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Averaging and Set-Size Effects in Selecting Groups of Movies for a Film Festival[1]

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This paper deals with the *set-size effect* in information processing: the study of how subjective judgments and impressions based on sets of information vary as a function of the amount of information in the set. Subjects rated each of a series of popular old movies to be used in assembling a college film festival. They then rated intact groups of movies of various size and indicated how much money should be spent for each group. Group ratings and money allocations were examined as a function of group size. Group ratings were found to increase in polarity and money allocations were found to increase as the number of movies in the group increased. This supports the general conclusion that the greater the amount of information presented, the more extreme the response. The set-size function in each case was negatively accelerated (i.e., subject to a law of diminishing returns). These results can best be described by an averaging model in which the value of each movie in a group is averaged with an initial neutral expectancy.
INDEX DESCRIPTORS: Set-Size Effects, Information Processing.

In recent years, a number of studies have been concerned with how people combine or integrate diverse pieces of information to make an overall rating or decision (Anderson, 1974). In many instances, support was found for a model that assumes that the respondent *averages* the values of the pieces of information presented to him. Evidence supporting the averaging hypothesis comes from two types of studies. Some studies have employed factorial manipulations of various categories of information and have shown that these categories do not interact (e.g., Anderson, 1962; Levin, 1975). Such findings support a general class of additive models which include both averaging models and adding models (models that assume adding of information values). Other studies specifically tested averaging models vs. adding models by comparing responses to information sets consisting of extreme values only with responses to information sets consisting of the same extreme values plus some additional less extreme values. An adding model would predict that responses to the latter sets would be at least as extreme as responses to the former sets, whereas an averaging model would predict the opposite. Results supported an averaging model in studies ranging from personality impression formation, where subjects are required to indicate their impressions of hypothetical persons described by sets of personality trait adjectives (Anderson, 1965), to simulated shopping decisions, where subjects are required to compare and select grocery stores on the basis of sample price information (Levin, 1974a, Exp. 1). The present study further explores averaging processes in information integration.

The simplest form of an averaging model for information integration would be as follows:

$$R_n = \sum_{i=1}^{n} s_i/n \qquad (1)$$

where R_n is the overall response to a set of n stimuli (items of information) and s_i is the scale value of the ith stimulus. The scale value can be considered as the subject's estimate of the location of the stimulus on the dimension of judgment (e.g., how favorable it is). One implication of Equation 1 is that for homogeneous sets of information—i.e., those where each stimulus has approximately the same scale value—the response should not vary as a function of the "set size," n (the number of pieces of information in the set). However, a number of studies of personality impression formation have shown that responses do vary as a function of set size. Specifically, Anderson (1967) found that impression ratings of persons described by four favorable traits were higher than ratings of persons described by two favorable traits, even though the average trait value was the same in each case. The converse was found when ratings of persons described by four unfavorable traits were compared to ratings of persons described by two unfavorable traits. Analogous findings were obtained by Levin, Schmidt and Norman (1971) when subjects compared two persons described by different numbers of favorable or unfavorable traits and indicated which person they would prefer to have as a friend. The finding that increasing the number of equal-valued stimuli in an information integration task leads to a more extreme or polarized response has been labeled the "set-size effect" (Anderson, 1967; Levin and Kaplan, 1974; Sloan and Ostrom, 1974).

The set-size effect in personality impression formation has been explained by assuming that subjects have a relatively neutral initial impression or expectancy of the person to be evaluated and that this initial impression is averaged in with the information presented. Thus, for example, the greater the amount of favorable information averaged with this neutral value, the higher will be the response. This modified version of the averaging model applied to evaluations based on n items of equal value can be stated as follows:

$$R_n = \frac{w_O I_O + nws}{w_O + nw} \qquad (2)$$

where w and s are the weight (degree of importance) and scale value, respectively, of each item of information; w_0 and I_0 are the weight and value of the initial impression. In addition to predicting that response polarity should increase with set size, this model predicts that the set-size effect should be a growth function of n with asymptote s. In

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TABLE 1. MEAN RATINGS OF INDIVIDUAL MOVIES (BASED ON A SCALE OF +10 TO −10)

Adventure	Adventures of Robin Hood (Errol Flynn, 1938)	+2.32
	African Queen (Humphrey Bogart, Katharine Hepburn, 1951)	+5.56
	Gunga Din (Cary Grant, 1939)	− .62
	Moby Dick (Gregory Peck, 1956)	+2.91
	Mutiny on the Bounty (Clark Gable, Charles Laughton, 1935)	+4.56
	Tarzan, the Ape Man (Johnny Weissmuller, 1932)	+4.21
Comedy	Abbott and Costello Meet Frankenstein (Bud Abbott and Lou Costello, 1948)	+3.00
	Adam's Rib (Spencer Tracy, Katharine Hepburn, 1949)	+4.41
	The Bank Dick (W. C. Fields, 1940)	+6.27
	It Happened One Night (Clark Gable, Claudette Colbert, 1934)	+2.09
	A Night at the Opera (Marx Brothers, 1935)	+5.88
Muscial	Anchors Aweigh (Frank Sinatra, Gene Kelly, 1945)	+ .53
	Forty-Second Street (Dick Powell, Ginger Rogers, 1933)	− .29
	Holiday Inn (Bing Crosby, Fred Astaire, 1942)	+1.06
	Singin' in the Rain (Gene Kelly, Debbie Reynolds, 1952)	+ .59
	Top Hat (Ginger Rogers, Fred Astaire, 1935)	+ .18
	Wizard of Oz (Judy Garland, 1939)	+4.32
Biography	Lust for Life (Kirk Douglas, Anthony Quinn, 1956)	+1.38
	Madame Curie (Greer Garson, 1943)	−1.12
	Pride of the Yankees (Gary Cooper, 1942)	− .26
	Somebody up There Likes Me (Paul Newman, 1956)	+1.56
	Story of Alexander Graham Bell (Don Ameche, 1939)	−1.21
	Story of Louis Pasteur (Paul Muni, 1935)	−1.41
Drama	Citizen Kane (Orson Welles, 1941)	+4.62
	The Defiant Ones (Tony Curtis, Sidney Poitier, 1958)	+2.74
	From Here to Eternity (Burt Lancaster, Frank Sinatra, 1953)	+3.24
	Grapes of Wrath (Henry Fonda, 1940)	+5.21
	Of Mice and Men (Burgess Meredith, Lon Chaney, Jr., 1939)	+4.44
	On the Waterfront (Marlon Brando, 1954)	+3.59
Mystery-Crime	The Desperate Hours (Humphrey Bogart, Frederic March, 1955)	+3.22
	Hound of the Baskervilles (Basil Rathbone, 1939)	+2.91
	Laura (Dana Andrews, Gene Tierney, 1944)	+ .50
	Little Caesar (Edward G. Robinson, 1931)	+4.38
	The Maltese Falcon (Humphrey Bogart, 1941)	+4.38
	Public Enemy (James Cagney, 1931)	+4.76
Science Fiction	Dracula (Bela Lugosi, 1931)	+3.94
	Flash Gordon (Buster Crabbe, 1936)	+2.53
	Frankenstein (Boris Karloff, 1931)	+4.82
	Invasion of the Body Snatchers (Kevin McCarthy, 1956)	− .76
	King Kong (Fay Wray, 1933)	+3.62
	The Wolf Man (Lon Chaney, Jr., 1941)	+4.24
War	All Quiet on the Western Front (Lew Ayers, 1930)	+5.03
	Dawn Patrol (Errol Flynn, 1938)	+ .47
	For Whom the Bell Tolls (Gary Cooper, Ingrid Bergman, 1943)	+4.47
	Red Badge of Courage (Audie Murphy, 1951)	+ .24
	Sands of Iwo Jima (John Wayne, 1949)	−1.41
	Thirty Seconds over Tokyo (Van Johnson, Spencer Tracy, 1944)	+2.00
Western	Broken Arrow (James Stewart, 1950)	+ .74
	High Noon (Gary Cooper, 1952)	+2.09
	Ox-Bow Incident (Henry Fonda, 1943)	−1.26
	Red River (John Wayne, Montgomery Clift, 1948)	− .82
	Shane (Alan Ladd, 1953)	+ .62
	Stagecoach (John Wayne, Claire Trevor, 1939)	− .71

other words, Equation 2 states that increases in response polarity with increases in set size should generate a negatively accelerated curve. This was in fact the case in the studies reported above. Following its establishment as a parameter useful in describing set-size effects, the initial impression was further shown to be an important parameter of impression formation by Kaplan (1972), who related it to individual differences in processing personality information.

One of the goals of the present study is to show that the set-size effect established in studies of personality impression formation holds for other subjective judgment tasks and that, consequently, the assumption of an initial expectancy as a component of the information integration process is tenable for a variety of situations. Some evidence that this is so has been provided by studies of simulated shopping decisions (Levin, 1974a, Exp. 2) and evaluations of job applicants (Dolezal and Levin, 1975).

The present study examines the set-size effect when groups of objects are to be rated. In this case, a group consists of a varying number of popular old movies to be used in assembling a college film festival. One change from previous studies of set-size effects is that the informational stimuli within a set—i.e., the individual movies within a group—are not necessarily homogeneous in value. This requires a slight modification in applying the averaging model stated in Equation 2. The parameter s which represented the scale value of each item of information in a set must now represent the *mean* scale value of items in a group. The modified model then predicts that as group size increases, ratings of groups with positive mean values should increase and ratings of groups with negative mean values should decrease. Furthermore, if the model holds, then the set-size effect should be described by a negatively accelerated growth function.

MATERIALS AND METHODS

Fifty-one students from introductory psychology classes at The University of Iowa who expressed an interest in and familiarity with movies of the 1930's, '40s, and '50s participated in the study. Fifty-four popular old movies were used as stimuli. The same class of stimuli was used in an earlier study of information integration concerning how people combine their own and outside opinions (Levin, 1974b).

Each student was given an alphabetical list of 36 movie titles. Accompanying the list was a booklet giving the stars, year of release, and a brief description of each movie. Students were asked to rate each movie on a scale of + 10 to −10 in terms of how much they thought students at their university would like or dislike the movie.

After completing the initial phase at their own pace and turning in their response sheets, the students were given a new sheet grouping the same 36 movies into the nine categories shown in Table 1. (Mean ratings of individual movies are also given in this table.) For a given student, three of the categories contained two movies, three contained four movies, and three contained six movies. Three different subgroups of 17 subjects each received different lists, so that across subjects each category was represented equally often by set sizes 2, 4 and 6. (That is why a total of 54 movies was needed, even though any one student was given only 36 movies.) Subjects were asked to rate each movie group on a scale of +10 to −10 in terms of how much students would enjoy seeing that group of movies *as a whole*.

The students were then told to assume that they had a total of $9,000 to purchase movies for a college film festival and that they were to indicate how much they would be willing to allocate to each intact group. That is, they could assign whatever amounts they wanted to each of the nine groups of movies, as long as the total was $9,000. (In actuality, some subjects erred in their calculations and the total was not always $9,000.) This part of the study was included to provide a second dependent variable which might reflect on how judgments are affected by set size.

RESULTS AND DISCUSSION

The data of primary theoretical interest are shown in Table 2, where set-size effects for ratings of movie groups and money allocations are summarized. An explanation is needed of how set-size effects for group ratings were obtained. For a given student, the mean response to individual movies within a given category or group was computed and compared with the student's rating of that group as a whole. When the mean rating of the individual movies in a group was positive (e.g., +2) and the group rating was greater than this value (e.g., +3), a *positive* set-size effect was scored. When the mean rating of individual movies in a group was positive (e.g., +2) and the group rating was less than this value (e.g., +1), a *negative* set-size effect was scored. A positive set-size effect was also scored when the mean rating of the individual movies in a group was negative (e.g., −2) and the group rating was less (i.e., more negative) than this value (e.g., −3); and a negative set-size effect was scored when the mean rating of the individual movies was negative (e.g., −2) and the group rating was higher (i.e., less negative) than this value (e.g., −1). In each case, the size of the effect was the difference between the group rating and the mean rating of the individual movies. Thus, the greater the number, the greater the extremeness of the group rating as compared to the average rating of individual movies within the group. For a given student, groups for which the mean rating of the individual movies fell between +1 and −1 were excluded from this particular analysis since they represent neutral sets. For each student, the mean set-size effect was computed for groups with set size 2, groups with set size 4, and groups with set size 6. These values, averaged over subjects, are given in the top half of Table 2.

TABLE 2. SUMMARY OF SET-SIZE EFFECTS

	Set Size 2	Set Size 4	Set Size 6
Mean Set-Size Effect for Group Ratings*	+ .07	+ 1.05	+ .92
Mean Amount of Money Allocated ($)	1673	3305	4004

* See text for explanation of how this was computed.

It can be seen in Table 2 that the magnitude of the set-size effect for group ratings was greater for set sizes 4 and 6 than for set size 2. For set size 2 the group rating tended to be nearly identical to the average rating of the two individual movies in the group, but for set sizes 4 and 6 the group rating was about one scale point more extreme than the average rating of the individual movies in the group. The difference between set size 2 and set sizes 4 and 6 was statistically significant, $t(50) = 2.34$, $p < .05$, while the difference between set size 4 and set size 6 did not approach statistical significance, $t(50) = 0.39$.

Trend tests across set sizes 2, 4, and 6 were conducted to test the predictions of the averaging model with an initial expectancy (Equation 2). If the model holds, a negatively accelerated growth function should describe the data, and both linear and quadratic trends should be observed. Both the linear and quadratic trends were of borderline significance, $t(50) = 1.93$ and 1.88, respectively, $.10 > p > .05$ in each case. Thus the results provide some support for the model.

The average amount of money allocated to groups of size 2, 4, and 6 are given in the bottom half of Table 2. It can be seen that the mean amount of money allocated increased with set size. The differences between each pair of set sizes were significant. These results are not surprising, since subjects would obviously allocate more money for six movies than for four or two. What is more interesting, however, is that the difference in amount of money allocated for groups of size 4 and 6 is less than the difference in money allocated for groups of size 2 and 4. A law of "diminishing returns" thus seems to be operating. But that is precisely what the averaging model predicts. Trend tests across set sizes 2, 4, and 6 for money allocations resulted in a highly significant linear trend, $t(50) = 9.12$, $p < .01$, and a quadratic trend of borderline significance, $t(50) = 2.00$, $p = .05$. The set size function for money allocations was thus similar to that for rating responses and provides additional support for the averaging model with initial expectancy.

CONCLUSIONS

This study looked for set-size effects when groups of objects were rated. Set-size effects were obtained. Rating responses were more extreme for movie groups of size 4 and 6 than for groups of size 2. Money allocations also increased as group size increased. In each case the function describing the set-size effect approximated that predicted by an averaging model which incorporates a relatively neutral initial expectancy that is averaged with the information presented. Previous support for such a model has been found primarily in studies of personality impression formation. The present results, along with those of other recent projects in the writers' laboratory (Levin, 1974a, Exp. 2; Dolezal and Levin, 1975), suggest that this model may be more generally applicable. The following simple principle of information usage may thus apply to a variety of situations requiring subjective ratings: the greater the amount of information, the more extreme the response.

LITERATURE CITED

ANDERSON, N. H. Application of an additive model to impression formation. *Science*, 1962, 138:817-818.

ANDERSON, N. H. Averaging versus adding as a stimulus-combination rule in impression formation. *Journal of Experimental Psychology*, 1965, 70: 394-400.

ANDERSON, N. H. Averaging model analysis of set-size effect in impression formation. *Journal of Experimental Psychology*, 1967, 75:158-165.

ANDERSON, N. H. Information integration theory: A brief survey. In D. H. Krantz, R. C. Atkinson, R. D. Luce, and P. Suppes (eds.), *Contemporary developments in mathematical psychology*. Vol. 2. San Francisco: Freeman, 1974.

DOLEZAL, J. M., and I. P. LEVIN. The integration of self-descriptions and descriptions by outside references in the evaluation of job applicants. *Proceedings of the Iowa Academy of Science*, 82(2): 140-143.

KAPLAN, M. F. The modifying effect of stimulus information on the consistency of individual differences in impression formation. *Journal of Experimental Research in Personality*, 1972, 6: 213-219.

LEVIN, I. P. Averaging processes in ratings and choices based on numerical information. *Memory and Cognition*, 1974, 2:786-790, a.

LEVIN, I. P. Combining personal and outside opinions: An information integration analysis. *Bulletin of the Psychonomic Society*, 1974, 3:44-46, b.

LEVIN, I. P. Information integration in numerical judgments and decision processes. *Journal of Experimental Psychology: General*, 1975, 104:39-53.

LEVIN, I. P. and M. F. KAPLAN. The set-size effect in personality impression formation is not an artifact. *Bulletin of the Psychonomic Society*, 1974, 3:187-188.

LEVIN, I. P., C. F. SCHMIDT, and K. L. NORMAN. Person preference choices: Tests of a subtractive averaging model. *Journal of Experimental Psychology*, 1971, 90:258-261.

SLOAN, L. R., and T. M. OSTROM. Amount of information and interpersonal judgment. *Journal of Personality and Social Psychology*, 1974, 29:23-29.