Behavior Research Methods & Instrumentation
1980, Vol. 12 (1), 8-15

Frequency of occurrence and concreteness ratings of homograph meanings

KEITH A. WOLLEN, STEVEN D. COX, MARGARET M. COAHRAN, DANIEL S. SHEA, and ROBERT F. KIRBY
Washington State University, Pullman, Washington 99164

The purpose of this research was to establish norms for the relative frequency of use of the different meaning of common homographs (words that have one spelling but two or more distinctly different meanings) and to present ratings of the concreteness-abstractness of those meanings. A total of 108 subjects wrote a phrase or sentence using each of 120 homographs that were presented at a 15.5-sec rate. For each homograph, norms are provided indicating the relative frequency with which each meaning was used by men and by women. In addition, four judges rated the concreteness-abstractness of each meaning. These ratings are also provided, as are the means of the overall concreteness for each homograph.

A homograph is a word that has a single spelling but two or more different meanings. Some people think of homographs as a small collection from the vast number of words that make up a lexicon. However, virtually any word has different meanings in different contexts and so could, in a sense, be viewed as a homograph. Thus, the study of homographs can be viewed as the study of a general characteristic of most words.

Perhaps for such reasons, homographs have become increasingly popular in psychological research in many different laboratories. Most of the uses center around the fact that homographs can be encoded in different ways. Because of this feature, homographs make excellent stimuli for experiments on set or priming (e.g., Cramer, 1968; Skanes & Donderi, 1973), encoding specificity (e.g., Goldstein, Schmitt, & Scheirer, 1978; Light & Carter-Sobell, 1970; Winograd & Conn, 1971), transfer (e.g., Hastroudi & Johnson, 1976; Muller, Brown, & Kausler, 1975), imagery (e.g., Begg & Clark, 1975), frequency estimation (e.g., Geis & Winograd, 1975; Rowe, 1973), clustering (e.g., Kausler & Kamichoff, 1970), and cerebral laterality (Wollen, Cox, Coahran, & Shea, Note 1).

To obtain homographs for research, many experimenters have had to scan dictionaries and thesauri. This is an extremely laborious and time-consuming method. Moreover, when completed, there are no normative data on such things as the relative frequencies of the various meanings. Thus, lists of homographs are clearly desirable.

There are a few existing lists, but most have weaknesses. For example, Fallows (1898) simply listed homographs and has no normative data whatsoever. Since the list is so old, many of the meanings do not apply today. Another source (Whitford, 1966) includes only those homographs that also have different pronunciations (e.g., refuse as a verb or a noun), and he provides no normative data.

Normative data are provided in the lists of Geis and Winograd (1974) and Kausler and Kollasch (1970). However, these lists include only a small number of homographs (50 and 40, respectively) and hence are too restricted for many purposes. Also, only two meanings are usually included, even though many of the words have more meanings. Some meanings are omitted and others are combined (e.g., Kausler & Kollasch combined meanings of "just" and "beautiful" for "fair," and "excellent" and "small" for "fine").

The most comprehensive list that also has normative data is provided by Cramer (1970). She used 100 homographs, which is a reasonably large number, and reported all responses made by her subjects. However, she provided no information concerning the relative number of males and females that participated in the research.

The Cramer (1970), Geis-Winograd (1974), and Kausler-Kollasch (1970) studies provided normative data on the frequencies of word associates to each homograph. One problem with the word-association approach is that it is sometimes impossible to tell exactly which meaning the subject encoded. For example, the stimulus "perch" had "sit" as a primary associate. Does "sit" refer to a noun (a place to sit) or to a verb (the act of sitting)? Another associate is "bird." Did the subject encode a noun (a bird perch) or a verb (a bird perching)? To preserve the precise meaning, we asked subjects to use each homograph in a phrase or sentence.

It is very likely that the encoding of a homograph will depend upon the preceding word or words. Previous norms have not exerted much control over this. Kausler and Kollasch (1970) used only two different random orders of the words, and Cramer (1970) had only one random order. Although Cramer rearranged the order of the pages, the words on a given page always appeared in the same sequence. Geis and Winograd (1974) recognized the problem and used four randomizations. We tried to gain still more generality by using

0005-7878/80/010008-08$01.05/0

six different randomizations, as well as by counterbalancing the pages on which the word appeared.

Previous researchers have used an unpaced procedure in which subjects respond to homographs in test booklets. Our experience has shown that subjects take much more care at first and then rush more and more as they tire of the task. To try to reduce this problem, we presented the homographs in a paced fashion so that the time spent on each word would be more nearly equalized.

METHOD

Materials

The materials were 124 homographs that ranged from three to seven letters in length. The homographs were obtained by scanning the *Macmillan Dictionary for Children* (1975). This source was used because we wanted common words that virtually everyone would know. We excluded words if we felt that only one meaning was likely to be used. Each homograph was typed in capital letters and photographed. The resulting negatives were mounted onto slides, thereby producing a light image on a dark background. Of the homographs, 21 overlapped with the 40 used by Kausler and Kollasch (1970), 14 overlapped with the 50 used by Geis and Winograd (1974), and 32 overlapped with the 100 used by Cramer (1970). Well over half of the homographs reported herein (73 in all) have not appeared in any of the previous sets of norms. Primary emphasis was placed on selecting homographs that would be likely to have both concrete and abstract codings. Previous norms have not had this emphasis.

Subjects

The subjects were introductory psychology students whose participation partially fulfilled a course requirement. The subjects were run in six small groups ranging in size from 15 to 22. Overall, there were 7 left-handed and 40 right-handed men and 5 left-handed and 56 right-handed women.

Procedure

The homographs were presented by means of a Kodak Carousel projector controlled by a Tally tape reader. Each slide was preceded by a 3,500-Hz tone that sounded for .5 sec and served as a warning that another word was to appear. As the tone terminated, a homograph appeared and stayed on the screen for 15 sec. The offset of the homograph marked the onset of another tone that repeated the cycle. Subjects were told that the purpose of the experiment was to investigate how words are used in sentences and phrases. The subjects were instructed to look at the screen when they heard the tone and to write a phrase or sentence as quickly as they could when they saw the word. The subjects wrote their responses in test booklets that consisted of six pages with 20 blank lines per page.

The first four homographs were for practice only and so were not scored. At the end of the practice session, questions were answered. The 60 experimental homographs were shown, using the same procedure. After the first 64 words, there was a brief break while the experimenter changed the slide trays. Then the last 60 homographs were shown.

Each of the six groups of subjects had a completely different sequence of words. The 120 experimental homographs were divided into six sets of 20 words each. A Latin square was used to assign sets to sections within the list so that each set appeared first for one group of subjects, second for another, third for still another, and so on. The balancing was such that, across groups of subjects, each set appeared before every other set as well as after every other set. Within sets, the words were randomized separately for each group of subjects, with the restriction that obviously related words (e.g., toast and jam, spring and dart, permit and refuse) could not follow each other.

RESULTS AND DISCUSSION

The relative frequency of occurrence of each meaning of each homograph was determined separately for men and women. The resulting percentages are shown in Table 1. The meanings are conveyed either by a brief definition or by using the word in a phrase, whichever seemed to communicate better. Table 1 does not include meanings used by only 1 or 2 of the 108 subjects. Also excluded are words for which all subjects used the same meaning. These words and the meanings used were "entrance" (an opening), "nap" (sleep), and "tense" (nervous). Thus, there are 117 homographs for which data are presented.

The percentages do not always add to 100 for several reasons. In many instances, there were meanings that were excluded because they were used by only one or two subjects. There was also a scattering of omissions, ambiguous meanings, and meanings inappropriate for the homograph. If such considerations are important for a given research project, it would be a simple matter to exclude words for which the sum of the percentages is appreciably below 100. In general, there was a high correlation between the percentage use of specific meanings by men and women (Pearson $r = .93$).

The comparability of our results to those of other investigators was also examined. This was accomplished by calculating the correlation coefficients between our norms and others, using whatever homographs were in common to the two sets of norms. Since some norms combined different meanings, meanings from our norms were similarly combined before calculating the correlations. In some cases it was not possible to know whether the combinations were the same as those used by other investigators, but the correlations should at least be approximations. Neither Cramer (1970) nor Geis and Winograd (1974) reported separate norms for males and females; hence, for comparisons with these data, it was necessary to average our values for males and females. The resulting correlations between our norms and others and the number of words in common were (1) $r = .73$ for Cramer, based on 32 common words; (2) $r = .95$ for Geis and Winograd, based on 14 common words; and (3) $r = .83$ (for males) and .87 (for females) for Kausler and Kollasch (1970), based on 21 common words. Thus, with the possible exception of the correlation with Cramer's norms, the correlations were fairly high.

Table 1 also includes a concreteness rating (designated by C) for each word meaning. These were determined by first making a list of all meanings for all homographs. Then four judges (the authors) rated each meaning on concreteness. Concreteness was defined along the general lines of Spreen and Schulz (1966).

Table 1
Percentage Frequency of Occurrence and Concreteness Ratings (C) for Men (M) and Women (W)

Homograph	C	Percentage M	W
ANNUAL (3.00-2.96)			
yearly	2	60	66
a yearbook	5	30	31
BANK (3.96-3.97)			
banks lend money	4	85	87
river bank	5	4	7
you can bank on it	2	4	5
BAR (4.91-4.88)			
a tavern or counter	5	77	90
a bar of gold, etc.	5	13	3
bar exams	1	2	3
BAT (4.35-4.57)			
an animal	5	34	49
baseball bat	5	30	26
to hit	3	19	10
Batman	5	6	3
"bat out of hell"	1	4	2
"bat an eyelash"	1	2	3
BEAR (2.49-2.60)			
I cannot bear it	2	79	77
an animal	5	13	18
he is an old bear	4	4	2
BEING (2.24-2.10)			
form of be	1	57	59
human being	4	40	34
BEND (3.21-3.08)			
to bend over	3	28	43
to bend metal	3	34	26
a bend in a river	4	26	15
to bend the rules	2	6	8
BLOCK (3.51-3.59)			
a city block	5	26	33
to block traffic	3	28	23
a block of something	4	15	21
blockhead	1	6	7
to block progress	2	8	2
a mental block	1	2	8
BLUFF (2.47-2.39)			
call his bluff	2	53	44
to bluff	2	28	36
a cliff	5	15	12
BLUNT (2.41-2.40)			
a blunt person	2	55	59
a blunt object	3	38	39
BOIL (3.49-3.13)			
to cook	3	67	90
a skin infection	5	22	6
BOOM (4.07-3.89)			
a noise	4	81	87
a machine	5	6	3
baby boom, boom town	2	0	7
BROKE (2.48-2.52)			
broke the vase	3	47	52
without money	2	45	41
broke a record, relationship	2	6	7
CAN (2.67-2.08)			
to be able	1	53	70
a container	5	38	26
CHANGE (3.70-3.43)			
coins	5	53	43
a difference	2	21	23
to change clothes, etc.	3	17	25
to change your mind	1	8	10
CHECK (4.17-4.00)			
a bank draft	5	62	49
to check a test	2	15	28
check book, account	5	4	16
check that out	2	9	3
to make a check mark	3	2	3
CLIP (3.81-3.95)			
a fastener	5	34	41
to cut	3	34	33
to fasten	3	9	10
to hit	3	9	3
a hit in football	4	6	3
a clip-on earring	4	2	5
COLD (3.88-3.86)			
cold in temperature	4	79	74
a disease	4	15	18
unfriendly	2	6	7
COMPACT (3.33-3.59)			
car	4	57	56
small, densely packed	2	30	25
cosmetic kit	5	2	13
to compact	3	6	2
CONSOLE (3.40-2.36)			
to comfort	2	26	72
a cabinet	4	60	16
COUNT (3.18-2.99)			
to count objects	3	46	59
count on us	2	11	21
Count Dracula, etc.	5	13	10
the final count	3	15	7
CRANE (4.85-4.93)			
a machine	5	53	54
a bird	5	23	26
crane your neck	3	6	3
CUE (4.31-4.04)			
a signal	3	34	44
pool cue	5	38	18
cue ball or cards	5	26	30
CURB (4.50-4.55)			
curb of a street	5	79	84
to curb appetite, impulse	2	11	13
to curb a dog	3	78	83
DART (4.67-4.48)			
a small missle	5	64	59
to move quickly	3	13	18
a game	4	6	16
Dodge Dart	5	15	7
DESERT (4.87-4.75)			
arid region	5	55	59
a dessert	5	36	30
to abandon	2	4	8
DIGEST (3.59-2.93)			
a magazine or diary	5	51	31
to digest food	2	45	59
to digest information	2	0	10
DOVE (4.10-4.29)			
a bird	5	53	61
dove into the pool	3	34	13
a symbol of peace	3	2	15
political dove	2	4	3
DOWN (3.20-2.96)			
a spatial location	3	38	52
feathers	5	23	13
downtown, down the road	2	6	20
he is down (emotionally)	2	11	8
prices, grades go down	2	11	2
DRY (3.46-3.48)			
not wet	4	53	61
to dry off	3	21	26

Table 1 Continued

Homograph	C	Percentage M	W
thirsty	2	11	0
dry throat or lips	3	6	3
dry humor	1	0	7
DUCK (4.56-4.62)			
an animal	5	64	75
to duck down	3	21	18
duck pond	5	11	3
FAIR (3.61-2.97)			
county fair	5	51	38
equitable	1	30	46
fair skies or skin	4	19	13
FAST (2.00-2.00)			
quick, quickly	2	81	80
to go without food	2	6	8
promiscuous	2	4	5
FELT (2.67-2.59)			
I felt ill	2	47	57
I felt the texture	3	34	25
a cloth	5	13	13
I felt it was wrong	1	6	5
FIGURE (3.36-3.20)			
a shape (person or thing)	4	62	48
to consider	2	32	39
a number	4	2	7
figure skater	4	4	3
FILE (3.65-3.56)			
to arrange	3	30	34
a container	5	13	18
to scrape	3	13	15
a set of records	4	17	8
a tool	5	8	5
to file for divorce	2	2	3
on file	2	2	3
FINE (2.05-1.89)			
I am (feeling) fine	2	32	30
library fine, etc.	2	19	20
fine time, he did fine	1	17	21
fine house	2	15	21
fine sandpaper, wire	4	11	5
FLAT (3.64-3.46)			
flat surface	3	64	70
flat (tire)	5	28	18
an apartment	5	2	3
FLY (3.94-3.72)			
to fly in air	3	49	54
an insect	5	43	34
pants placket	5	6	3
fly-by-night	1	2	3
FOIL (4.27-4.79)			
thin metal	5	66	90
to thwart	2	23	7
fencing foil	5	6	2
FORCE (2.59-3.00)			
to force a door or person	3	26	33
strength	3	17	34
"The Force" (Star Wars)	1	30	8
police, air, etc., force	4	21	16
FRESH (2.00-2.00)			
uses implying newness or purity	2	79	79
flirtations	2	19	15
GRATE (3.44-3.20)			
to grate cheese	3	53	54
a metal grille	5	23	18
to grate on nerves	2	9	18

Table 1 Continued

Homograph	C	Percentage M	W
GROSS (1.53-1.62)			
a gross person	2	38	59
gross weight, profit, etc.	1	40	33
12 dozen	2	11	0
gross understatement	1	4	3
GROUND (4.78-4.73)			
earth	5	74	70
groundhog	5	4	13
ground floor	4	4	7
chopped	3	6	3
she ground corn	3	2	7
HAMPER (3.88-4.29)			
a container	5	57	74
to hinder	2	34	23
HEAD (3.49-3.72)			
head of a body, bed, etc.	5	32	43
a good head (intelligent)	1	19	10
a leader	4	4	16
to head south	1	4	10
a brand name	5	11	3
sexual slang	3	9	0
drug slang	4	4	2
ahead	3	4	2
a big head (inflated ego)	1	2	3
HIDE (3.29-3.21)			
to conceal	3	68	54
hide and seek (game)	3	15	33
animal skin	5	13	8
hideaway	4	2	5
HOLD (2.46-2.62)			
to grip an object or person	3	36	48
to wait or to keep (hold it, hold still)	2	34	33
put on hold	2	13	5
a grip	4	2	5
to have an emotional hold	2	2	3
HOST (3.84-3.94)			
a host of a party	4	94	92
to host a party	2	2	3
a multitude	1	4	0
HUSKY (4.37-4.15)			
husky body	4	30	46
a dog	5	36	21
(a school mascot)	4	32	18
husky voice	3	0	7
INTEREST (1.85-1.89)			
to have interest in	2	83	87
interest on a loan	1	15	11
INVALID (2.39-2.96)			
not valid	1	64	51
a sick person	5	34	49
IRON (3.64-4.16)			
a metal	5	26	57
to iron a shirt	3	30	11
an appliance	3	13	25
iron pills	3	15	5
muscles of iron	4	4	3
JAM (4.41-4.28)			
a food	5	68	64
a difficult situation	2	8	12
jam session	3	11	5
traffic jam	4	6	7
jammed door, etc.	3	0	5
to jam into	3	2	3
KIND (1.58-1.79)			

Table 1 Continued

Homograph	C	Percentage M	W
a kind person	2	57	79
a kind of car	1	38	16
I kind of like her	1	4	5
LASH (3.70-3.56)			
eyelash	5	23	28
to lash out	2	19	31
give him 30 lashes	4	21	15
to tie	3	15	8
to whip	3	6	5
a whipping tool	5	4	3
whiplash	5	4	3
LEAD (3.65-3.55)			
to lead a horse, etc.	3	17	43
a metal	5	43	13
pencil lead	5	8	23
"get the lead out"	1	19	10
take the lead, etc.	3	11	5
LIGHT (4.80-4.51)			
light bulb, switch, etc.	5	40	38
it is light out	4	40	34
metaphorical uses (e.g., see the light)	1	8	11
to light a fire	3	2	10
light in weight	2	4	2
LIKE (2.00-2.00)			
I like cake	2	89	93
similar to, she looks like you, etc.	2	11	7
LOAF (3.77-3.76)			
bread, meat loaf	4	77	74
to loaf	3	23	23
LOUNGE (4.58-4.48)			
a room	5	74	69
to be idle	3	21	26
lounge chair	5	4	5
MIGHT (1.56-1.22)			
maybe	1	72	87
strength	3	28	11
MINE (2.08-1.81)			
belonging to me	1	68	75
coal, etc., mine	5	19	16
explosive device	5	6	3
MOLD (4.49-4.47)			
mold on cheese	5	68	69
jello, etc., mold	4	17	16
to mold clay	3	11	8
to mold personality	2	4	7
MOLE (4.87-4.78)			
an animal	5	49	43
a body spot	5	40	44
chemical unit	2	4	7
NET (4.07-3.95)			
fish, tennis, etc., net	5	72	72
net profit, weight	1	19	25
to net a fish	3	8	2
NOVEL (1.76-1.72)			
new	1	81	82
a book	5	19	18
OBJECT (2.53-2.23)			
to object	2	34	33
some material thing	4	36	28
the purpose	1	23	34
ODD (1.00-1.00)			
unusual	1	79	93
not even	1	11	3
ORGAN (4.81-4.84)			
a musical instrument	5	81	82

Table 1 Continued

Homograph	C	Percentage M	W
a part of the body	4	19	16
PAGE (4.82-4.76)			
a book page	5	79	84
a messenger	4	6	10
to call someone	3	6	7
a person's name	5	8	0
PEER (3.45-3.40)			
an equal	4	68	66
to look	2	26	28
PELT (4.72-4.63)			
animal skin	5	79	67
to strike	3	13	15
PERCH (4.17-3.91)			
a fish	5	47	25
to perch	3	30	34
a resting place	4	21	36
PERFECT (1.02-1.07)			
it is perfect	1	98	93
to perfect the process	2	2	7
PERMIT (3.32-3.40)			
a document	4	66	70
to allow	2	34	30
PICK (2.93-2.93)			
to pick up (grasp objects)	3	38	36
to choose	2	23	26
a tool	5	13	15
to pick nose, teeth	3	13	8
to tease	2	6	3
take your pick	2	4	3
pick us up	2	0	5
PIT (4.32-4.18)			
a hole	5	45	33
fruit pit	5	9	30
this is the pits	2	13	23
this room is a pit	4	21	7
PLANE (4.35-4.87)			
airplane	5	77	92
plane geometry	1	15	3
PLOT (2.27-2.14)			
a plan	2	79	82
a plot of land	4	13	7
to plan	2	6	8
PRESENT (2.83-2.85)			
a gift	4	43	43
to be present at a meeting	2	26	18
now, at this time	1	17	20
to present an award or speech	3	6	16
to introduce someone	3	8	3
PRESS (3.40-3.49)			
newspeople	4	28	31
to push	3	23	23
to iron clothes	3	19	20
a machine	5	8	12
the newspaper process	3	11	5
to press for an answer	2	2	5
press your luck	2	4	2
PRUNE (4.43-4.77)			
a fruit	5	62	85
to prune shrubs	3	19	8
"old prune," "prune face"	4	19	7
PUNCH (4.32-4.22)			
a drink	5	60	57
to hit	3	34	38
Punch and Judy	5	6	3
PUPIL (5.00-5.00)			

Table 1 Continued

Homograph	C	Percentage M	W
part of the eye	5	53	69
a student	5	47	31
RACKET (4.15-4.28)			
tennis racket	5	53	48
racquetball	4	23	28
a scheme	1	13	7
noise	4	6	13
RASH (3.83-3.96)			
a skin rash	5	68	74
a rash decision	1	26	23
a rash of people	1	2	3
REFUSE (2.26-2.10)			
to reject	2	87	95
trash	4	13	5
ROCK (4.33-4.56)			
a stone	5	47	77
music	4	32	28
to sway	3	6	5
do not rock the boat	1	4	3
ROOT (3.41-3.36)			
part of a plant	5	47	48
root of the problem	1	27	34
root beer	5	4	8
to dig	3	9	0
family history	2	2	5
square root	1	4	2
ROSE (4.91-4.83)			
a flower	5	79	82
I rose from the chair	3	4	8
a girl's name	5	4	5
RUNG (3.65-3.34)			
bell has rung	3	32	48
"wrung"	3	34	31
ladder rung	5	32	16
SAW (3.16-3.01)			
I saw them	2	49	61
a cutting tool	5	32	31
to cut	3	15	7
SEAL (4.26-4.22)			
an animal	5	43	48
a seal (Easter, jar, etc.)	5	23	16
to seal something	3	17	20
my seal of approval	2	11	7
seal with a kiss	3	2	8
SENSE (1.09-1.19)			
to make sense	1	36	28
sense of humor, direction, etc.	1	15	23
common sense	1	23	13
sixth sense	1	17	15
to sense, use the senses	2	9	18
SHED (4.15-4.06)			
a building	5	55	52
to shed hair, clothes, tears, etc.	3	41	46
SOLE (3.95-3.95)			
shoe sole	5	64	52
only	1	15	16
filet of sole	5	9	21
"soul"	1	11	10
SOW (4.25-4.13)			
female hog	5	53	53
to sow seeds	3	32	41
SPRING (2.56-2.23)			
season of the year	2	77	85

Table 1 Continued

Homograph	C	Percentage M	W
to move quickly	3	4	8
water	5	6	5
bed, etc., spring	5	11	0
SQUASH (4.48-4.42)			
a vegetable	5	62	62
a game	4	21	18
to squash	3	15	20
STABLE (3.43-3.76)			
horse's stable	5	53	66
emotionally balanced	1	19	20
condition of health	2	15	10
mechanically balanced, unchanging	2	11	5
STEER (4.31-3.81)			
an animal	5	64	46
to steer a car, etc.	3	30	41
to steer clear of	2	2	12
STICK (3.56-3.48)			
a piece of wood	5	40	46
to adhere	3	19	8
stick to it	2	6	18
stick it to him, etc.	1	9	7
"stick in the mud"	1	2	10
"get on the stick"	1	6	0
stick shift	5	4	2
STRESS (2.22-2.02)			
mental stress	2	70	89
mechanical stress	3	21	2
to stress a point	2	4	8
STRIP (3.42-3.44)			
to remove something	3	38	39
a strip of bacon, wood, etc.	4	21	30
air strip, Las Vegas strip, etc.	4	19	13
strip poker or strip tease	3	17	16
SUIT (4.45-4.41)			
clothing	5	83	82
law suit	2	13	3
to please	1	4	12
SWALLOW (3.30-3.31)			
to swallow food	3	70	77
a bird	5	17	18
to believe	2	6	5
TEAR (4.06-4.13)			
tear drops	5	49	51
to rip	3	43	38
a rip	4	6	11
TEND (1.35-1.26)			
to have a tendency to	1	64	74
to take care of	2	17	16
to pay attention to	2	17	10
TIRE (4.51-4.49)			
a tire for a car, etc.	5	77	79
to get tired	2	15	16
TOAST (4.54-4.53)			
a form of bread	5	77	74
a proposed drink	3	17	21
to toast bread	3	6	2
WAKE (3.56-3.33)			
wake up from sleep	3	57	82
boat's wake	5	17	15
funeral wake	4	17	3
WATCH (3.59-3.55)			
a timepiece	5	53	51
to observe	2	28	36

Table 1 Continued

Homograph	C	Percentage M	W
watch out	2	19	12
WELL (3.49-3.04)			
oil, water well	5	54	41
I am well	2	23	38
he did well	1	8	12
oh well, etc.	1	11	8
WILL (1.71-2.09)			
I will go	1	55	56

Table 1 Continued

Homograph	C	Percentage M	W
a legal document	4	23	36
her will, will power	1	19	7
WOUND (4.06-4.40)			
a physical injury	5	55	72
past of "to wind"	3	21	10
to injure physically	3	8	7
all wound up (tense)	2	8	5
to hurt someone's feelings	2	2	3

Meanings that referred to material objects that could be experienced directly by the senses were assigned a rating of 5 (concrete), and meanings that could not be experienced directly by the senses were assigned a rating of 1 (abstract).

The judges first agreed on one or two exemplars of each of the five possible ratings. Then each judge rated a particular meaning. If three of the four judges agreed, the meaning was added to the list and another meaning was evaluated. Thus, each new meaning was compared with the meanings that had already been rated; this technique was used to reduce the number of internal inconsistencies within the ratings. If there was not agreement among three of the four judges, a fifth judge (an undergraduate student) resolved the split.

It is not possible to describe exactly the bases for assigning words to the five rating categories, but the types of words in each category did show some general trends. Meanings given a rating of 5 were generally specific objects, typically nouns, such as "tire" (vehicle), "toast" (food), "fly" (insect), and "lead" (metal). Ratings of 4 were more general things, such as "object" (some material thing), "present" (gift), and "force" (police). Ratings of 3 were primarily verbs depicting specific actions, such as "punch" (to hit), "saw" (to cut), and "hold" (to grip). Ratings of 2 consisted of verbs describing nonspecific actions, such as "hamper" (to hinder), "object" (to oppose), and "plot" (to plan). Finally, ratings of 1 consisted of various parts of speech, such as "can" (to be able), "net" (profit), "odd" (unusual), "object" (purpose), and "well" (as in "oh, well"). Over all 117 words, the number of meanings with ratings of 1, 2, 3, 4, and 5 were 58, 93, 93, 56, and 115, respectively.

The numbers in parentheses beside each word in Table 1 are the means of the concreteness ratings for men (the first number) and women (the second number). These means were based only on the data shown in Table 1; in other words, meanings not used by at least three subjects (men and women combined) were excluded. The mean of these means for all words was 3.48 for men and 3.43 for women, a difference that did not reach statistical significance [$F(1,232) < 1.00$]. Thus, although the mean concreteness was higher for men on some words and higher for women on others, the overall level of concreteness was about the same for both sexes. The utility of the concreteness ratings was demonstrated by Wollen et al. (Note 1), who used 64 of the homographs. In that experiment, words presented to the left hemisphere were coded more concretely than words presented to the right hemisphere for men but not for women.

An internal analysis of the concreteness ratings revealed that the primary (most frequent) coding tended to be more concrete than the secondary (next most frequent) coding. For males, the means for the primary and secondary responses of all 117 homographs were 3.70 and 3.19, respectively ($t = 2.74$). For females, the corresponding values were 3.60 and 3.16 ($t = 2.40$). Hence, it appears that, when there is a choice, subjects will respond more often with a concrete coding than with an abstract one.

REFERENCE NOTE

1. Wollen, K. A., Cox, S. D., Coahran, M. M., & Shea, D. S. *Homograph coding and cerebral laterality.* Paper presented at the meeting of the Psychonomic Society, Phoenix, November 1979.

REFERENCES

Begg, I., & Clark, J. M. Contextual imagery in meaning and memory. *Memory & Cognition*, 1975, **3**, 117-122.

Cramer, P. Mediated priming of polysemous stimuli. *Journal of Experimental Psychology*, 1968, **78**, 137-144.

Cramer, P. A study of homographs. In L. Postman & G. Keppel (Eds.), *Norms of word association.* New York: Academic Press, 1970.

Fallows, A. M. *A complete dictionary of synonyms and antonyms.* New York: Revell, 1898.

Geis, M. F., & Winograd, E. Norms of semantic encoding variability for fifty homographs. *Bulletin of the Psychonomic Society*, 1974, **3**, 429-431.

Geis, M. F., & Winograd, E. Semantic encoding and judgments of background and situational frequency for homographs. *Journal of Experimental Psychology: Human Learning and Memory*, 1975, **1**, 385-392.

Goldstein, E., Schmitt, J. C., & Scheirer, C. J. Semantic effects in encoding specificity: A levels of processing approach. *Memory & Cognition*, 1978, **6**, 13-19.

Hashtroudi, S., & Johnson, M. K. Transfer and forgetting:

Interpretive shifts and stimulus reinstatement. *Journal of Experimental Psychology: Human Learning and Memory,* 1976, **2**, 262-272.

KAUSLER, D. H., & KAMICHOFF, N. C. Free recall of homographs and their primary associates. *Journal of Verbal Learning and Verbal Behavior,* 1970, **9**, 79-83.

KAUSLER, D. H., & KOLLASCH, S. F. Word associations to homographs. *Journal of Verbal Learning and Verbal Behavior,* 1970, **9**, 444-449.

LIGHT, L. L., & CARTER-SOBELL, L. Effects of changed semantic context on recognition memory. *Journal of Verbal Learning and Verbal Behavior,* 1970, **9**, 1-11.

Macmillan dictionary for children. New York: Macmillan, 1975.

MULLER, J. H., BROWN, S. C., & KAUSLER, D. H. Paired-associate transfer with homographic stimuli. *Journal of Experimental Psychology: Human Learning and Memory,* 1975, **1**, 167-172.

ROWE, E. J. Frequency judgements and recognition of homonyms. *Journal of Verbal Learning and Verbal Behavior,* 1973, **12**, 440-447.

SKANES, G., & DONDERI, D. C. Stimulus set, response set, and word identification. *Journal of Experimental Psychology,* 1973, **99**, 413-423.

SPREEN, O., & SCHULZ, R. W. Parameters of abstraction, meaningfulness, and pronunciability for 329 nouns. *Journal of Verbal Learning and Verbal Behavior,* 1966, **5**, 459-468.

WHITFORD, H. C. *A dictionary of American homophones and homographs.* New York: Teachers College Press, 1966.

WINOGRAD, E., & CONN, C. P. Evidence from recognition memory for specific encoding of unmodified homographs. *Journal of Verbal Learning and Verbal Behavior,* 1971, **10**, 702-706.

(Received for publication January 13, 1980;
accepted January 22, 1980.)