warm	4.16	13
dirty	5.24	26			

Property	Typicality	Dominance	Property	Typicality	Dominance
	WALRUS (.29)				
brown	3.32	23	heavy	5.94	9
cold	4.03	10	long	4.91	5
grey	4.47	16	slimy	3.84	5
large	5.21	33	wet	4.69	5
slimy	4.13	3	white	2.91	28
smooth	3.82	6		WHEEL (.24)	
	WHALE (.30)		flat	1.97	4
big	6.28	81	hard	3.78	4
blue	3.66	23	large	3.03	4
grey	4.59	18	round	6.38	75
			wooden	3.22	4

Note—Beside each noun (in parentheses) is a value representing the relative frequency with which the noun elicited sensory descriptors; that is, proportion = number of sensory descriptors/total number of descriptors output. Typicality was rated on a scale of 1-7; 7 = highly typical. Dominance is given in percentages.

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