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ATTITUDINAL EFFECTS OF MERE EXPOSURE [1]

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The hypothesis is offered that mere repeated exposure of the individual to a stimulus object enhances his attitude toward it. By "mere" exposure is meant a condition making the stimulus accessible to the individual's perception. Support for the hypothesis consists of 4 types of evidence, presented and reviewed: (a) the correlation between affective connotation of words and word frequency; (b) the effect of experimentally manipulated frequency of exposure upon the affective connotation of nonsense words and symbols; (c) the correlation between word frequency and the attitude to their referents; (d) the effects of experimentally manipulated frequency of exposure on attitude. The relevance for the exposure-attitude hypothesis of the exploration theory and of the semantic satiation findings were examined.

On February 27, 1967, the Associated Press carried the following story from Corvallis, Oregon:

> A mysterious student has been attending a class at Oregon State University for the past two months enveloped in a big black bag. Only his bare feet show. Each Monday, Wednesday, and Friday at 11:00 A.M. the Black Bag sits on a small table near the back of the classroom. The class is Speech 113—basic persuasion. . . . Charles Goetzinger, professor of the class, knows the identity of the person inside. None of the 20 students in the class do. Goetzinger said *the students' attitude changed from hostility toward the Black Bag to curiosity and finally to friendship* [italics added].

This monograph examines the general hypothesis implied by the above phenomenon: mere repeated exposure of the individual to a stimulus is a sufficient condition for the enhancement of his attitude toward it. By "mere exposure" is meant a condition which just makes the given stimulus accessible to the individual's perception.

Even though the hypothesis seems to be in conflict with such celebrated laws as *familiarity breeds contempt* and *absence makes the heart grow fonder,* it is not particularly original or recent (Fechner, 1876, pp. 240–243; James, 1890, p. 672; Maslow, 1937; Meyer, 1903; Pepper, 1919). The foremost proponent of this hypothesis, the advertising industry, has always attributed to exposure formidable advertising potential. But—apparently, in respect for the law of enhancement by association—it seldom dared to utilize *mere* exposure. The product, its name, or its hallmark is always presented to the public in contiguity with other and always attractive stimuli, commonly females, exposed more boldly than the product itself. At the same time, however, the advertising industry also likes to warn against *over*exposure, relying, it would appear, on the above law of familiarity (Erdelyi, 1940; Wiebe, 1940).

It isn't altogether clear just what evidence supports these advertising principles. And

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direct evidence that attitudes are enhanced by *mere* exposure or *mere* contact with the stimulus object is scant. Moreover, it is the product of antiquated methods, and almost all of it concerns music appreciation (Downey & Knapp, 1927; Krugman, 1943; Meyer, 1903; Moore & Gilliland, 1924; Mull, 1957; Verveer, Barry, & Bousfield, 1933; Washburn, Child, & Abel, 1927). The problem of attitudinal effects of social contact and interaction has also been of some interest in the study of interracial attitudes (Cook & Selltiz, 1952). But these studies have invariably examined the effects not of *mere* perceptual exposure of people to each other, but of processes considerably more complex: prolonged social interaction, group interdependence, cooperation, etc. (Deutsch & Collins, 1951; Kramer, 1950; MacKenzie, 1948; Wilner, Walkley, & Cook, 1952). Although the independent variables in these studies have generally been featured under the labels "contact" and "exposure," the effects they report cannot, because of confounding with a multitude of other events (and with reinforcement in particular), be regarded as produced alone by contact or exposure. Thus, it has been known for some time that social interaction enhances the attitudes of interactors toward each other (Bovard, 1951; Festinger, 1951; Homans, 1961; Newcomb, 1963). But it is not known just what contribution to the relationship between social interaction and attitudes is made by *mere* exposure on the one hand, and by the variety of psychologically significant processes that necessarily accompany mere exposure during the course of social interaction, on the other.

The main empirical support for the exposure hypothesis comes, therefore, not from work on interaction, interracial attitudes, or attitudes in general, but from an entirely different and seemingly unrelated area of research. It comes from some recent work on word frequencies. This recent research shows that there exists an intimate relationship between word frequency and meaning. And this relationship, in my opinion (for which I shall later present support), may be a special case of the more general relationship between mere exposure and attitude enhancement.

The strength and pervasiveness of the relationship between word frequency and meaning—the *evaluative* aspect of meaning, in particular—is truly remarkable. For, if there is any correspondence between the frequency with which words are used and the actual preponderance of the things and events for which these words stand, then we may congratulate ourselves on living in a most happy world. According to the Thorndike-Lorge count (1944), the word "happiness" occurs 761 times, "unhappiness" occurs only 49 times. "Beauty" is to be found at least 41 times as often as "ugliness," and "wealth" outdoes "poverty" by a factor of 1.6. We "laugh" 2.4 times as often as we "cry"; we "love" almost 7 times more often than we "hate"; we are "in" at least 5 times more often than we are "out"; "up" twice as often as we are "down"; much more often "successful" than "unsuccessful"; and we "find" things 4.5 times more often than we "lose" them—all because most of us are "lucky" (220) rather than "unlucky" (17).

We have all the reasons in the world to be "happy" (1449) and "gay" (418) rather than "sad" (202) and "gloomy" (72), for things are 5 times more often "good" than "bad," almost 3 times more often "possible" than "impossible," and about five times more "profitable" than "unprofitable." That is, perhaps, why "boom" and "prosperity" outdo "recession" by a factor of just about 30, "abundance" outdoes "scarcity" by at least 3:1, and "affluence" is 6 times more prevalent than "deprivation." Catering to our corporeal sensibilities, things are 3 times more often "fragrant" than they are "foul," 12 times more often "fresh" than "stale," and almost 7 times more often "sweet" than "sour," and everything that can be filled is three times as often "full" as it is "empty." If we have anything, we have "more" of it 6 times more often than we have "less" of it,[2] and 3 times more often "most" of it than "least" of it. And those things that we have so frequently more of are 5 times more often "better" than they are "worse," 6 times more often "best" than "worst," and 4 times more often "superior" than "inferior." Still,

[2] N.B. The more-less ratio in this text is 7:1 up to now.

they "improve" at least 25 times as often as they "deteriorate."

These examples suffice to convince one that the world represented by a one-to-one correspondence with word frequencies is as unreal as it is spectacular. Bitterly aware of it, Sartre (1964) confessed in his autobiography, ". . . as a result of discovering the world through language, for a long time, I took language for the world [p. 182]."

But, while they are unfaithful in representing reality, word frequencies are extraordinarily accurate in representing real values: words that stand for good, desirable, and preferred aspects of reality are more frequently used.

It isn't entirely clear who discovered this remarkable relationship between word frequency and the evaluative dimension of word meaning. Postman (1953) seems to be one of the early workers to note its generality, while Howes and Solomon (1950) observed in their critique of McGinnies' (1949) perceptual defense experiment that the so-called "taboo" words he used as stimuli are particularly infrequent. However, the first systematic research effort that demonstrates the word-frequency–word-value relationship is due to Johnson, Thomson, and Frincke (1960). These authors were the first, I believe, to collect empirical data showing that words with "positive" meaning have higher frequency counts than words with "negative" meanings. They have also gathered experimental evidence showing that the repeated use of a nonsense word tends to enhance its rating on the good-bad scale of the semantic differential. Johnson, Thomson, and Frincke (1960) have not tried to explain either of these two aspects of the frequency-value relationship, being primarily concerned with its implications for the study of word-recognition thresholds.

This paper examines the frequency-value relationship, proposing that it is considerably more pervasive and general than implied by the Johnson-Thomson-Frincke results, and that it is, moreover, a special case of a broader and more basic phenomenon: the enhancement of attitudes by mere repeated exposure. I shall first review evidence on the correlation between word frequency and word value, and between stimulus frequency and attitude. Experimental evidence on these two relationships, and on the likely causal direction, will then be examined.

Word Frequency–Word Value: Correlational Evidence

Johnson, Thomson, and Frincke (1960) obtained correlations of .63, .40, and .38 between the L-count (Thorndike & Lorge, 1944) and the good-bad scale values for three samples of randomly chosen words. In a further attempt, they constructed 30 pairs, each consisting of one frequent and one infrequent word. These pairs were given to a group of subjects with the instructions to "encircle the most pleasantly toned word of each pair." In 87% of the pairs the majority of subjects endorsed the more frequent word. Finally, 64 nonsense syllables of low, medium, and high association were rated by a group of subjects on the good-bad scale of the semantic differential. Johnson, Thomson, and Frincke reported a clear relationship between association value and "goodness" ratings. The rationale of this study invoked the assumed relationship between association of the given nonsense syllable and the probability of occurrence of the corresponding letter combination in meaningful words (Underwood, 1959).

In an attempt to examine the generality of this phenomenon, we studied the evaluations of 154 antonym pairs. First, a large pool of antonym pairs was amassed. From this pool all symmetric [3] pairs were chosen in the following manner. For each antonym pair 10 judges, 1 at a time, were asked to give the antonym of one member of the pair. Ten other judges—independently of the first 10—were asked to give the antonym of the other

[3] One finds in the course of this endeavor that the antonymic relation is seldom symmetric. According to the standard sources, if Y is listed as the antonym of X, then chances are that not X but Z is listed as the antonym of Y. For instance, in the 1960 edition of Webster's New Collegiate Dictionary, "extend" is given as the antonym of "contract." Looking up "extend" we find, however, that its antonym is "reduce." The antonym of "reduce," on the other hand, is "increase." The antonym of "increase" is "decrease," the antonym of "decrease" is "amplify," the antonym of "amplify" is "condense," and the antonym of "condense" is "expand." We can ultimately close the circle, because "contract," according to this source, is the antonym of "expand."

TABLE 1

SEMANTIC PREFERENCE AND FREQUENCY OF 154 ANTONYM PAIRS

% agreement	Preferred alternative (*a*)	Nonpreferred alternative (*b*)	Frequency of (*a*)	Frequency of (*b*)	% agreement	Preferred alternative (*a*)	Nonpreferred alternative (*b*)	Frequency of (*a*)	Frequency of (*b*)
100	able	unable	930	239	96	active	passive	186	29
100	attentive	inattentive	49	4	96	early	late	1022	2859
100	better	worse	2354	450	96	front	back	1094	6587
100	encourage	discourage	205	147	96	full	empty	1129	395
100	friendly	unfriendly	357	19	96	live	die	4307	1079
100	honest	dishonest	393	41	96	presence	absence	277	163
100	possible	impossible	1289	459	96	probable	improbable	64	14
99	advance	retreat	452	105	96	rational	irrational	33	9
99	best	worst	1850	292	96	reasonable	unreasonable	155	56
99	clean	dirty	781	221	96	resolutely	irresolutely	30	4
99	comfortable	uncomfortable	348	112	96	strong	weak	770	276
99	favorable	unfavorable	93	25	96	succeed	fail	264	620
99	good	bad	5122	1001	96	superior	inferior	166	40
99	grateful	ungrateful	194	13	96	timely	untimely	27	6
99	peace	war	472	1118	95	accept	reject	667	51
99	present	absent	1075	65	95	direct	indirect	416	23
99	pure	impure	197	4	95	include	exclude	533	38
99	responsible	irresponsible	267	30	95	increase	decrease	781	86
99	reward	punishment	154	80	95	most	least	3443	1259
99	right	wrong	3874	890	95	practical	impractical	340	12
99	smile	frown	2143	216	95	regularly	irregularly	122	5
99	tolerant	intolerant	42	13	95	rich	poor	656	857
99	victory	defeat	118	166	95	wealth	poverty	243	146
98	add	subtract	2018	6	94	approve	disapprove	171	45
98	advantage	disadvantage	404	41	94	conscious	unconscious	299	116
98	agreeable	disagreeable	58	43	94	leader	follower	373	45
98	capable	incapable	176	30	94	obedient	disobedient	70	4
98	desirable	undesirable	160	42	94	together	apart	1835	276
98	find	lose	2698	593	93	agreement	disagreement	143	21
98	fortunate	unfortunate	136	108	93	certain	uncertain	800	107
98	forward	backward	736	139	93	first	last	5154	3517
98	friend	enemy	2553	883	93	major	minor	366	83
98	high	low	1674	1224	93	normal	abnormal	335	43
98	honorable	dishonorable	58	8	93	regular	irregular	340	44
98	kind	unkind	1521	34	93	unselfish	selfish	32	137
98	legal	illegal	180	34	93	upwards	downwards	9	40
98	life	death	4804	815	93	wide	narrow	593	391
98	love	hate	5129	756	92	more	less	8015	1357
98	mature	immature	91	17	92	now	then	7665	10208
98	moral	immoral	272	19	92	up	down	11718	5534
98	pleasant	unpleasant	457	114	92	upward	downward	111	27
98	polite	impolite	115	3	92	visible	invisible	110	74
98	reliable	unreliable	78	9	92	yes	no	2202	11742
98	success	failure	573	262	91	always	never	3285	5715
98	valid	invalid	22	56	91	familiar	unfamiliar	345	39
98	voluntary	involuntary	28	26	91	maximum	minimum	43	86
97	adequate	inadequate	95	59	91	optimism	pessimism	28	11
97	competent	incompetent	69	23	90	agree	disagree	729	38
97	found	lost	2892	1074	90	necessary	unnecessary	715	107
97	important	unimportant	1130	40	90	over	under	7520	2961
97	likely	unlikely	364	25	90	sweet	sour	679	102
97	on	off	30224	3644	90	whole	part	1663	1585
97	patience	impatience	139	39	89	light	dark	2387	1005
97	patient	impatient	392	79	88	deep	shallow	881	104
97	patiently	impatiently	85	82	88	smooth	rough	346	294
97	popular	unpolular	418	12	86	white	black	2663	1083
97	positive	negative	92	28	85	in	out	75253	13649
97	profitable	unprofitable	57	12	85	independent	dependent	134	18
97	promote	demote	90	2	84	fast	slow	514	434
97	remember	forget	1682	882	83	comedy	tragedy	126	189
97	satisfactory	unsatisfactory	154	32	83	fasten	unfasten	142	16
97	willingly	unwillingly	66	13	79	day	night	4549	3385
96	above	below	941	529	78	dry	wet	592	319

TABLE 1—*Continued*

% agreement	Preferred alternative (*a*)	Nonpreferred alternative (*b*)	Frequency of (*a*)	Frequency of (*b*)	% agreement	Preferred alternative (*a*)	Nonpreferred alternative (*b*)	Frequency of (*a*)	Frequency of (*b*)
78	long	short	5362	887	63	answer	question	2132	1302
78	unshaken	shaken	6	83	63	men	women	3614	2552
77	usually	unusually	718	91	61	different	same	1194	1747
74	upstairs	downstairs	314	226	59	inward	outward	43	54
72	inner	outer	143	97	59	man	women	7355	2431
72	interior	exterior	185	48	58	husband	wife	1788	1668
70	near	far	1338	1835	58	usual	unusual	516	273
70	unlimited	limited	43	67	57	offense	defense	86	223
68	inside	outside	656	921	55	hot	cold	1006	1092
68	wrap	unwrap	293	17	55	import	expert	86	88
67	infinite	finite	71	2	55	inwardly	outwardly	32	33
67	internal	external	36	26	54	inconspicuous	conspicuous	33	59
65	coming	going	1486	4623	52	play	work	2606	2720
64	informal	formal	64	166	51	mortal	immortal	54	26

member of the pair. Only those pairs were retained about which the 20 judges showed unanimous agreement with the dictionary sources. A list of 154 antonym pairs was thus obtained. These were given to 100 subjects, all college students, for judgments as to which member had "the more favorable meaning, represented the more desirable object, event, state of affairs, characteristic, etc." A different random order of the antonym pairs was given to each subject, and the lateral positions of the members of each pair were reversed at random for half of the group.

Table 1 shows the list of these 154 antonym pairs, together with the "desirability" and the frequency data (the Thorndike-Lorge L-count). The preferred member of each pair is always listed first. The "desirability" figures are simply the percentages of subjects choosing the left member of the pair as the preferred alternative.

It is of some interest, however incidental, that there is considerable agreement about desirability of the meanings. On half of the items the agreement exceeded 95%. Agreement is high even for words which are not genuinely evaluative. For instance, 97 of the 100 students preferred "on" to "off," 98 preferred "add" to subtract, 96 "above" to "below," and 92 "upward" to "downward."

For the overwhelming majority of the items the preferred word is also the more frequent one. Only 28 of the 154 antonym pairs (18%) show a negative relationship between frequency and desirability. Moreover, these "reversals" occur primarily for antonym pairs on which there is relatively little agreement. For pairs with agreement greater than 95% (i.e., the upper half of the list) there are only six reversals out of the 77 possible. It is significant, moreover, that in three of these six antonym pairs the less desirable member (which in these cases is the more frequent one) has more meanings and linguistic uses than the more desirable one. "Invalid" means both "not valid" and "cripple," but "valid" is just "valid." "Yes" is an adverb, but "no" is an adverb *and* an adjective. And "front" is a noun, a verb, and an adjective, while "back" is all that and an adverb to boot.

Toward the end of the list where the desirability preferences are divided fairly evenly between the two members of the antonym pairs, the frequencies of the two antonyms often are nearly the same. "Play" is preferred to "work" only by a majority of two (a curious commentary on the contemporary college population!), and the respective frequency counts of these antonyms are 2606 and 2720. The "hot-cold" preference is 55 to 45 and their frequency counts 1006 and 1092. The "husband-wife" preference is 58 to 42 and their respective frequencies, 1788 and 1668.

Three antonym items about which agreement was complete or nearly complete show a curious pattern of results. They are "good-bad" (5122:1001), "better-worse" (2354:450), and "best-worst" (1850:292). Since "better" is presumably better than "good," "worse" worse than "bad," and since "best" is presumably better than "better," and "worst" worse than "worse," we would expect

the greatest separation between the frequencies of "best" and "worst," smallest between the frequencies of "good" and "bad," and medium between the frequencies of "better" and "worse." Since absolute differences are deceiving, we best take the ratios of the frequencies, which are 6.34, 5.23, and 5.12 for "best-worst," "better-worse," and "good-bad," respectively. It is indeed the case that the frequency ratios increase from "good-bad" to "best-worse." However, if frequency reflects "desirability," we would also expect the frequency of "best" to exceed the frequency of "better," and that of "better" to exceed the frequency of "good." In fact, however, "good" is more frequent than "better," and "better" more frequent than "best!" But *is* "better" better than "good?" In an extensive study of meanings Mosier (1941) found that "good" was consistently rated as better than "better."

> Startling as this may appear to grammarians, it is psychologically sound, since GOOD is a positive assertion, whereas BETTER implies comparison with some standard which might, in many cases, be itself unfavorable. Compare the often heard comment, "He is getting better, but he is still far from good" [p. 134].

For purposes of comparison the frequencies of French, German, and Spanish equivalents of some of the antonyms examined are given in Table 2 below. Systematic data on indigenous desirability ratings are unfortunately not available, but it would be surprising if the French, German, and Spanish judgments differed from those obtained in the United States. An informal inquiry among foreign visitors marshalled a good deal of support for this conjecture. Comparing the data in Tables 1 and 2, the agreement is rather striking. In 15 out of the 44 cases the frequency relation in the antonym pairs is the same in the three foreign languages as in English: the more favorable item is more frequent, a result exceeding chance expectation by a large margin. The results in Table 2, furthermore, give a ready expression to our favorite ethnic prejudices. The relatively low frequency of the two Romance equivalents of "early" and the high frequency of these equivalents of "late," in comparison to their Germanic counterparts, make generalizations about national character tempting, as does the relatively low frequency of the German equivalent of "reward." The foreign equivalents of answer-question, hot-cold, import-export, peace-war, etc., however, show patterns of differences that may reflect more than superficial linguistic idiosyncrasies.

Several questions can immediately be raised about the above results. First, are these figures up to date? The Thorndike-Lorge count is based on samples of material published during the late twenties and the early thirties. The German equivalents come from a source dating to the late 19th century (Käding, 1898). The French count was published in 1929 (Van der Beke, 1929), and the Spanish in 1927 (Buchanan, 1927). Secondly, do these results reflect general verbal habits? Word counts are based on printed material alone. Do people show the same linguistic predilections in ordinary speech as they do in writing? Admittedly, both questions indicate caution in generalizing from the above results. But this caution needn't be excessive. Howes (1954) has recently asked Harvard and Antioch undergraduates to estimate the probabilities of various words. The correlations between the students' estimates of several word samples and the L-count of the Thorndike-Lorge source varied around .80. There is also evidence from word association studies showing that word counts do reflect general verbal habits of the population. A word which has a high frequency of occurrence in print is also a highly probable associate. The association norms to 200 words were recently collected by Palermo and Jenkins (1964) from a sample of 4,500 school children and college students in Minneapolis. The list of the 200 stimulus words represents a systematic sample of verbs, nouns, pronouns, adverbs, adjectives, participles, etc., all having fairly high frequency on the Thorndike-Lorge counts. Since in the word association task each subject makes one response to each stimulus word, Palermo and Jenkins collected from their subjects 900,000 word responses. Among them "good" occurred 4890 times, "bad" only 1956. The response "right" was given 477 times, the response "wrong" only 100 times. "Full" was found 431 times among the associations, "empty" only 62 times. "Strong" was given 557, "weak" 96 times. "Together" occurred 575 times, "apart"

TABLE 2

FREQUENCY RANKS OF ENGLISH, FRENCH, GERMAN, AND SPANISH ANTONYM PAIRS

English	French	German	Spanish
able (3) unable (9)	capable (3) incapable (4)	fähig (4) unfähig (11)	capaz (3) incapaz (7)
accept (3) reject (9)	accepter (2) rejeter (5)	annehmen (2) ablehnen (5)	acceptar (3) rechazar (5)
active (6) passive (14)	actif (6) passif (?)	tätig (5) untätig (?)	activo (6) pasivo (10)
answer (2) question (3)	réponse (4) question (2)	Antwort (3) Frage (2)	respuesta (4) pregunta (4)
better (2) worse (4)	meilleur (2) pire (5)	besser (2) schlechter (?)	mejor (2) peor (2)
certain (2) uncertain (9)	certain (2) incertain (10)	sicher (2) unsicher (9)	cierto (2) incierto (9)
clean (3) dirty (7)	propre (2) sale (7)	sauber (9) schmutzig (12)	limpio (3) sucio (6)
comedy (9) tragedy (9)	comédie (6) tragédie (9)	Komödie (9) tragödie (11)	comedia (4) tragedia (8)
comfortable (5) uncomfortable (11)	à l'aise (4) inconfortable (9)	bequem (5) unbequem (10)	cómodo (7) incómodo (10)
day (2) night (2)	jour (2) nuit (2)	Tag (2) Nacht (2)	día (2) noche (2)
direct (3) indirect (12)	direct (6) indirect (12)	direkt (3) indirekt (8)	directo (4) indirecto (8)
dry (3) wet (4)	sec (3) mouillé (5)	trocken (5) nass (9)	seco (3) mojado (6)
early (2) late (2)	tôt (3) tard (2)	früh (2) spät (2)	temprano (4) tarde (2)
fast (2) slow (3)	vite (2) lent (4)	schnell (2) langsam (3)	pronto (2) lento (4)
find (2) lose (3)	trouver (2) perdre (2)	finden (2) verlieren (2)	encontrar (2) perder (2)
friend (2) enemy (3)	ami (2) ennemi (2)	Freund (2) Feind (2)	amigo (2) enemigo (2)
full (2) empty (4)	plein (2) vide (4)	voll (2) leer (4)	lleno (2) vacio (4)
good (2) bad (2)	bon (2) mauvais (2)	gut (2) schlecht (3)	buen (2) mal (2)
high (2) low (2)	haut (2) bas (2)	hoch (2) niedrig (4)	alto (2) bajo (2)
hot (2) cold (2)	chaud (3) froid (3)	heiss (5) kalt (3)	caliente (5) frío (2)
husband (3) wife (3)	mari (3) femme (2)	Mann (2) Frau (2)	esposo (2) esposa (2)
import (7) export (11)	importation (11) exportation (10)	Einfuhr (11) Ausfuhr (12)	importación (?) exportación (13)
increase (3) decrease (8)	augmentation (10) reduction (11)	Vermehrung (6) Verminderung (11)	aumento (5) diminución (?)
independent (6) dependent (14)	indépendent (7) dépendent (?)	selbstständig (4) abhängig (6)	independiente (5) dependiente (9)
life (2) death (2)	vie (2) mort (2)	Leben (2) Tod (2)	vida (2) muerte (2)
light (2) dark (2)	clair (3) sombre (3)	hell (4) dunkel (3)	claro (2) obscuro (2)

TABLE 2—*Continued*

English	French	German	Spanish
life (2)	vivre (2)	leben (2)	vivir (2)
die (2)	mourir (2)	sterben (2)	morir (2)
long (2)	long (2)	lang (2)	largo (2)
short (2)	court (3)	kurz (2)	corto (3)
love (2)	aimer (2)	lieben (2)	amar (2)
hate (4)	haïr (6)	hassen (6)	odiar (7)
more (2)	plus (2)	mehr (2)	más (2)
less (2)	moins (2)	weniger (2)	menos (2)
near (2)	près (3)	nah (2)	cerca (2)
far (2)	loin (2)	fern (2)	lejos (2)
peace (3)	paix (3)	Friede (3)	paz (2)
war (2)	guerre (3)	Krieg (2)	guerra (2)
positive (9)	positif (6)	positiv (8)	positivo (7)
negative (11)	negatif (11)	negativ (?)	negativo (7)
possible (3)	possible (2)	möglich (2)	posible (2)
impossible (5)	impossible (3)	unmöglich (3)	imposible (2)
presence (4)	présence (2)	Anwesenheit (9)	presencia (3)
absence (7)	absence (5)	Abwesenheit (9)	ausencia (4)
reward (6)	récompense (6)	Anerkennung (5)	premio (4)
punishment (6)	punition (12)	Strafe (4)	castigo (4)
right (2)	juste (2)	richtig (2)	justo (3)
wrong (3)	faux (3)	falsch (3)	mal (2)
strong (2)	fort (2)	stark (2)	fuerte (2)
weak (3)	faible (3)	schwach (3)	debil (4)
sweet (2)	doux (2)	süss (4)	dulce (2)
sour (9)	amer (4)	sauer (9)	amargo (4)
together (2)	ensemble (2)	zusammen (2)	junto (2)
apart (4)	séparé (2)	getrennt (3)	separado (3)
victory (5)	victoire (4)	Sieg (4)	victoria (5)
defeat (7)	défaite (8)	Niederlage (8)	derrota (9)
wealth (4)	richesse (5)	Vermögen (4)	riqueza (3)
poverty (7)	pauvreté (12)	Armut (10)	pobreza (5)
white (2)	blanc (2)	weiss (2)	blanco (2)
black (2)	noir (2)	schwartz (3)	negro (2)
wide (2)	large (2)	breit (4)	ancho (3)
narrow (3)	étroit (3)	schmal (6)	angosto (8)

Note.—The figures in brackets indicate frequency ranks: (1) means that the word is among the 500 most frequent words, (2) that it is among the 1000 most frequent words, (3) that it is among the 1500 most frequent words, etc. The source of these counts is Eaton (1940).

29 times. "Light" was a response 8655 times (N.B., some subjects must have given it more than once), "dark" 4274 times. But as in the case of the Thorndike-Lorge count, "front" occurred 22 times, while "back" occurred 265 times; "rich" was given 36 times, while "poor" was a response 95 times. "Near" was given 981 times, "far" 1218. "Coming" was given 166 times, "going" 714 times. And, as in L-count, "play" and "work" showed 791 and 957 occurrences, respectively.

However, the best evidence about the relationship between the individual's verbal habits and the evaluative aspect of meaning is found in a recent study by Siegel,[4] although it wasn't the purpose of her study to explore this relationship. Siegel's experiment dealt with the effects of verbal reinforcement on the emission of words differing in affective connotation and in frequency. Eighteen six-letter words of known frequencies and previously judged on the good-bad and the pleasant-unpleasant scales were selected from a larger

[4] Siegel, Felicia S. Effects of word frequency and affective connotation on verbal responding during extinction. (Mimeo)

sample. Six of these words were of high frequency (100 and more in 1 million), six of medium (20 to 30), and six of low frequency (1 to 5). Within each frequency class two words were previously judged to be good, two neutral, and two bad. Three groups of subjects, other than those involved in the affective judgments, participated in the experiment, each having to deal with six words of the same frequency. The procedure consisted of presenting the subject with the list of six words, all high, medium, or low in frequency, depending on the condition in which he was in, and giving him at the same time a stack of cards on which appeared illegible six-letter "words." Ostensibly, each card contained one of the six words in the subjects' list. Actually, the "words" consisted of random sequences of six letters, printed over several thicknesses of paper and one carbon. Their legibility was further reduced by placing each card in an onionskin paper envelope. The subjects' task was to "read" or to guess what word appeared on each card. Of interest for the present purposes are the first 50 trials which served to establish operant rate, and during which, of course, no reinforcement of any sort was given. Table 3 shows data on the guessing behavior of Siegel's subjects as a function of word frequency and affective connotation. Reported in each cell is the average number of times a word of a given frequency and affective value was used as a guess during the 50 operant trials. Since there are six words to choose from, 8.33 represents a chance response rate. It is clear, however, that both frequency and affective connotation displace response rate away from the chance level. High frequency seems to result in overcalling, and low frequency in undercalling. But it is striking to discover that affective connotation had an even stronger effect on response emission, the marginals for that variable showing a somewhat greater range of differences.

TABLE 3

FREE RESPONSE EMISSION AS A FUNCTION OF WORD-FREQUENCY AND WORD VALUE[a]

Word value	Word frequency			$\bar{X}$
	Low	Medium	High	
Good	7.43	9.43	9.68	8.85
Medium	6.28	8.57	8.71	7.85
Bad	6.28	5.86	7.71	6.61
$\bar{X}$	6.66	7.95	8.70	

[a] From Siegel, 1960.

Some words in the language have primarily an evaluative function. These words should show the frequency-value relationship with particular clarity. Several instances of this relationship are examined.

Let us first consider the scales of the Semantic Differential (Osgood, Suci, & Tannenbaum, 1957). We have chosen only those scales which have high and relatively pure loadings on one of the three main factors, *evaluation, potency,* and *activity.* Table 4 shows the polar opposites of these scales, together with their frequencies according to the Thorndike-Lorge L-count. The left-hand polar opposites in the three columns are the favorable, potent, and active ends of the scales. It is significant that among the 19 evaluative scales the favorable polar opposite has always higher frequency than the unfavorable opposite. For the scales which do not load high on the evaluative factor the high frequencies are divided fairly evenly among the potent and nonpotent opposites. In 9 of the 15 potency scales the highly potent end of the scale is more frequent. In 3 of the 8 activity scales the active polar opposite is more frequent.

There are two other instances of a high correlation between frequency and value for adjectives. The first comes from the work by Gough (1953). Gough has given the items of his Adjective Checklist to 30 judges who rated each adjective for favorability. The most favorable and the least favorable quartiles of Gough's checklist are reported in his publication. The average word frequency of the upper quartile is 140, and of the lower quartile 48. The second illustration comes from data collected by Anderson (1964). A list of 555 adjectives was recently used by Anderson in his work on impression formation. The list was constructed out of a large sample of items. The 555 selected items were given by Anderson to a group of 100 subjects with the instructions to rate on a 7-point scale "how much you yourself would like the person described by that word." We have simply computed the correlation between these likeabil-

TABLE 4

POLAR OPPOSITES OF THE SEMANTIC DIFFERENTIAL AND THEIR FREQUENCIES

Evaluative factor			
beautiful	ugly	987	178
clean	dirty	781	221
fair	unfair	561	59
fragrant	foul	66	39
good	bad	5122	1001
grateful	ungrateful	194	13
happy	sad	1449	202
harmonious	dissonant	26	9
honest	dishonest	393	41
kind	cruel	1521	165
nice	awful	630	370
pleasant	unpleasant	457	114
positive	negative	92	28
reputable	disreputable	23	21
sacred	profane	102	13
successful	unsuccessful	352	14
sweet	sour	679	102
true	false	1711	209
wise	foolish	420	223
Potency factor			
bass	treble	28	17
brave	cowardly	216	26
deep	shallow	881	104
hard	soft	1909	549
heavy	light	680	1005
large	small	1697	1818
masculine	feminine	54	40
mature	youthful	91	99
rough	smooth	294	346
rugged	delicate	37	248
severe	lenient	119	9
strong	weak	770	276
tenacious	yielding	22	7
thick	thin	443	646
wide	narrow	593	391
Activity factor			
active	passive	514	434
bright	dark	645	1005
excitable	calm	7	267
fast	slow	514	434
heretical	orthodox	2	21
hot	cold	1006	1092
rash	cautious	37	48
sharp	dull	324	289

ity ratings and the logarithm of the Thorndike-Lorge L-count.[5] Figure 1 shows this relationship graphically, where means of log

[5] Items for which there was no frequency information in the Thorndike-Lorge count were not included in computing this coefficient. These items were primarily of the hyphenated form, such as open-minded, good-humored, well-spoken, fault-finding, ultra-critical, wishy-washy, etc.

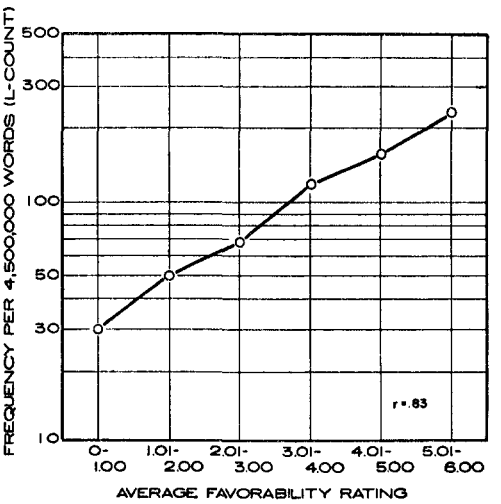

FIG. 1. Average frequencies of 555 adjectives rated for favorability. (Based on data from Anderson, 1964.)

frequencies are plotted for six categories of adjectives in increasing order of favorability. Considering that the reliabilities of the Thorndike-Lorge count and of Anderson's favorability ratings are less than perfect, the coefficient of correlation of .83 is particularly impressive.

Miller, Newman, and Friedman (1958) have shown that word frequency is a negative function of word length. The problem immediately arises, therefore, as to which of these two variables is critical for word value and word meaning. In order to examine this possible confounding between frequency and word length, the above correlation was recomputed holding the number of letters constant. No appreciable change in the previously obtained coefficient was observed.

The relationship between word frequency and word length is generally explained in terms of the principle of least effort. Words that require considerable effort in writing and in speech are less likely candidates for use. In an attempt to control for effort Frincke and Johnson (1960) have asked subjects to choose the "most pleasantly toned word" from each of 108 homophone pairs. The greatest majority of these pairs consisted of words of the same length, and all pairs, of course, consisted of words that required the same effort in uttering them. Out of 3,132 possible choices,

the more frequent member of the pair was chosen 1,836 times.

Dixon and Dixon (1964) have given a list of 200 verbs (in past-tense form) to 60 female and 60 male judges who rated them on an 11-point good-bad scale. The instructions were to rate what "kind of impression the subject thought a psychologist would get of him when he used each verb in a sentence." These impression ratings have correlations with log frequencies (the Thorndike-Lorge L-count) equal to .48 for females and to .50 for males. But it must be pointed out that these coefficients represent correlations severely attenuated by unreliability of the frequency variable. The Thorndike-Lorge count lists verbs in the present-tense form. If an adjectival form of the verb exists, then it is also listed. In our own research, in computing correlation coefficients, only the present-tense frequencies were used.

Miron (1961) had American and Japanese subjects rate a sample of three-element phonetic combinations on various scales of the Semantic Differential. The subjects also rated these stimulus materials for their familiarity. It is interesting that the correlations between familiarity and the composite of evaluative scales were .59 and .50 for the American and the Japanese samples, respectively. But the correlations of familiarity with the composites of the potency and activity factors were low and negative.

As a final example of the relationship between word frequency and the evaluative aspect of meaning, two poems by William Blake are called to the reader's attention:

Infant Joy

"I have no name:
I am but two days old,"
What shall I call thee?
"I happy am,
Joy is my name."
Sweet joy befall thee!

Pretty joy!
Sweet joy but two days old,
Sweet joy I call thee:
Thou dost smile,
I sing the while,
Sweet joy befall thee!

Infant Sorrow

My mother groaned! My father wept;
Into the dangerous world I leapt;
Helpless, naked, piping loud,
Like a fiend hid in a cloud,

Struggling in my father's hands,
Striving against my swadling bands,
Bound and weary I thought best
To sulk upon my mother's breast.

In these two poems, expressing opposite qualities of affect, the frequencies of the critical words (i.e., words which convey the major content, and hence not articles, pronouns, or auxiliary verbs) were averaged. The average frequency of *Infant Joy* is 2,037. The average for *Infant Sorrow* is 1,116. Two formally similar verses, one by Browning and the other by Shelley, show the same pattern:

Song. R. Browning

The year's at the spring,
And day's at the morn;
Morning's at seven;
The hillside's dew-pearled;
The lark's on the wing;
The snail's on the thorn;
God's in his Heaven—
All's right with the world.

Dirge. P. B. Shelley

Rough wind, that moanest loud
Grief too sad for song;
Wild wind, when sullen cloud
Knells all the night long;
Sad storm, whose tears are in vain,
Bare woods, whose branches strain,
Deep caves and dreary main—
Wail, for the world's wrong.

The average word frequency of Browning's poem is 1,380. The poem by Shelley—which comes to a rather different and sadder conclusion—has an average frequency of 728.

Stimulus Frequency Attitude: Correlational Evidence

We may now turn to the more general question of the effect of exposure on attitude, still limiting ourselves to correlational studies. Here, less evidence exists, and the evidence which is available is often indirect. But the

results are quite similar to those just reviewed. For instance, Alluisi and Adams (1962) found a correlation of .843 between the preference subjects expressed for the appearance of letters and their frequency in the language. Strassburger and Wertheimer (1959) had subjects rate for "pleasantness" nonsense syllables varying in association value. Higher association values consistently received higher "pleasantness" ratings. Wilson and Becknell (1961) and Braun (1962) successfully replicated these results. Braun also found that eight-letter pseudo-words, varying in their order of approximation to English (Miller, 1951), show the same pattern. These two studies differ from the similar ones by Johnson, Thomson, and Frincke, discussed earlier, in that subjects in the former ones were asked to judge how pleasant were the stimuli themselves, or how much subjects liked them (Wilson & Becknell, 1961), while in the latter whether they *meant* something close to "good" or close to "bad."

In 1947 the National Opinion Research Center conducted an extensive survey on the "prestige" of various occupations and professions. Nearly 100 occupational categories were rated for "general standing." Twenty-four of these occupations are labeled by single words, such as "physician," "scientist," "janitor," etc. The remainder is described less economically: "owner-operator of a printing shop," or "tenant farmer—one who owns livestock and machinery and manages the farm." Thus, one is able to determine the frequency of usage for only a part of this list—the 24 single-word occupations. The correlation between rated occupational prestige of these 24 items and the log of frequency of usage is .55.

Similar to the ratings of occupational prestige are the social distance ratings of ethnic and racial groups, first developed by Bogardus (1925) over 30 years ago. Recent replications show that these social distance ratings enjoy remarkable stability (Bogardus, 1959). The correlation between the so-called "racial-distance quotients," which are numerical equivalents of these ratings, and the log frequency of usage of these ethnic labels is .33.

In order to explore relationships of this sort further, I have selected 10 countries whose names are found in the Thorndike-Lorge L-count, and whose frequencies can be arranged in increasing order in approximately constant log units. These countries were then given to high-school students with the instructions to rank-order them in terms of liking. Table 5 shows the average rank each country received and its frequency of usage according to the L-count. There seems to be little question about the frequency-attitude relationship. The same relationship is found with American cities. Selected were 10 cities that (*a*) are listed in the Thorndike-Lorge L-count, and (*b*) can be arranged in increasing order of frequency in approximately constant log units. University students were asked how much they would like to live in each of these 10 cities. Their task, specifically, was to rank-order these cities according to their preferences "as a place to live." The average ranks, together with frequency counts of these 10 cities, are shown in Table 5.

Other subjects, also high-school students in the Midwest, were asked to rate on a 7-point scale how much they liked various trees, fruits, vegetables, and flowers. In each case 10 items were selected which were listed in the Thorndike-Lorge count and which could be ordered according to a constant log frequency unit. Table 6 shows both the average ratings (0 = dislike; 6 = like) and the frequency counts for the four types of items. The rank correlations between the frequency and average attitude are .89, .85, .84, .81, .85, and .89, for countries, cities, trees, fruits, vegetables, and flowers, respectively.

TABLE 5

PREFERENCE RANKS AND FREQUENCY COUNTS FOR 10 COUNTRIES AND 10 CITIES

Countries			Cities		
Country	Frequency	Average preference rank	City	Frequency	Average preference rank
England	497	2.67	Boston	255	2.75
Canada	130	3.33	Chicago	621	3.08
Holland	59	3.42	Milwaukee	124	3.83
Greece	31	4.00	San Diego	9	4.25
Germany	224	4.92	Dayton	14	5.75
Argentina	15	6.08	Baltimore	68	6.08
Venezuela	9	6.58	Omaha	28	7.08
Bulgaria	3	7.75	Tampa	5	7.08
Honduras	1	7.92	El Paso	1	7.50
Syria	4	8.34	Saginaw	2	7.58

TABLE 6

PREFERENCE RATINGS OF TREES, FRUITS, VEGETABLES, AND FLOWERS, AND THEIR CORRESPONDING FREQUENCIES

Trees	f	APR	Fruits	f	APR	Vegetables	f	APR	Flowers	f	APR
pine	172	4.79	apple	220	5.13	corn	227	4.17	rose	801	5.55
walnut	75	4.42	cherry	167	5.00	potato	384	4.13	lily	164	4.79
oak	125	4.00	strawberry	121	4.83	lettuce	142	4.00	violet	109	4.58
rosewood	8	3.96	pear	62	4.38	carrot	96	3.57	geranium	27	3.83
birch	34	3.83	grapefruit	33	4.00	radish	43	3.13	daisy	62	3.79
fir	14	3.75	cantaloupe	1.5	3.75	asparagus	5	2.33	hyacinth	16	3.08
sassafras	2	3.00	avocado	16	2.71	cauliflower	27	1.96	yucca	1	2.88
aloes	1	2.92	pomegranate	8	2.63	broccoli	18	1.96	woodbine	4	2.87
yew	3	2.83	gooseberry	5	2.63	leek	3	1.96	anemone	8	2.54
acacia	4	2.75	mango	2	2.38	parsnip	8	1.92	cowslip	2	2.54

Note.—f = frequency of usage; APR = average preference rating.

Of course, word counts do not faithfully represent the frequencies with which one encounters the above items. And it is difficult to discover precisely how often the average Midwestern high school student encounters a yew, a cowslip, or a radish. But a fair index of frequency of exposure can be found in farm production data. For seven of the vegetables in Table 6 farm production figures for 1963 are available, and they are shown below in thousands of tons:

corn (4.17)	2,340.9
potatoes (4.13)	13,777.1
lettuce (4.00)	1,937.6
carrots (3.57)	843.8
asparagus (2.33)	187.8
cauliflower (1.96)	123.4
broccoli (1.96)	123.9

Included also (in brackets) are average preference ratings of these seven vegetables. The rank correlation between the production figures and the average preference ratings is .96.

Of course, this impressive correlation coefficient, like those we observed above, may not reflect the effect of frequency on attitude but the effect of attitude on frequency. Thus, it can be argued that many roses are grown because people like roses. But it can also be argued that people like roses because there are many roses growing. There is less ambiguity, however, with regard to the correlation between frequency of letters and the preference for their appearance (Alluisi & Adams, 1962). There aren't so many e's in English just because we like the way e's look. Still, until there is experimental evidence, the question of which is the cause and which the effect remains a matter of conjecture. We shall now turn, therefore, to such experimental evidence.

Exposure—Meaning: Experimental Evidence

Experiment I. The first experimental study on the relationship between exposure and word meaning was carried out by Johnson, Thomson, and Frincke (1960). These authors first asked subjects to rate a number of nonsense words on the good-bad scale of the semantic differential. The subjects were then instructed that "this is an experiment concerning the effectiveness of repetition in learning to pronounce strange words correctly." Some of these words were shown once, others twice, 5 times, or 10 times. Subjects were required to look at these words and to pronounce them on each presentation. Following this training procedure the words were again rated on the good-bad scale. A significant exposure effect was obtained, with the words shown frequently increasing on the evaluative scale. Strangely, however, words which were seen only once in training were judged afterwards not quite as "good" as before training. Thus, as a result of 2, 5, and 10 exposures words improved in meaning, and as a result of but 1 exposure they deteriorated. This finding, however, may be an artifact of the before-after procedure used by Johnson, Thomson, and Frincke. Moreover, frequencies and stimuli were fully confounded in their study.

Our experiment used the same stimuli which, incidentally, came from the familiar experiment by Solomon and Postman (1952) on the effects of word frequency on recognition threshold, but our design differed from the one used by Johnson, Thomson, and Frincke in several respects. In the Johnson-Thomson-Frincke experiment the same words always appeared in the same frequencies to all subjects. Thus, the word "jandara," for instance, was given 10 times to each subject, and the word "mecburi" was given once to each subject. It is possible that the effects these authors obtained are not due to the

frequency manipulation alone, but that they depend on the stimulus material with which the frequency variable was fully confounded. In our study words and training frequencies were, therefore, counterbalanced in a Latin-square design. Because words and the number of exposures were counterbalanced, an after-only design could be employed, requiring no premeasures. The effects of repeated exposure could be observed for each word by comparing the favorability rating it received after having been exposed during training once, twice, five times, etc. Eliminating premeasures also eliminated for each stimulus one full exposure that necessarily preceded and therefore accompanied the frequency manipulation.

The present experiment differs from that of Johnson, Thomson, and Frincke (1960) in several other respects which are less critical for the interpretation of results. The procedure of this experiment, therefore, is described in some detail. Except for some specific changes, the same general methodology is followed throughout this series of studies.

Twelve seven-letter "Turkish" words, shown in Figure 3, were counterbalanced against six frequencies (0, 1, 2, 5, 10, and 25) in six replications of the experiment. Seventy-two subjects were run, one at a time, 12 subjects in each replication. The initial instructions informed the subject that the experiment dealt with "pronouncing foreign words." He was told that he would be shown some foreign words, hear the experimenter pronounce them, and that he would be required to pronounce them himself. The words were typed on 3×5-inch cards. On each trial a card was shown to the subject for approximately 2 seconds. Simultaneously the experimenter pronounced the word, requiring the subject to follow him. Since each frequency class contained two word-stimuli, there were 86 trials altogether. The position of a given stimulus in the sequence of these 86 trials was determined at random. Following the above frequency training subjects were told that the words they had just learned to pronounce were in fact Turkish adjectives, and that their next task would be to guess what they meant. The experimenter told the subject that he realized how nearly impossible this task was, and he therefore did not require him to guess the word meanings exactly. Instead, it would suffice if the subject indicated on a 7-point (0 to 6) good-bad scale whether each word meant something good or something bad and to what extent, because these Turkish adjectives all meant something good or bad. These ratings were made of the 10 stimuli which the subject received during the frequency training, and of 2 additional ones previously never seen by him.

The results of the experiment are shown in Figure 2 and in Figure 3. In Figure 2 are shown the ratings of "goodness" averaged for each of the six frequencies, and plotted on a log scale. Each point on that curve is based on 144 observations, and it is clear that a strong exposure effect was obtained ($F = 5.64$; $df = 5/355$; $p < .001$). Figure 3 shows the exposure effect for each of the 12 words separately. The ratings of "goodness" were averaged for each word when it was given during training with the lower frequencies of 0, 1, and 2 (hatched bars), and when it was given with the higher frequencies of 5, 10, and 25 (solid bars). This was possible because each word was used in each frequency equally often but for different subjects. It is evident from Figure 3 that some words are rated as having more positive meaning than others, and this effect is indeed significant ($F = 8.35$; $df = 11/781$; $p < .001$). Apparently, some of these words "sound better" than others. But independently of word content, subjects consistently rated the given word to mean something "better" if they had seen it (and had said it) more often. This is true for all the 12 words used in the experiment, a result that has a chance likelihood equal to .00024.

Experiment II. Since the hypothesis proposed above holds that it is *mere* exposure that is a sufficient condition of attitude change, the procedure used in Experiment I is not optimal for testing its validity. Subjects in Experiment I were required to pronounce the nonsense words during training, and it is possible that a decrease in difficulty in pronouncing the words associated with successive presentations was responsible for the results. In other words, subjects rated the frequent stimuli more favorably because they found them easier to pronounce than stimuli which they saw and pronounced only once or twice. And, there were stimuli which they never pronounced and, in fact, did not really know how to pronounce. Wilson and Becknell (1961) suggested that the evaluative ratings of nonsense syllables of high association value are higher than of low associ-

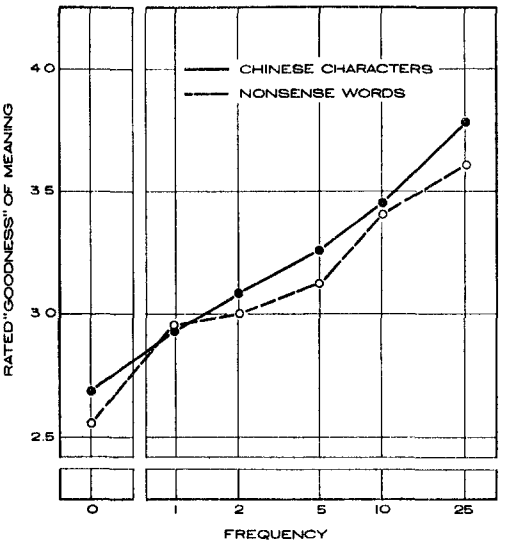

FIG. 2. Average rated affective connotation of nonsense words and Chinese-like characters as a function of frequency of exposure.

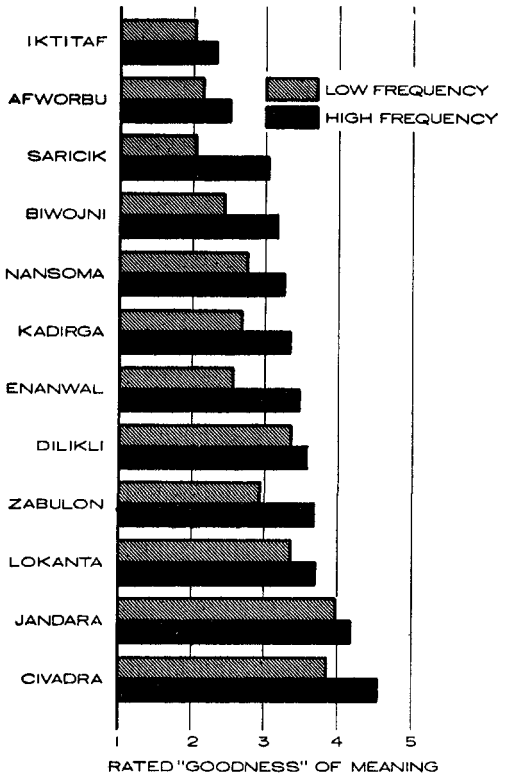

FIG. 3. Average rated affective connotation of nonsense words exposed with low and high frequencies.

ation value because they are easier to pronounce. In order to follow up their suggestion a group of 22 University of Michigan subjects were given the above "Turkish adjectives" with the instructions to rate them according to "how easy or difficult it is to pronounce" them. Using a 7-point scale, a significant item-effect was revealed by an analysis of variance ($F = 14.28$; $df = 11/263$; $p < .001$), showing that there are indeed differences among the nonsense words in the ease with which they can be pronounced upon their first presentation. The Wilson-Becknell conjecture is supported by a correlation of .46 between the average ease of pronouncing the words and the evaluative scores obtained in Experiment I. These latter scores were obtained by averaging for each word the rating it obtained in all frequencies.

These results, however, in themselves do not preclude a relationship between exposure and evaluative rating. With ease of pronouncing held constant the exposure effect may still be obtained. This expectation is strengthened by the results of a study described above (Frincke & Johnson, 1960) in which homophone pairs differing in word-frequency were rated for "pleasantness." Since homophones do not differ in pronounciation, the obtained frequency effects show that ease of pronouncing may be a sufficient factor in affecting evaluative ratings but not a necessary one. In order to eliminate the pronounciation factor and to reduce the subjects' active participation while exposure is being manipulated, the following experiment was carried out.

To meet the requirements of the definition of "mere exposure," Chinese characters were substituted for the nonsense words. These stimuli were taken from Hull's (1920) concept formation study, and I am told that not only are most of them meaningless, but that they are also far from the absolutely minimal standards of Chinese caligraphy. Nevertheless, they were quite adequate for our experimental purposes. The subjects were again told that the experiment dealt with the learning of a foreign language, but now they were not required to pronounce the characters. Nor were they able to pronounce them subvocally. They were simply instructed to pay close attention to the characters whenever they were exposed to them. In all other respects the experiment was identical to the one employing nonsense words. Now, too, following training subjects were told that the characters stood for adjectives, and that their task was to guess their meaning on the good-bad scale. Characters and exposures were again counterbalanced. Figures 2 and 4 show the results, and it is obvious that the exposure-favorability relationship previously found with nonsense words obtains ($F = 4.72$; $df = 5/335$; $p < .001$) even if the individual's exposure to the stimulus consists of his passively looking at it for a period of about 2 seconds. Figure 4 shows that the exposure effect is found for all stimuli but one.

The above results add strength to the hypothesis that mere exposure is a sufficient condition for attitude enhancement. But again the last experiment did not succeed in completely eliminating a learning factor from the exposure manipulation, for it is possible that this manipulation is now confounded with the ease of recognition. This danger of confounding, however, is probably minimal because at no time were the subjects ever required to recognize or discriminate the idiograms.

The results of Experiments I and II are in an apparent conflict with results reported by Amster and Glasman (1966). These researchers report a negative result using a procedure similar to that employed by Johnson, Thomson, and Frincke (1960). The experiment was similar in all respects except that meaningful English words were substituted for the nonsense stimuli. No exposure effect was observed by Amster and Glasman for these meaningful words. But this finding is not at all surprising. Nor is it especially significant for the understanding of exposure effects. Adding one more occasion (or even 10 more occasions) to see and say a perfectly well-known English word to all the times this word had been seen and uttered by the individual in the past—a figure often in the thousands—really shouldn't have much effect on the meaning he attributes to it. The expectation of a change in the evaluative aspect of meaning as a function of a few additional exposures becomes even less reasonable when we consider that

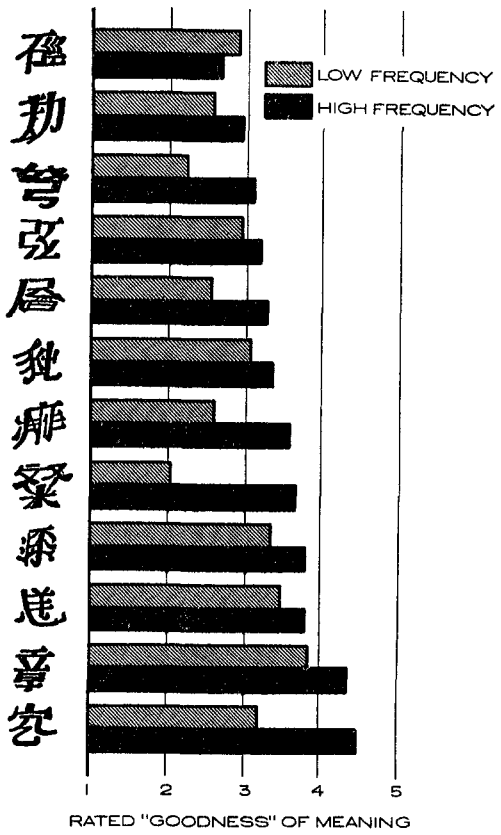

FIG. 4. Average rated affective connotation of Chinese-like characters exposed with low and high frequencies.

the change in affective connotation is a linear function of the logarithm of frequency, as we noted in Figures 1 and 2. If n is the frequency of the subject's preexperimental exposure to the word, then the comparisons made by Amster and Glasman involved the following four frequencies: $n+1$, $n+2$, $n+5$, and $n+10$. Since n is large, perhaps as large as 1000, the differences in exposures amounted to fractions of 1%.

Word-Frequency–Word-Value Relationship as a Special Case of the Exposure-Attitude Relationship

In the first section of this paper some evidence was presented suggesting that words with positive affective connotations are used more frequently (both in print and in speech) than words with negative affective connotations. In the second section evidence was given to suggest that the affective connotation of a word improves with their repeated use. Because the second item of evidence rests on experimental proof, in which the frequency of usage was systematically and independently manipulated, one cannot question the causal direction implied in these data. But finding that the frequency of usage affects meaning needn't necessarily preclude the possibility that meaning determines the frequency of usage. It is necessary, therefore, to examine more closely the results on the correlational evidence between word-frequency and word value.

Why are positive words used more frequently? Besides the rather wistful and unlikely explanation that there are more positive than negative referents (i.e., we live in a paradise), one real possibility suggests itself. The evidence reviewed so far deals only with usage *per word*. The totality of "good" and "bad" usage, however, depends on the numbers of different "good" and "bad" words in the language. It is entirely possible, therefore, that the superiority of "good" words in frequency *per word* exists side by side with the superiority of "bad" words in their greater variety. This possibility receives some support from the fact that in English (and in a host of other languages) prefixes and suffixes that serve to negate or reverse meaning, such as anti, de, im, in, ir, less, un, etc., are most commonly attached to words having a positive connotation. Once attached to a word they almost universally form a word with a negative affective connotation. Positive words with these prefixes or suffixes are exceptional: unselfish, independent, are some examples.

It would appear, therefore, that there are indeed more negative than positive words. And if there are more different negative words, the usage *per word* would naturally be attenuated for these words, because the total usage would be distributed among a larger universe of items.

Norman [6] has asked a group of students to separate a large sample of adjectives into "good" ones and "bad" ones. On the average 2.31 more items were placed in the "bad" pile than in the "good" pile. The frequency figures in Table 1 above show a pattern consistent with Norman's independent finding.

[6] Warren T. Norman, personal communication, 1965.

The average frequency of the preferred antonyms is 2.3 times larger than the average frequency of the nonpreferred antonyms! Therefore, for the material considered here, the ratio of total positive and negative usage is equal to unity.

If repeated usage enhances the affective meaning of words, a relatively large supply of negative words would in fact be needed. It would be equally reasonable to expect that there exist devices in language protecting words from a deterioration of meaning. It is entirely possible that the prefixes and suffixes discussed above serve this function. Because the negative qualities of these prefixes and suffixes are independent of their referents, because they are essentially abstract, and because they derive their negativity from the semantic function they perform, words formed by means of these prefixes and suffixes are perhaps better able than root words to resist an enhancement of affective connotation as a result of repeated usage. I was unable to find evidence corroborating this point of view, although there is a good deal of philological literature on both positive changes in meaning (see for instance vanDongen, 1933) and negative changes in meaning (see, for instance, Schreuder, 1929). Most of the sources, however, consider changes in meaning of root words only.

If there are many remaining doubts that frequency of words is a function of the value of their referents, then the following frequencies of a few well-chosen but significant words should once and for all dispel them:

Psychologist	36
Chemist	32
Economist	32
Sociologist	14
Astronomer	12
Geologist	9
Physicist	8
Geographer	7
Botanist	6
Biologist	5

Exposure-Attitude Relationship: Experimental Evidence

Experiment III. In all the experiments above the question asked of the subjects in rating the stimuli following exposure dealt with the evaluative aspect of their meaning. The subjects were never required to say just how much they "liked" the nonsense words or "Chinese" characters. In all probability, the results would have been the same if they were asked directly to state their attitude toward these words and characters, and the Wilson-Becknell (1961) results support this conjecture. But because their stimuli were essentially verbal, subjects' answers could in these studies be strongly influenced by semantic factors. This would have been less likely, of course, in the case of Chinese characters than in the case of nonsense words.

As was pointed out above, there is some direct evidence on the attitudinal effects of mere exposure, dealing almost exclusively with music appreciation. Meyer (1903), for example, played to his students oriental music 12 to 15 times in succession. In most cases the students' introspective protocols indicated a better liking for the pieces on the last than on the first presentation. One of the students who took part in Meyers' experiment (H. T. Moore), and who showed enhancement effects of repeated exposure ("I liked the last time better than the first, because I became more used to the successive chords"), followed up this work in a study of his own 20 years later. Moore and Gilliland (1924) played to their students jazz and classical records once a week for 25 weeks. Liking for classical records increased, but no change was found for jazz music. Similar results are reported by other writers (Krugman, 1943; Verveer, Barry, & Bousfield, 1933; Washburn, Child, & Abel, 1927). Downey and Knapp (1927) played to 33 students a variety of musical selections (e.g., Tschaikowsky's *Marche Slave,* Massenet's *Meditation* from "Thais," *Columbia, The Gem of the Ocean,* etc.) once a week for five weeks. All pieces of music except one (*Columbia, The Gem of the Ocean*) became better liked at the close of the sessions. Alpert (1953) presented subjects with sounds having unfamiliar rhythms. His subjects found these sounds at first unpleasant. After repeated presentations, however, the liking for them increased. Additional exposures of subjects to the tones resulted in increasing indifference on the part of the listeners. More recently, Mull (1957) found that upon repeated exposure to their music subjects enjoyed Schoenberg and Hindemith more.

In the area of visual arts, Pepper (1919) found that repeated exposure resulted in more positive esthetic judgments of unusual color combinations. Krugman and Hartley (1960), however, using famous paintings, could only find ambiguous results. Maslow (1937) projected for 4 days in succession 15 paintings of great masters. Six days following the last presentation the 15 paintings were presented once again, and interspersed among them were 15 others (matched for the artist) which the subjects had never seen. The results indicated a greater liking for the familiar paintings. Maslow (1937) also made tests of preference, frequently with similar results, for other familiar and unfamiliar objects, such as rubber bands, paper clips,

blotters, pens, pencils, etc. A similar experiment to the one with paintings, but using instead Russian girls' names, showed the same results. The same subjects were used in all these studies and the sessions took place in the same room, the subjects always sitting in the same chairs. Toward the end of the testing program Maslow asked if anyone would like to change seats. No one did, preferring, apparently, to remain in the familiar one.

Although the results of the above studies are fairly consistent, the conditions under which they were carried out make their conclusions somewhat less than compelling. In the majority of instances, the circumstances of the repeated exposure were quite ambiguous. The experiments were usually conducted in classes, the instructor serving as the experimenter. Subjects often responded aloud, thus being able to influence each other's judgments and opinions. Prior to the sessions the experimenter often expressed his own preferences. The stimuli, repeatedly shown, were not always exposed under the same conditions, and the material, exposures, and sequences were seldom counterbalanced. But in all of these experiments a pattern of results emerges showing that the frequency manipulation has more pronounced attitude effects for stimuli that are novel, unfamiliar, or unusual than for familiar stimuli. This pattern is, of course, consistent with the observation that attitude enhancement is a function of the logarithm of frequency.

Becknell, Wilson, and Baird (1963) have recently reported more convincing support for the exposure-attitude hypothesis. Slides of nonsense syllables were presented with different frequencies (1, 4, 7, and 10). Following this exposure training (which also included interspersed presentations of slides with landscapes and with ads) female subjects were given pairs of boxes containing nylon stockings, and they were asked to choose the "brand" they preferred. These "brands" corresponded to the nonsense syllables previously shown, and they were printed on the boxes. Each subject received two different pairs of boxes for comparison. The paired-comparison data showed a tendency of subjects to prefer the box marked by the more frequent syllable. Again, however, the semantic component is not excluded from the effects obtained in these two studies.

There is one more item of evidence, somewhat indirect, on the problem of the effects of exposure. In a study by Munsinger (1964) subjects were given the opportunity to present to themselves CVC trigrams whose association value, evaluation scale value, and prepotency score (Mandler, 1955) were previously assessed. By pressing a response key the subject would expose in a small window a trigram which he would then have to spell. The rate at which he key-pressed constituted the dependent measure. In one of Munsinger's experimental groups subjects could expose to themselves, by means of that key response, trigrams that were matched for association and prepotency. All these trigrams, however, previously scored low on the evaluative scales of the semantic differential. After subjects reached

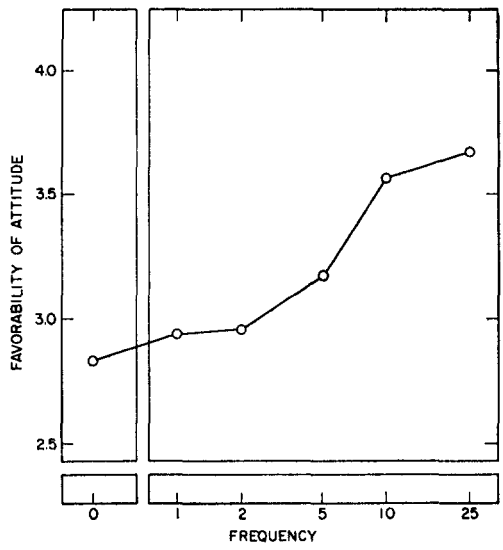

FIG. 5. Average attitude toward photographs as a function of frequency of exposure.

an asymptotic key-pressing rate, the experimental conditions changed such that now the subjects' response would expose trigrams that were high in evaluation, although they were still matched for association and prepotency. A significant increase in key-pressing rates is reported by Munsinger following the change in the affective value of the trigrams. Again, however, the semantic component is not entirely excluded from the effects obtained in these two studies.

Because they are less a matter of semantic factors, we have chosen to manipulate interpersonal attitudes by means of exposure. Using the same experimental design as with the Chinese characters, faces of men (photographs of graduating Michigan State University seniors taken from the MSU Yearbook) were employed as attitude objects. The experiment was introduced to subjects—all students at the University of Michigan—as dealing with the problem of "visual memory." Following the exposure manipulation, which consisted of presenting each photograph a different number of times for a period of 2 seconds, subjects were asked to rate on a 7-point scale how much they might like the man on each photograph. The results of this study are shown in Figures 5 and 6. While the exposure effect is not as clear as previously (only 9 of the 12 stimuli show it), it is still rather impressive ($F = 9.96$; $df = 5/355$; $p < .001$).

The Exposure-attitude Hypothesis and Related Theoretical Issues

The above results raise a series of empirical and theoretical questions. Are all attitudes

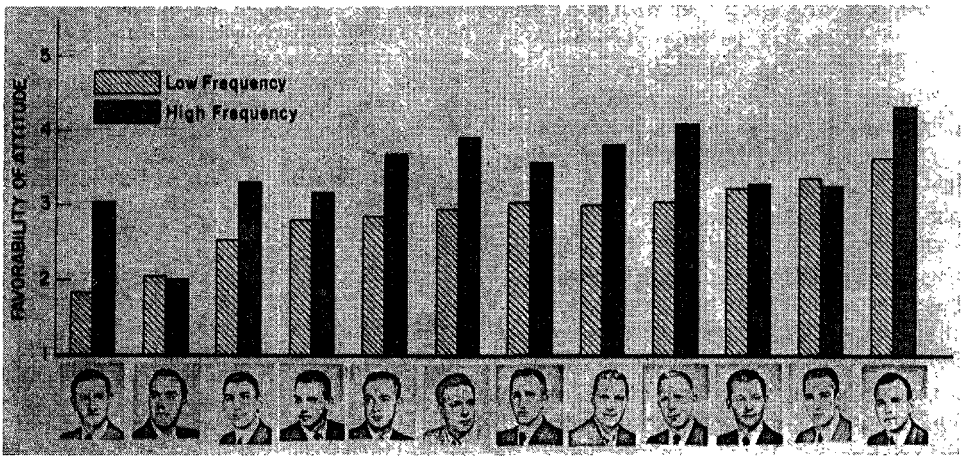

FIG. 6. Average attitude toward photographs exposed with low and high frequencies.

enhanced by mere repeated exposure? Is there a number of repetitions beyond which attitude begins to become negative? Does this number vary systematically across attitude objects? Are these effects stable? These and similar questions can only be answered by further empirical work. On a theoretical level these questions address themselves primarily to those psychological processes that mediate exposure effects.

Let us first consider a possible biological significance of an exposure-enhancement mechanism. A stimulus presented for the first time evokes in the organism an instinctive fear reaction. Lorenz (1956) noted that a young raven,

> confronted with a new object, which may be a camera, an old bottle, a stuffed polecat, or anything else, first reacts with escape responses. He will fly up to an elevated perch, and, from this point of vantage, stare at the object literally for hours. After this he will begin to approach the object very gradually . . .

Bühler, Hetzer, and Mabel (1928) observed that human infants reacted to a strange sound by crying out with fear. Upon the second exposure of the sound stimulus, movement and vocalization that indicated displeasure were observed. On the third exposure, the infants listened to the sound showing some signs of attention, but did not seem to show any displeasure. On the fourth exposure, they looked in the direction of the sound with detectable interest. These facts, of course, are borne out by common observation. Hunt (1965) reported that young infants he observed preferred a familiar mobile to a new one. And the "Black Bag" story cited in the introduction represents another example of phenomena in this category. At the outset the "Black Bag," in fact, attracted a good deal of hostility. Cairns (1966) has recently presented a very convincing argument that the affiliative behavior and social attachments among animals are solely determined by the animals' exposure to one another. Examining evidence on affiliative preferences of animals observed under conditions of inter- and intraspecific cohabitation and of animals deprived of social contact, Cairns concluded that such affiliative preferences vary directly with the length of the association and with the importance of the cues which are generated in the course of the association. Cairns, moreover, did not limit his conclusion to inter-animal social attachments but prposed that "animals tend to remain in the presence of [any] objects to which they have been continually exposed [p. 409]."

The survival value of an avoidance reflex to a novel stimulus is obvious. But there is no direct evidence that all organisms are equipped with an avoidance reaction occurring upon the encounter of a novel stimulus. However, if we assume that they are, then the exposure-attitude hypothesis becomes more

reasonable. The first encounter with the novel stimulus produces fear reaction. If no negative consequences are associated with this first encounter, the avoidance reaction upon the second encounter will naturally be weaker. If such encounters continue, and if no other events—negative in their consequences for the organism—accompany these encounters, then the organism's attitude toward the stimulus must improve. To be sure, the hypothesis does not deny or preclude the effects of reinforcement. The exposure of a stimulus coupled with reward will strengthen the animal's approach behavior; and the exposure of stimulus coupled with a noxious event will strengthen his avoidance reactions. But in the absence of reward or punishment, mere exposure will result in the enhancement of the organism's attitude toward the given stimulus object.

If novel stimuli evoke fear, conflict, or uncertainty, one should be able to detect these states, and to observe their dissipation upon repeated exposure. To the extent that GSR measures arousal that is associated with the above states, we would expect greater GSRs upon the presentation of novel stimuli than upon the presentation of familiar ones, and we would also expect a drop in GSR reactivity to be the consequence of repeated stimulus exposure.

Experiment IV. Changes in affective arousal that occur as a result of repeated exposure of a novel stimulus were examined in an independent experiment. Fifteen subjects were presented with nonsense words (the same as in Experiment I) in a series of 86 trials. Two words appeared 25 times, two 10 times, two 5 times, two twice, and two once. The position of a word in the series of trials was determined by a random device. Words were counterbalanced against frequencies in three experimental replications. Due to a mechanical failure of the apparatus, data for one subject could not be used, and were not included in the analysis.

On a given trial, the stimulus word was projected onto a screen for a period of 2 seconds, and the subject's GSR was recorded. The interstimulus interval was 20 seconds. GSR was measured only during the first 10 seconds following stimulus onset, and all GSRs occurring during the last 12 seconds of the interstimulus interval were treated as artifacts. The Kaplan-Hobart technique of GSR measurement (Kaplan & Hobart, 1964), which requires current of only 10 microamperes, was employed. Zinc–zinc sulphate electrodes (Kaplan & Fisher, 1964; Lykken, 1959) were applied to the forefinger and the middle finger of the subject's nonpreferred hand.

The results of the experiment are shown in Figure 7 and Figure 8. In Figure 7 changes in conductance are plotted for each successive presentation of the stimulus-word. For purposes of clarity data for only one stimulus are graphed in each frequency class. The results for the other set of stimuli are the same. It can be seen that, in general, successive presentations result in a lower autonomic reactivity. After about seven or eight exposures a stable asymptote is reached. Hence, only stimuli shown 25 and 10 times attain an asymptote. Words shown five times, twice, or once generate greater changes in conductance even on their last exposure. This effect is seen better in Figure 8 in which GSRs on the last exposure of the stimuli were plotted. As prior frequency of exposure increases there is a

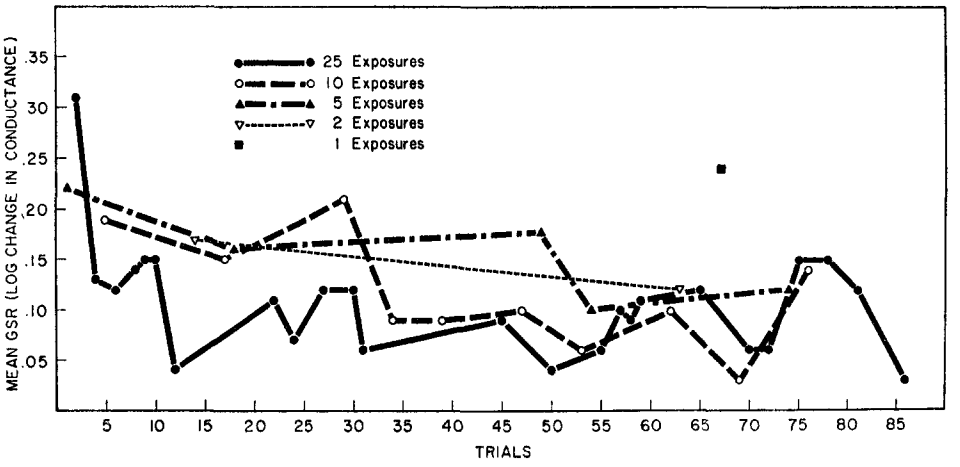

FIG. 7. GSR obtained upon repeated exposures of nonsense words.

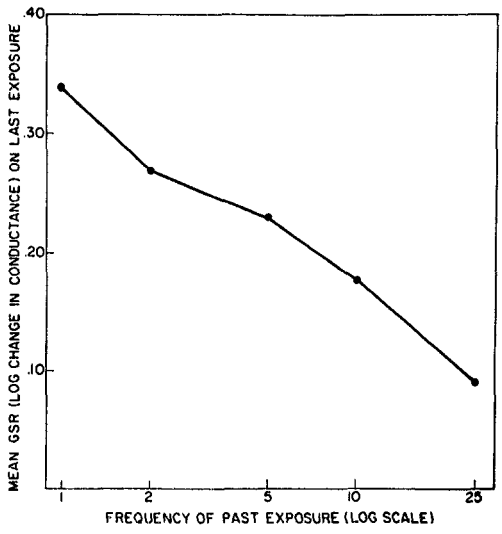

FIG. 8. GSR obtained on the last exposure of nonsense words exposed with various frequencies.

lesser change in conductance upon stimulus presentation. This effect is significant at the .05 level ($F = 4.01$; $df = 4/117$).

These results cannot be due to an overall adaptation that may be occurring as the series of the 86 trials progresses. It is clear that the stimulus shown just once generated a substantial GSR although it occurred as late as on the 67th trial. As a matter of fact, its GSR does not differ from the GSR obtained for the *first* presentation of the other stimuli. The last presentation of the stimulus word that had just one prior exposure also resulted in a substantial GSR although it occurred on the 64th trial. And on the whole, although there is variability over trials, at any one point during the series GSR's are higher for stimuli with infrequent prior exposures than for stimuli previously seen by the subject many times. It seems, therefore, that with increased exposure there is a genuine reduction in stimulus-evoked arousal. These findings are in agreement with those reported by Berlyne, Craw, Salapatek, and Lewis (1963). In their study subjects were shown visual patterns differing in complexity and in incongruity. The patterns were presented for 3 seconds on three successive occasions. A significant drop in GSR was obtained between the first and the second presentation. But no significant GSR effects were associated with complexity or incongruity.

DISCUSSION

While the bulk of the results presented and reviewed in this monograph supports the hypothesis that repeated exposure is a sufficient condition of attitude enhancement, there are findings and theoretical formulations which appear to be in conflict with the hypothesis. The most pronounced source of ostensibly contradictory results is in the area of exploration and curiosity. There is impressive evidence today that in a free situation the subject (human or animal) will turn toward a novel stimulus in preference to a familiar one (e.g., Berlyne, 1960). If such orienting and exploratory "approach" behavior is a symptom of a favorable attitude toward the stimulus object, the wealth of data on exploration and orienting behavior (Berlyne, 1950, 1955; Berlyne & Slater, 1957; Dember & Milbrook, 1956; Montgomery, 1953; Thiessen & McGaugh, 1958; Thomson & Solomon, 1954) stands in clear contradiction to those reported in this monograph.

But there is at present no direct evidence to support the above assumption. And, on the contrary, it is more likely that orienting toward a novel stimulus in preference to a familiar one may indicate that it is less liked rather than it is better liked. Ordinarily, when confronted with a novel stimulus the animal's orienting response enables it to discover if the novel stimulus constitutes a source of danger. It need not explore familiar stimuli in this respect. Novelty is thus commonly associated with uncertainty and with conflict—states that are more likely to produce negative than positive affect. Most recent work by Harrison (1967) indicates quite clearly that exploration and favorable attitudes are in fact negatively related. Using nonsense words, Chinese characters, and photographs of men's faces, Harrison obtained measures of liking from one group of subjects and measures of exploration from another group. The correlations between exploration and liking were −.69, −.69, and −.60 for nonsense words, characters, and photographs, respectively. If the function of orienting behavior is eventually to change the novel stimulus into a familiar one, it is also its consequence to render the stimulus object eventually more attractive (or perhaps merely less repulsive).

In his research Harrison also obtained data on the behavioral consequences of exposure, and in particular, on response conflict that novelty seems to arouse. It is a truism, of

course, to assert that novel stimulus is one to which *no* specific response, beside orienting, has as yet been attached. But the novel stimulus cannot fail being similar to an entire host of other stimuli that the individual had encountered in the past, and to which he had attached specific responses. And it is entirely likely that some of these generalized response tendencies that the novel stimulus simultaneously excites are mutually incompatible; that is, they cannot all be emitted at the same time. This antecedent condition is what makes response conflict (of some, however small, magnitude) a necessary concomitant of novelty.

Using latency of free associations as a measure of response conflict, Harrison was able to demonstrate that response conflict is markedly reduced upon repeated exposure of a novel stimulus. Chinese ideographs were shown to a group of subjects once, twice, 5 times, 10 times, and 25 times, in a manner similar to that used in other experiments described above. Following this exposure manipulation, Harrison presented each stimulus once again requiring the subject to respond "with the first thing that came to mind." Included now were also Chinese ideographs that the subject had never seen. The latency of these free associations was obtained on each such trial, and the results revealed a systematic and significant drop in latencies as a function of the frequency of prior exposure.

Another set of data which may also be of some consequence for the exposure-attitude hypothesis is to be found in the area of semantic satiation. In a typical semantic-satiation experiment the subject is asked to repeat words, two or three per second, for a period of 15 seconds. The general findings in this area indicate that following this sort of rapid repetition the word seems to "lose" its meaning (for a review of the literature see Amster, 1964). Loss of meaning is measured by a departure from polarity on semantic differential scales, such as good-bad, strong-weak, etc. (Lambert & Jakobovits, 1960). When repeated in rapid succession and rated on some semantic differential scale, immediately thereafter the words tend to be placed neither toward one (e.g., good) nor the other (e.g., bad) end of the scale, but are rated toward the neutral point of the scale. While several studies have demonstrated a reduction of polarization following rapid repetition of a word (Das, 1964; Kanungo & Lambert, 1963a, 1963b; Messer, Jakobovitz, Kanungo, & Lambert, 1964), there is an equal amount of conflicting evidence (Amster & Glasman, 1965; Floyd, 1962; Reynierse & Barch, 1963; Schulz, Weaver, & Radtke, 1965). Yelen and Schulz (1963) attribute satiation findings to a regression artifact. A reduction of polarity of *positive* words as a result of repetition would indeed be embarrassing for the exposure-attitude hypothesis. A reduction of polarity of *negative* words (i.e., words with a semantic score below the neutral point) would, of course, be entirely in agreement with the present results, for they would simply be showing an enhancement effect along the evaluative dimension. It should be noted that all our stimuli initially received negative ratings, that is, below the neutral point, 3, on the 0–6 good-bad scale. Given no exposure at all, the evaluative ratings for the Turkish nonsense words, Chinese-like characters, and photographs were 2.56, 2.67, and 2.79, respectively. In terms of polarity these averages are −.44, −.33, and −.21. Contrary to the semantic satiation hypothesis, absolute polarities increased after 25 exposures, for they were +.61, +.78, and +.61, respectively. Admittedly, the controversy within semantic satiation literature may have to be resolved before clear implications for the exposure effect can be drawn. Parenthetically it should be noted, however, that the form of exposure used in the semantic satiation paradigm (i.e., 30 to 45 repetitions in 15 seconds) is not what has been above defined as the sufficient condition of attitude enhancement. Moreover, in semantic satiation studies the stimulus is commonly a verbal response made by the subject himself. Whether such a response-produced stimulus should constitute what is meant by mere exposure is a matter of some doubt.

The above hypothesis and data seem to be consistent with the theory of reinforcement recently proposed by Premack (1959). This new and engaging approach to reinforcement effects, for which a good deal of impressive

evidence has already been accumulated (Premack, 1961, 1962, 1963, 1965; Premack & Bahwell, 1959; Premack & Collier, 1962), holds that if the emission of one response, A, is made contingent upon the emission of another response, B, and if A occurs with greater frequency than B, B will gain in the rate of emission. A can, therefore, be considered as having positive reinforcement value which seems to depend alone upon its frequency of occurrence. Contingencies between responses can be introduced by controlling manipulanda or the availability of goal objects. Thus, for instance, in studying these effects in Cebus monkeys, Premack (1963) used four manipulanda: a plunger, a hinged door, a vertically operated lever, and a horizontally operated lever. It was possible to make any manipulandum inoperable at any time, and to make it operable only in the case of a prior manipulation of another manipulandum. Thus, each manipulandum could serve for the reinforc*ing* or for the reinforc*ed* response. After establishing for each monkey the probabilities of operating each item under free access to all, contingencies were arranged between pairs of items, such that, for instance, the vertical lever could not be operated unless the animal pulled the plunger, or the hinged door remained locked unless the subject pressed the horizontal lever, etc. The introduction of these contingencies resulted in the predicted effects. In general, responses that were less probable increased in the rate of emission when more probable responses were made contingent upon them. When two responses were equal in probability of emission little or no change in response rates was observed.

Viewed in the present context, the individual's response probabilities can be taken as an indication of his "attitudinal liking" or "attraction" to the goal objects of these responses, or to the instrumental stimuli associated with them. To the extent that the reward value of a given response, A, which is contingent upon another response, B, is a direct function of A's probability of emission, then increasing its probability of emission will increase its reward value. Premack (1961) was able to demonstrate such an effect in rats for licking and bar pressing. Changing the language somewhat, it may be said that the individual's "attitudinal liking" for the goal object of the response A increases with the individual's exposure to the goal object of A. In Premack's work continuous reinforcement schedules are used and, hence, the individual's frequency of exposure to the goal object of A is equal to the frequency of emission of A.

There are important differences between the phenomena observed by Premack and those reported in the present paper. In most of his experiments the frequency of occurrence of responses results from an independent, perhaps genetically given or previously acquired, response preference of the subject. In the experimental work on attitudinal effects of exposure, the frequency of occurrence of the stimulus-object is deliberately manipulated. Moreover, the subject usually does not have a prior preference for the stimulus exposed. On the contrary, he may often manifest avoidance tendencies. But the parallel is compelling.

While there is a great deal in common between Premack's work on reinforcement and the research on attitudinal effects of exposure, a clear understanding of the implications of one for the other requires a systematic determination of what "reinforcement value" and "attitudes" have in common that makes them both equally vulnerable to simple frequency effects.

CONCLUSION

The balance of the experimental results reviewed and reported in this paper is in favor of the hypothesis that mere repeated exposure of an individual to a stimulus object enhances his attitude toward it. But, as yet, the account books cannot be closed. Further research must examine the boundary conditions of the exposure-attitude relationship, for it is possible that the neat linear log-frequency–attitude relationship, repeatedly observed here, may well break down under some conditions. This future research must, in particular, concentrate on the effects of large frequencies of exposure, on duration of exposure, on interexposure intervals, and on

many other similar parameters of mere exposure. This research must also assess the applicability of the exposure-attitude relationship to a greater variety of stimulus objects. The question of generalization of specific exposure effects is of equal theoretical importance. Does repeated exposure to a given stimulus result in the enhancement of attitudes toward similar or related stimuli?

Because the above effects seem to be a function of the *logarithm* of frequency of exposure, they are more apparent and more pronounced for differences among small frequencies than for differences among large frequencies. For the same reason, attitudinal enhancement produced by means of exposure will be more readily effected for novel objects than for familiar ones. It is likely that exposure effects for very familiar objects are absent completely or are so small that they cannot be detected at all by methods now available. As we have seen above, Amster and Glasman (1966) failed to obtain the exposure effect for common English words. It will be important for future research, therefore, to determine the range of familiarity for which the exposure effect is obtained.

Mere exposure is a necessary precondition of a vast variety of experimental manipulations. For example, in attempts to change attitudes by means of persuasive communications the attitude object is mentioned repeatedly, regardless of whether the attempt is directed toward making the attitude more favorable or toward making it less favorable. Making attitudes more favorable should, therefore, be easier than making them less favorable. It is interesting that studies on the effectiveness of persuasion in attitude change seldom try to effect a negative change, and almost never compare the relative success of a pro-persuasion with the success of a con-persuasion. In an attitude-change study Tannenbaum and Gengel (1966) have recently obtained only positive shifts, although both a positive as well as a negative manipulation were employed.

The partial reinforcement manipulation, too, is subject to possible confounding with the number of stimulus presentations. Erlebacher and Archer (1961), for instance, reported the curious result that at the completion of training greater numbers of correct responses were associated with smaller percentages of reinforcement. However, in the various conditions of reinforcement subjects worked until they performed in succession a predetermined number of correct responses, the same for all percentages of reinforcement. Therefore, percentage of reinforcement was in this study completely confounded with the number of stimulus exposures (and also with the number of reinforcements). Although many authors have tried to cope with this confounding in one way or another (e.g., Festinger, 1961; Kanfer, 1954; O'Connell, 1965), the methodological difficulties have not been completely overcome. None of the four variables that are associated with the partial reinforcement effect—percentage of reinforced trials, number of trials, number of positive reinforcements, number of nonreinforcements—can be studied independently of the others.

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