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AFFECT AND EXPECTATION [1]

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4 groups of Ss were exposed to a probability learning situation in which they guessed which of 2 stimuli would next appear. One set of stimuli contained angry and smiling faces, while the other or neutral set contained big and little kangaroos. When the input ratio was 70% angry faces to 30% smiling faces, Ss markedly underestimated the dominant input. When the ratio was reversed (70% smiling, 30% angry), expectancies for the dominant stimulus approximated objective input. Thus, relative preferences for the stimuli appeared to dictate expectations. Expectancy curves for the relatively neutral kangaroos fell between the curves for the affective stimuli. Considerable inter-individual variability was found for affective expectancies. These individual differences were tentatively associated with personality differences.

Brunswik's (1939, 1943) suggestion that research on learning should approximate everyday learning situations and Humphreys' (1939) classic study on conditions of uncertain outcome have been succeeded by a large number of studies of probabilistic events. Striking regularities have been demonstrated for acquisition, asymptotic response level, and the degree to which probability response levels can be manipulated by instructions, extraneous rewards, previous reinforcement frequencies, stimulus asymmetries, and contingent probabilities (e.g., Brackbill, Kappy, & Starr, 1962; Dorwart, Ezerman, Lewis, & Rosenhan, 1965; Gerjuoy, Gerjuoy, & Mathias, 1964; Goodnow, 1955; Grant, Hake, & Hornseth, 1951; Hake & Hyman, 1953; Irwin, 1953, 1960; Marks, 1951; Messick & Solley, 1957; Siegel & Goldstein, 1959; Stevenson & Weir, 1959; Stevenson & Zigler, 1958; Weir, 1962).

Almost all of these studies have employed affectively neutral or nearly neutral stimuli in the choice situations—colored lights, blank and not-blank cards, etc. Such stimuli presumably permit greater control of the experimental situation in that they are less laden with unknown and private associations than are nonneutral stimuli. At the same time, such stimuli have helped to cast the expectancy area into a distinctly cognitive mold. The probabilities to be learned and the response behavior that is demanded characterize an experimental situation to which the terms strategy, decision making, and rational game theory have been applied. Influences upon expectancy of an emotional or motivational nature are usually not considered in this experimental paradigm.

What would happen in the learning of expectancy if the stimuli were affective in character? If, rather than red lights, one employed smiling and angry faces? The significance of the question derives in part from the fact that in "the natural environment," as Brunswik called it, such emotional expectancies exist and must be learned. In part also, its importance resides in the interaction of expectancy, need, and reward and in the necessity to clarify the possible influence of motivation in originating and shaping certain expectancies and thereby, perhaps, certain consequent perceptions and behaviors (Murphy, 1947, 1956; Solley & Murphy, 1960). In affective probability learning some reinforcement value may be embedded in the meaning of the stimulus itself and may augment or reduce reinforcements imposed in the experimental procedure.

What might be expected in affective probability learning? First of all, we might anticipate that initial response rates would vary depending upon the affective valence of the stimulus. Thus, while in the standard proba-

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bility learning experiment initial response rates hover about .5, in affective probability learning initial rates would be above or below .5 depending in part upon the positive or negative affective value of the dominant stimulus to the individual. Such findings were, indeed, obtained by Messick and Solley (1957) in their exploratory studies of probability learning in children. Initial preferences for stimuli (happy and sad faces) were so strong among some subjects that their response rates began at or close to 1.00 and underwent extinction during the subsequent trials. Solley and Messick (1957) also noted a tendency for adults to overguess the frequency of occurrence of "happy" as opposed to "sad" in the learning of probability relations among combinations of attributive characteristics.

Moreover, we might also expect that the learning curves and the asymptotic response levels would vary according to the affective valence of the dominant input. Where the dominant input has a negative valence, for example, the acquisition curve would be flatter and the asymptotic level lower than for

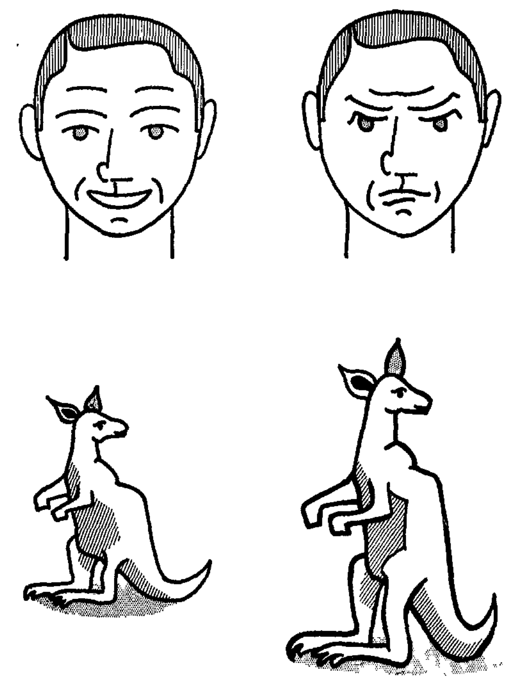

FIG. 1. Experimental and control stimuli used in this experiment.

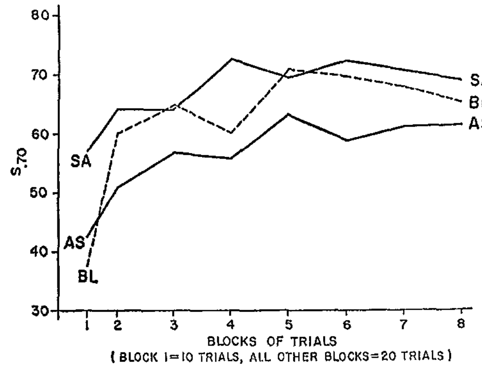

FIG. 2. Performance of subjects in the BL, SA, and AS conditions.

positive valued inputs. That the positive or negative meaning of the stimulus can significantly affect response levels (at least over 30 trials) has been demonstrated by Solley, Jackson, and Messick (1957); when various symbols and manipulations reflecting positive or negative evaluative meaning were associated experimentally with previously neutral stimuli, subjects significantly overguessed the occurrence of stimuli associated with positive meaning and underguessed those associated with negative meaning.

Finally we would expect that individual differences in expectancy for positive and negative affect would be related to stable personality characteristics. Consequently, in addition to significant constant effects indicating that, on the average, stimuli with positive value are expected to occur overly frequently, we will also investigate the possibility that certain personality dispositions may mediate the influence of affective value on expectancies (cf. Klein & Schlesinger, 1949).

METHOD

Materials

Two sets of stimuli were employed: the experimental stimuli were angry and smiling male faces and the relatively neutral stimuli were big and little kangaroos. The faces and animals were simple line drawings which were multilithed onto 5 × 8 inch cards, scale photographs of which are shown in Figure 1. The experimental deck consisted of 150 cards with a 70-30 input randomized in blocks of 10. Two decks were constructed for each set of stimuli. One deck consisted of 70% smiling faces (or big kangaroos for the neutral series) and 30% angry faces (or little kangaroos), and is called the SA (or BL) condition. The second deck consisted of 70%

angry faces (little kangaroos) and 30% smiling faces (big kangaroos), and is referred to as the AS (or LB) condition.

Procedure

The experiment was carried out with groups of 8–13 subjects. Each subject was first given three booklets containing 50 pages each. The experimenter then displayed the stimulus cards and said (for 70% angry, 30% smiling conditions):

> Here are two faces. One is angry [show] and the other is smiling [show]. Now, I have a deck of such cards [show] and I want you to guess which face is coming up. When I say "guess," if you think the face will be smiling, write an *S* on the first page of your booklet. If you think the face will be angry, write an *A*. Then turn the page and wait until I say "guess," and enter your next guess on the following page. Use a separate page for each guess, but don't guess until I tell you to. All right . . . Guess . . . Here [shows card].

Instructions were appropriately altered for the neutral conditions where subjects wrote B for big and L for little kangaroo. After each guess, the experimeter showed the card. An intertrial interval of about 3 seconds effectively prevented the subjects from looking back over their responses.

Subjects

Subjects were 116 undergraduate males and females, who were distributed among the various conditions as shown in Table 1.

RESULTS AND DISCUSSION

Figure 2 presents the mean proportion of responses to the stimulus with the 70% input ($S_{.70}$) for the AS, SA, and BL conditions. (Data from the LB condition are not included since they did not differ significantly from BL, on the one hand, and were obtained from a small N—$N = 9$—on the other.) A comparison of the six groups, using the Kruskal-Wallis test (Siegel, 1956) applied to individual subjects' mean proportions of responses to the dominant input for the first 10, last 40, and entire 150 trials, indicated that these values were not drawn from the same population ($p < .01$).

Initial Response Levels

As Table 1 shows, initial response rates varied from the typically obtained .5 level, even for BL, the "control" condition. (Note that response rate always refers to responses to the more frequent stimulus.) Thus, it would appear that the apparently neutral BL condition was not as neutral as we might have preferred: big and little kangaroos appear to have semantic associations that make subjects' expectations for these stimuli depart from the ordinarily expected .5. Strictly speaking, then,

TABLE 1

COMPOSITION OF THE SAMPLES: MEANS (PERCENTAGE) AND STANDARD DEVIATIONS OF CHOICES OF DOMINANT INPUTS

Composition and sex of subjects	*N*	First 10 trials				Last 40 trials		Total 150 trials	
		M	*SD*	*t*	Deviation from .50 two-tailed $p <$	*M*	*SD*	*M*	*SD*
AS—70% angry; 30% smiling									
M	22	44.09	19.46	1.39	*ns*	63.07	18.32	58.55	10.40
F	15	40.00	15.06	2.48	.05	59.33	13.34	55.96	8.80
M + F	37	42.43	17.92	2.53	.05	61.55	16.59	57.50	9.86
SA—70% smiling; 30% angry									
M	22	58.64	17.40	2.28	.05	67.73	13.94	66.15	9.81
F	20	56.00	15.30	1.71	.10	73.00	8.75	70.40	7.34
M + F	42	57.38	16.48	2.87	.01	70.24	12.05	68.17	8.97
BL—70% big; 30% little									
M	16	33.75	17.28	3.64	.01	65.00	16.68	61.17	10.83
F	12	42.50	15.34	1.62	*ns*	70.00	9.30	67.39	9.37
M + F	28	37.50	17.03	3.81	.005	67.14	14.22	63.83	10.68
LB—70% little; 30% big									
M + F	9	40.00	9.43	3.00	.02	73.06	8.06	65.78	3.49

TABLE 2

COMPARISON OF INITIAL RESPONSE RATE, ASYMPTOTIC PERFORMANCE, AND TOTAL PERFORMANCE FOR AS, SA, AND BL CONDITIONS (MANN-WHITNEY U TESTS, TWO-TAILED)

	N_1	N_2	Trials 1–10		Trials 111–150		Trials 1–150	
			z	$p <$	z	$p <$	z	$p <$
AS versus SA	37	42	3.31	.0009	2.72	.007	4.48	.00006
BL versus SA	28	42	4.23	.0001	1.56	.12	2.00	.05
BL versus AS	28	37	1.38	.16	1.12	.27	2.22	.03

the BL data serve as comparison, rather than as control data.

For the SA condition, there was a significant initial departure from .5 in the direction of guessing more smiling than angry faces. One might argue that for this condition there was some learning of the input probabilities even in the first 10 trials. Such an argument would not hold, however, for the AS condition where the initial expectancy was significantly below .5, despite the fact that angry faces constituted 70% of the input. A similar result was obtained for the BL condition. In these conditions the aversiveness of the $S_{.70}$ input (or perhaps the attractiveness of the $S_{.30}$ input) overcame both the actual dominance of the $S_{.70}$ stimulus in the deck, and ordinary .5 initial response tendencies. The differences in initial response tendencies are clearly seen in Table 2 where comparison of expectancies between SA versus AS and SA versus BL yield two-tailed p values of less than .0009 and .0001, respectively. No significant differences emerged between the AS and BL conditions.

Asymptotic Response Rates

As Figure 1 indicates, there was a strong tendency for the differences between the three conditions to diminish and stabilize towards the end of the 150 trials. Nevertheless, markedly significant differences continued to appear between the AS and SA conditions (Table 2), though neither of these conditions differed significantly from the BL condition at asymptote. The data would suggest that over time the subjects gradually learned to respond somewhat more to the objective stimulus inputs and to become relatively less affected by the affective value of the stimuli.

Expectancy across 150 Trials

Mean proportions of $S_{.70}$ responses were, as might be expected, different for the AS and SA conditions over all 150 trials (Tables 1 and 2). Where the dominant input was an angry face, that stimulus was expected 58% of the time. On the other hand, where the 70% stimulus was a smiling face, the subjects anticipated the stimulus 68% of the time. Indeed, as Figure 2 shows, the mean curves for the experimental conditions did not overlap.

Differences between responses to the affective stimuli and to the relatively neutral ones were also significant across the 150 trials (Table 2).

Sex Differences

We examined the data to see whether there were sex differences in the tendency to over- or underexpect the $S_{.70}$ input. Male-female comparisons within each condition revealed no statistically significant differences (Table 3). When, however, comparisons were made across conditions it was found that mean differences in expectancy of the $S_{.70}$ input were far greater for females than for males (Tables 1 and 3). Thus, over the entire 150 trials mean expectancy for $S_{.70}$ for females in the AS condition was 56% while expectancy in the SA condition was 70.4% (Table 1). The difference was significant beyond .0001 (Table 3). For men, such overall significant differences were present but not as sharp. At the asymptote, women tended to overexpect the $S_{.70}$ input when it had a positive affective valence and to underestimate it markedly when the $S_{.70}$ valence was negative. For men, continuous exposure to the stimuli decreased

TABLE 3

SEX DIFFERENCES IN EXPECTANCY FOR AS, SA, AND BL CONDITIONS (MANN-WHITNEY U TESTS, TWO-TAILED)

	N_1	N_2	Trials 1–10		Trials 111–150		Trials 1–150	
			z	$p <$	z	$p <$	z	$p <$
Within AS: F versus M	15	22	1.17	*ns*	1.04	*ns*	.57	*ns*
Within SA: F versus M	20	22	.399	*ns*	−1.04	*ns*	1.53	.13
AS versus SA (M)	22	22	2.15	.03	.94	*ns*	2.44	.01
AS versus SA (F)	15	20	2.67	.008	2.98	.003	3.92	.0001

the impact of the affect to the point that, at asymptote, no significant differences in expectancy between the SA and AS conditions were evident (Table 3). The data suggest that the affective stimuli were, to begin with, not quite as influential for men as they were for women, and that after 110 trials men were more able than women to resist the influence of the affects per se, and to respond more to the objective inputs.

Individual Differences in Expectancy and Their Relation to Personality

The apparent regularity of probability learning curves (and most other average performance curves) are misleading in that these mean performance curves summarize and conceal large individual differences.[2] These individual differences lead us to inquire about possible relations between affective expectancy and personality.

Most of the subjects had taken the Edwards Personal Preference Schedule (EPPS) 5 weeks before the probability learning experiment. Correlations between the 15 need scales of the EPPS and total responses for the $S_{.70}$ stimulus over all trials are presented in Table 4, separately for males and females and for the AS and SA conditions. Before proceeding to discuss these relations, however, we must issue a caveat: In addition to the problems of interpreting correlations for 15 measures based upon such small sample sizes, the EPPS imposes some structural constraints upon the sizes of the correlation coefficients by virtue of its ipsative format. One of the properties of such an ipsative test is that the sum of the *covariances* between these 15 scales and some other "criterion" score is 0, and when the ipsative scale variances are constant, the sum of the "criterion" *correlations* is also 0 (Radcliffe, 1963). Thus, these ipsative covariances may be considered to be covariances for the needs measured in a nonipsative or normative way with the average normative covariance subtracted. Since this average normative covariance is not known,

TABLE 4

CORRELATIONS BETWEEN TOTAL RESPONSES FOR THE $S_{.70}$ INPUT AND PERSONALITY CHARACTERISTICS

$S_{.70}$ input	AS 70% angry		SA 70% smiling	
	Females (N = 15)	Males (N = 19)	Females (N = 20)	Males (N = 20)
EPPS				
Achievement	−.06	.19	.11	−.51**
Deference	.62**	.00	−.24	−.31
Order	.40	.38*	.03	−.04
Exhibition	−.38	−.41*	−.14	.39*
Autonomy	−.23	−.15	.03	.34
Affiliation	.05	−.02	−.33	.10
Intraception	.34	.09	−.19	−.20
Succorance	−.25	−.26	.14	.46*
Dominance	−.01	−.16	.29	−.27
Abasement	−.16	.21	.00	.21
Nurturance	.27	.02	−.04	.17
Change	−.48*	−.14	−.13	.02
Endurance	.29	.63**	.25	−.31
Heterosexuality	−.13	−.20	.55**	.02
Aggression	−.23	−.01	−.14	.03

Note.—Ns vary from condition to condition. In addition, not all subjects took the EPPS. Thus, the Ns here are lower than those cited in Table 1.
* $p < .05$.
** $p < .01$.

[2] Figures 3a and 3b containing more detailed information have been deposited with the American Documentation Institute. Order Document No. 8606 from ADI Auxiliary Publications Project, Photoduplication Service, Library of Congress, Washington, D. C. 20540. Remit in advance $1.25 for microfilm or $1.25 for photocopies and make checks payable to: Chief, Photoduplication Service, Library of Congress.

it is difficult to compensate in the interpretation of the correlations for the restriction that the sum of the ipsative covariances is 0.

With this warning in mind, we will proceed to discuss some of the high correlations in a deliberately tentative fashion. There is a modest consistency across sex for some of these correlations, but *only* in the AS condition. We note, for example, that the number of angry responses in the AS condition correlates negatively with Exhibition (the need to occupy center stage, as it were) and positively with Order. The negative relationship with Change for females, and the positive relationship with Endurance for males, would appear to be consistent with previously reported correlations for Order (Edwards, 1954). The positive correlation between total expectancy for angry affect and deference among females, but not among males, would appear to be a stimulus-linked relationship: Since the stimuli were male faces, this finding might suggest that women who expect males to be angry are also deferent to them.

In the SA condition, we find positive correlations between the number of smiling faces guessed and both Exhibition and Succorance among males. Among females, there is a strong positive correlation with interest in the opposite sex (Heterosexuality). (Recall again that the stimulus face was male.) Finally, if we take a high expectancy of smiling faces to mean a desire for relatively immediate social reinforcement from the environment, and the need for achievement as reflecting a preference for internal (as opposed to social and external) reinforcement, the negative correlation for males between the EPPS Achievement scale and expectancy for smiling faces can be rationalized.

CONCLUSIONS

We turn again to the differences between the AS and SA conditions. At the moment, it is clear that no definite statement can be made as to *why* these differences occur. Does the higher $S_{.70}$ response level in the SA condition occur because subjects prefer the smiling face, or because they avoid the angry? Is it the positive valence of the smile that dictates the elevated response level, or the negative valence of anger, or the contrast of the two? The available data do not permit us to decide. At a descriptive level, however, we can say that given a context in which a smiling face is the more probable occurrence, subjects' guesses will tend to approximate input. On the other hand, where the context is such that anger is the more probable occurrence, subjects will tend to underguess the dominant input markedly.

These findings suggest that, with regard to emotional expectancies, subjects' responses are somewhat autistic, that is, their behavior appears to be influenced by internal determinants such as affects and motivations as well as by external determinants such as input probabilities (Helson, 1953; Murphy, 1947; Solley & Murphy, 1960). Although such motivationally biased expectancies may not override immediate stimulus conditions in many perceptual tasks (Solley & Long, 1958), they may contribute to the context of perception by influencing the hypothesis or "best bet" used to organize the stimulus information (Bruner, 1957; Ittelson & Cantril, 1954; Postman, 1951), and in extreme cases may set the stage for autistic perception (Murphy, 1947; Solley & Murphy, 1960).

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