# GSR and the anchoring of pitch judgments*

VIKTOR SARRIS
University of Duesseldorf, Duesseldorf, Germany
and
BIRGIT TEWS and WOLFGANG SCHÖNPFLUG
Ruhr University, Bochum, Germany

In earlier studies it was shown that the mean anchor-adaptation level relationship follows a cubic trend. The "arousal" hypothesis that anchor stimuli produce specific GSR effects was tested and confirmed. It was recommended that the question of whether or not the *quartic* GSR trend that was found reflects "context" effects should be further investigated.

Recent studies on anchor effectiveness in psychophysics have shown that the mean anchor-AL (adaptation-level) relationship follows a cubic trend (Sarris, 1967, 1969). Furthermore, *variability* in judgment was also found to be related to anchor values, namely: (1) When the anchor was at the center of the stimulus series, inter- and intraindividual variability were minimal; (2) when the anchor was mildly beyond the series center, thus producing a maximum contrast effect, variability in judgment was maximal; and (3) when an anchor was psychologically extreme relative to both ends of the series, the common psychophysical contrast effect disappeared and judgmental variability assumed an intermediate value approximately equal to that obtained in experiments where no anchor was used (Sarris, in press).

These phenomena may reflect differences in "attention" to anchor stimuli (cf. Sarris & Haider, 1970). More specifically, Ss' differing degrees of contrast may be correlated with different states of "arousal" (see, e.g., Haber, 1958). For, in Case 1, the anchor in fact "anchors," i.e., *stabilizes*, S's judgments; however, in Case 2, the anchor produces a *conflict* in S between E's instruction to ignore the anchor and S's experience that the anchor, though discrepant from AL, still belongs to the same psychological class of series stimuli; finally, in Case 3, where the anchor is effectively ignored because of its phenomenal dissimilarity to the series, no *judgmental* conflict is involved in Ss' task. The galvanic skin response (GSR) is known to be a component of orienting behavior and may also indicate arousal because of conflict (Berlyne, 1960; Lynn, 1966). It was hypothesized, therefore, that a lawful relationship might exist between anchor value and GSR amplitude. Specifically, it was predicted that GSR amplitude, as a numerical function of anchor, should follow a *quartic* trend, the maxima of GSR being associated with intermediate deviations of anchors from AL and the minima of GSR being associated with extreme anchors and with the anchor at the center of the series.

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## METHOD

The psychophysical test situation followed the typical Helson (1947) procedure except for necessary alterations due to GSR recording requirements.

### Stimuli and Main Procedure

The study of pitch was chosen because its range of possible anchor variation is relatively broad and also since the common *interaction* of receptor adaptation on one hand and relativity of perceptual judgment on the other hand can be avoided if sound intensity is moderately weak. The specific frequency stimuli (sine waves) were chosen to correspond closely with those in an earlier study; i.e., for a 500- to 600-Hz series (500, 525, 550, 575, 600 Hz), five pitch anchors (85, 250, 550, 700, 7,000 Hz) which had previously been found to fully describe the cubic anchor-AL relationship (Sarris, 1969; Sarris & Haider, 1970) were employed. All pitches were presented binaurally via earphones at const 65 Phon.

The anchor, which S was instructed neither to judge nor regard, preceded each series stimulus and remained the same throughout a given session. The anchor was presented for 2 sec; after a break of 4 sec, one of the series stimuli was given for 2 sec and was judged according to a 9-step rating scale. The response times (15, 20, or 25 sec) were varied randomly to avoid rapid GSR habituation (Pendergrass & Kimmel, 1968). Five pairs with the same anchor but different series stimuli, randomly presented, constituted a test block. In a single session, S completed 15 test blocks.

The 90 Ss were students at the Ruhr University (Bochum), 60 being males. In order to avoid possible carryover effects and to circumvent rapid GSR habituation as effectively as possible, each S was tested only once; i.e., S was assigned randomly either to one of the five anchor conditions or to the control test ("without anchor"). Thus, each experimental group consisted of

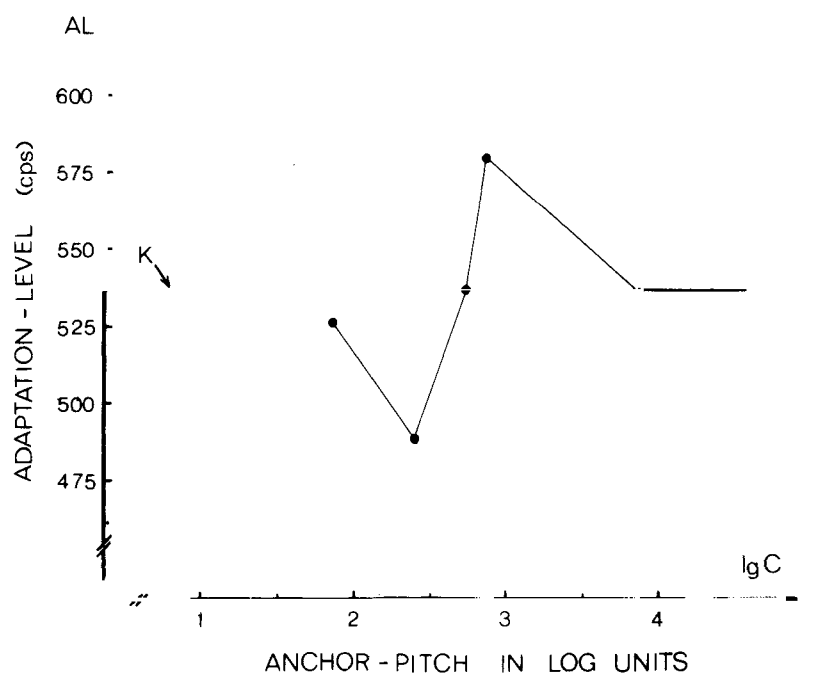


Fig. 1. Mean adaptation level (cps) as a function of anchor values (in log units of Hertz).

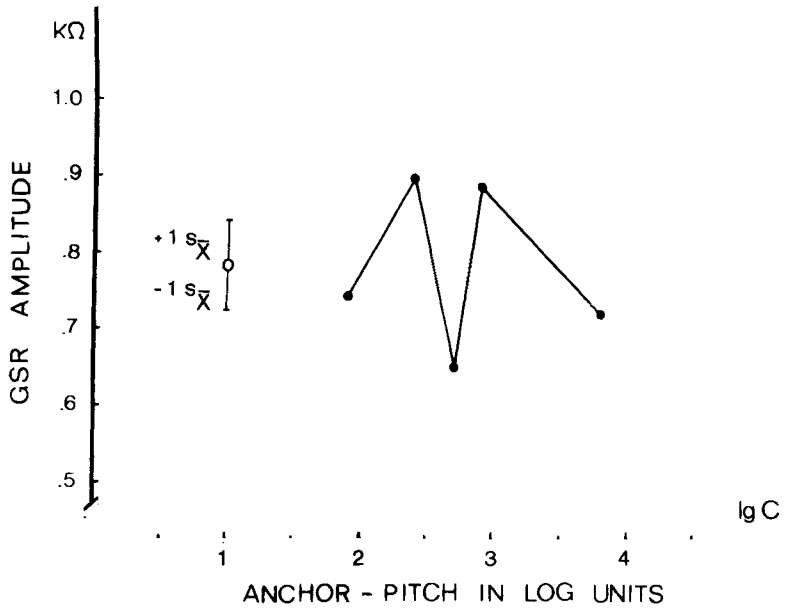


Fig. 2. Mean GSR measure (in kilo-ohms) as a function of anchor values (in log units of hertz). The $s_{\bar{X}}$ bar denotes the mean GSR standard error.

15 Ss, 10 of whom were male students. The experiment involved a three-factor design (5 by 2 by 5) planned to account for anchor variation (A), sex (S), and states of habituation over three-trial blocks (B). Each test session lasted about 40 min.

GSR Recording

For the specific anchor-GSR session S received careful instructions. S was seated in a comfortable chair in a quiet laboratory room. Velcro electrodes were attached to the ventral sites of the second and fourth finger, and skin resistance was monitored throughout the experimental session. The electrodes were connected to a recording apparatus in the next room, where the equipment for automatic presentation of the stimuli was located. After approximately 3-5 min of rest, during which E made adjustments in the recording room, automatic presentation of stimuli was started.

After S had completed the experiment, a physiological reading was taken of the minimum resistance with a 4-sec period following each anchor stimulus and of the resistance level just prior to occurrence of each anchor (base level). The difference between base level and minimum resistance was defined as the GSR to the respective anchor frequency.

RESULTS AND DISCUSSION

The empirical ALs (i.e., the physical points of *neutral* judgment) were calculated from the 90 individual judgment curves (Helson & Himelstein, 1955). The results are summarized in Fig. 1, which clearly shows that the anchor-AL relationship follows a cubic trend; i.e., with extreme anchor, the trend approaches the respective control line K ("without-anchor" value). Nonparametric trend analysis (Ferguson, 1965) yielded a highly significant cubic component ($p < 0.001$). For similar findings, see Sarris (1969) and Sarris & Haider (1970).

Of greater theoretical interest in the present context, however, is the empirical anchor-GSR relationship. The mean GSR values for the five anchor conditions are depicted in Fig. 2. This graph shows that GSR does indeed follow the hypothesized quartic trend (see above).

But note the rather extreme GSR variability, which is responsible for the overall nonparametric trend analysis of GSR data *not* achieving significance for the quartic component ($p \approx 0.20$). A three-factorial analysis yielded a lower, though still insignificant, p value ($0.10 < p < 0.05$); however, analysis of covariance (the covariate being the GSR of the *stimuli series* from the first test block), controlling statistically for interindividual differences (see, e.g., Winer, 1962), produced borderline significance [$F(4,64) = 3.66$; $p = 0.06$]. An additional corroborating statistical check is given elsewhere (Sarris, in press).

In view of the fact that high GSR variability is a well known general phenomenon and the hypothesized complex GSR trend was tested here under a minimal number of different anchor conditions, the data appear to corroborate the evidence presented graphically in Fig. 2. However, although the "arousal" hypothesis of anchor effectiveness receives important support here, what remains is less a statistical than a methodological problem. The reported data do not demonstrate beyond doubt that the quartic GSR trend reflects *context* effects in psychophysics; i.e., one cannot be certain that the GSR data reflect either *absolute* frequency effects per se or the effect of the distance between anchor and series frequencies.[1] Since both theoretical interpretations would be of challenging relevance, it is recommended that they should be investigated more fully in future research.

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NOTE

1. Although the experiment had been planned to provide an empirical check on the question of context effects (by means of additional recordings of the *series-stimulus* GSR), these additional data were not found relevant, since perhaps the constant 4-sec interval between the anchor and the series stimulus was too short for obtaining reliable *series*-GSR measurements.