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ABSTRACT

A study examined the effects of gender on social interaction under numerically imbalanced conditions. Specifically, the study tested R. M. Kanter's assumption that all tokens (individuals who enter a work environment where their gender is numerically scarce) respond in a similar manner to token conditions, although evidence exists that males and females respond differently. An interpersonal simulation was run to test both males and females under three different sex ratio conditions. Subjects were 122 librarians--42 males and 80 females. These subjects role-played situations in which they were members of minority groups in the ratios 19:1 (skewed), 6:1 (tilted), and 1:1 (balanced). Effects were measured using the Situational Communication Apprehension Measure (SCAM), because responses in extreme ways would be evidence of perceived performance pressure. The degree of numerical imbalance was found to be linearly related to performance pressure, and males felt significantly less performance pressure than females under the highly skewed sex ratio conditions. Overall, Kanter's theory was supported. (RL)

# The Effects of Numerical Imbalance and Gender on Tokens: An Examination of Kanter's Theory

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An Examination of Kanter's Theory

The so-called liberation of the 70's spawned large numbers of women entering male dominated professions and men entering female dominated professions although in much fewer numbers. Unfortunately, the sexual-political atmosphere of some environments can preclude success for those newcomers subject to tokenism. Individuals are deemed "tokens" when they enter a job environment with a history of their sex being numerically scarce and rare to a given occupation. While tokens are usually fewer in number in comparison to the dominant group, their presence is an uncomfortable reminder to the dominants of the pressure they are under to share job rewards with previously excluded classes (Laws, 1975).

Tokenism is a form of patterned communication brought about by structural parameters as a way of adapting to a particular kind of pressure (Laws, 1975). Empirically, structural parameters manifest themselves in various measures of dispersion or differentiation (Blau, 1974). Blau argues that the task of a structural analysis is to study the linkage between structural differentiation and the integration of individuals into groups (and groups into larger social structures) via social interaction.

In this paper, structural differentiation refers to sex ratios, or the proportional representation of males in relation to females in a collectivity. Tokenism is brought about by the historical and immediate imbalance in sex ratios. While all such cases of imbalanced

sex ratios do not suggest tokenism, some form of token dynamics is usually brought about whenever the proportional representation of men to women is highly skewed (Kanter, 1977a). Kanter (1976; 1977a; 1977b) theorizes that tokens perform under a different set of working conditions than the majority. Her theory is the subject of this research.

Kanter's theory discarded the effects of cultural or sexual differences, focusing instead on numerical proportions of groups composed of similar individuals. She identified four group types. Uniform groups are composed of only one kind of person or social type. The "typological ratio" of uniform groups is 100:0. Skewed groups, with a ratio of about 85:15, are typified by a large number of one group type over another. The more sparsely represented types in a skewed group were identified by Kanter as tokens. Tilted groups, having approximately a 65:35 ratio, are less proportionally exaggerated. In tilted groups, the minority members can become allies and affect the group culture. Groups with ratios from 60:40 to 50:50 are termed balanced and contain subgroups rather than majority and minority members.

Kanter identified three perceptual phenomena associated with tokens: visibility, polarization, and assimilation. Tokens are more highly visible in groups than are dominants and thus are under more performance pressure. Polarization refers to the tendency of certain groups to exaggerate their differences, a phenomenon which results in the dominant group heightening its boundaries, thereby developing a tighter coalition and isolating the token. Assimilation of tokens is based upon the stereotypes of a person's social type which causes a

role entrapping situation to develop for the token.

Existing literature on tokenism generally and Kanter's theory specifically is sparse. For example, Segal (1962) observed male nurses and Laws (1975) examined sponsorship as a device for inducting female tokens into a college faculty. Wolman and Frank (1975); cited in Kanter, 1977a) reported on lone women in professional training group and Taylor and Fiske (1975; cited in Kanter, 1977a) experimented with black tokens in a white male group. Though not primarily concerned with sex ratios, there are several studies which report on professional women in male dominated fields (Hennig, 1970; Epstein, 1970; Lynch, 1973; Cussler, 1958; all cited in Kanter, 1977a).

There is no mention of the effects of numerical imbalance in the organizational communication literature (see Dennis, Goldhaber, and Yates, 1978; Richetto, 1977; Porter and Roberts, 1974; Guetzkow, 1965), nor the small group communication literature (see Shaw, 1971; Rosenfeld, 1973; Davis, 1969). This absence is due in part to communication researchers' preoccupation with communication qua communication and its emergent aspects. As a result, broad structural concerns are often neglected in communication research, perhaps because (incorrectly) it is seen as the domain of organizational theory or sociology. Richetto (1977) and others have made a similar argument.

Outside of Kanter's own in-depth interviews and observations of women in sales for a large corporation, the authors are aware of only one other published test of her theory. Spangler, Gordon and Pipkin (1978) studied women in law schools, one school possessing a skewed sex ratio and another possessing a tilted ratio. Spangler, et al. found token dynamics to exist in law schools and to vary with the imbalance

in the ratios. While they found support for Kanter's theory, the data may have been strongly influenced by social desirability factors. Further, the study brought to light the difficulty in putting Kanter's theory to an empirical test.

A review of Kanter's theory reveals the following propositions about tokens: 1) high visibility leads to increased performance pressure; 2) polarization results in boundary heightening by the dominant group; and 3) assimilation based on stereotypes causes role entrapment of the token. The present research examines the first proposition regarding performance pressure and thus the following hypothesis is proposed:

Hypothesis 1: The greater the imbalance in the proportions, the greater will be the performance pressure upon minority group members.

Although Kanter's research focused on women executives in organizations, she generalized her findings to all tokens (Kanter, 1977a, p. 968). Therefore, another testable proposition is generated from the theory: sex differences should matter little under conditions of numerical imbalance.

There is, however, some evidence to suggest that males and females face different dynamics in role entrapping situations and respond differently to performance pressures (Laws, 1975; Athanassaides, 1974; Shaw. 1971; Thompson, 1967). Chief among the contributors to different token dynamics for males and females are cultural factors. Laws (1975) argues that class or status in American society is established at birth by virtue of one's gender with males assuming the preferred status.

Consequently, females do not have the same access to the reward and opportunity structure as their male counterparts, numerical dominance or the enlighten attritudes of the 70's notwithstanding.

As such, female tokens are "double deviants" (Laws, 1975). The woman as token is assigned to a "primary-deviant" status because she is born female. If the woman aspires to the privileges and attributes of the dominant group, as embodied in certain all-male occupations, she becomes a double deviant. Thus, when a woman seeks to advance her position, she increases her deviancy by not only being female but also by refusing to accept her status as one. Male tokens, however, are not double deviants because they are born to the favored gender in our society. They are "single deviants" in the sense that they aspire to an occupation which places them in the minority.

We feel that it is reasonable to argue that differences in gender, which translates to differences in "deviancy level," could either heighten or lessen the effects of tokenism. That is, the more deviant one is, the greater the experience of "being different," and in all likelihood, being treated differently. The conept of "deviancy level" is plausible enough to suggest that gender, in addition to numerical imbalance may affect social interaction in a work environment. Therefore, in light of the above information, the following research question is posed:

Research Question: To what extent does gender influence social interaction under conditions of numerical imbalance?

Kanter's theory infers the null, or no difference. The alternative hypothesis states that females should experience greater performance

pressure than males, especially under extreme conditions (i.e. a skewed sex ratio).

## Method

This research consisted of a survey experiment in which subjects were presented with a hypothetical situation. The basic story cast the focal character as a relative newcomer to an academic faculty. The faculty was not only homogeneous with respect to sex, but had a history of the newcomer's sex being numerically scarce and rare to their job environment.[1] Subjects were asked to predict the response of the minority member under skewed, tilted, and balanced sex ratio conditions.

While this interpersonal simulation or "role-play" may not afford greater external validity than field research in this area, it does permit a comparison of male and female responses to the token role under relatively equal experimental conditions. It is very difficult to make the same comparison in a field setting because no two sets of field conditions are ever exactly alike. Thus, the information gained from such a simulation can be an important precursor to field work with either or both sexes.

The use of interpersonal simulations is well documented in the literature. Bem (1965, 1967, 1972) provided his subjects with the

[1]This was accomplished by telling respondents that until recently the academic institution was formerly all female (or all male) and the department in question had resisted hiring members of the opposite sex even when the opportunity presented itself. The story further intimated that the faculty was under some pressure to balance its sexual representation, and it was under these circumstances that the focal person was hired. Along with a skewed proportional representation, these conditions are sufficient to create tokenism.

behaviors of other subjects who had responded to a specific treatment condition in a cognitive dissonance experiment. Bem's subjects, the observers, were asked to predict the attitudes of individuals subject to the original experiment. Among other simulations, Bem (1967) successfully replicated Festinger and Carlsmith's (1959) forced compliance study and Brehm and Cohen's (1959) free choice study. Others have replicated the results of additional dissonance experiments with some success (Harris and Tamler, 1971; Jones, 1966; Zanna, 1970; all cited in Bem, 1972). While investigating their situated identity theory, Alexander and Knight (1971) went so far as to replicate a complex pattern of interaction effects in a forced compliance study by Carlsmith, Collins and Helmreich (1966), and Alexander and Lauderdale (1977) replicated Zelditch, Lauderdale and Stublarec's (1975) conformity study.

Pretesting. While many interpersonal simulations establish a linkage to actual behavior, not all are successful (see Bem, 1972). In principle, this is because the simulation may not appear to model reality closely enough or the process of scanning one's cognitive structures is likely to be less careful and thorough when responding to hypothetical situations (Schwartz, 1977). Thus, the use of simulations should be valid to the extent: 1) they lie within the realm of the subject's experience so the subject can easily project himself/herself into the situation, and 2) the implications of the simulation are made salient so decision-making for the hypothetical situation more closely approximates decision-making in "real-life."

With these considerations in mind, several versions of the final vignette were pretested. An opportunistic sample of 20 persons

responded to various combinations of token occupations and sex ratios. The final vignette resulted from the following reasoning: 1) Because this sample was known to be composed of librarians, many of whom were familiar with academic institutions, a library science department was chosen as the occupational setting. 2) Since the field of library science per se has not had a recent history of tokenism, this was introduced by an academic institution that did. 3) The ratios were scaled to fit the size of typical academic departments. 4) Finally, since a certain amount of apprehension accompanies any new job, subjects were asked to assume the preliminary adjustments were past.

Design

Subjects were 122 librarians, 42 males and 80 females. Each subject was asked to consider three situations which differed in the proportional representation of the majority in relation to the minority. Males and females were given the same vignette excepting the fact that males responded to the vignette where a male was the minority member and females responded to the vignette where a female was the minority member. The design was a two between, one within subjects design. The first theoretical variable, sex, was a between subjects variable. The second theoretical variable, sex ratio, was the within subjects variable. Order of administration was not a theoretical variable but was included as a between subjects variable.[2] An a priori sample size limit prohibited testing all possible orders. Thus, 3 of the 6 possible orders were tested.

[2]Because order is a categorical variable, it was not suitable for covariance analysis.

Independent variables. Proportional considerations were manipulated by asking the female respondent to imagine she joined three different all male faculties; one having 19 males, a second having 6 males, and a third having only 1 male. The male respondent was asked to join three different all female faculties of the same proportions. The 19:1 ratio represents a skewed sex distribution; it corresponds to Kanter's limits for that category which is around 85:15. The 6:1 ratio represents a tilted sex distribution, but is at the lower end of Kanter's ratios for that category which is around 65:35. To fall safely within that category meant a ratio of somewhere between 2:1 and 5:1. This was viewed as too similar to the 1:1 condition, hence, indistinguishable to the respondent. The 1:1 ratio represents the balanced sex distribution which corresponds to Kanter's specification for that category which is 50:50.

Sex of the respondent is completely nested within sex of the minority member. In other words, males were not asked to role-play females and vice versa. This bypasses the inclination of subjects to role-play members of the opposite sex by invoking cultural stereotypes.

Dependent Variable. The dependent variable was the Situational Communication Apprehension Measure (SCAM). The two behavioral responses to performance pressure that Kanter identifies are underachievement and overachievement. These behavioral responses pose some special measurement problems for both field research and especially for simulation research. While Kanter does not elaborate the affective responses to performance pressure, it is logical to assume they would be negative and anxiety producing. The fact that tokens find it necessary to

respond in extreme ways is evidence of an aversive motivational state. It is only individual responses to such pressure that may range from over-asserting oneself to under-asserting oneself. Accordingly, the Situational Communication Apprehension Measure (SCAM) (Snavely and Phelps, 1979) was selected as a measure of the affective response to performance pressure. This measure identifies the feelings an individual experiences while interacting with a specific other situation in mind. Recent articles (Snavely and Phelps, 1979; Richmond, 1978) have argued that aspects of the interaction context may provoke apprehension in individuals who cannot be said to experience apprehension across all contexts. This is important for this study because performance pressure is brought about by contextual conditions (i.e. the proportional representation of men and women in a given job environment). Previous research indicates high reliability for the scale (Cronbach's alpha = .81) and a strong case for its validity (Snavely and Phelps, 1979). Pretesting of this scale for this study revealed one of the items to be too ambiguous, and thus was subsequently dropped from consideration.

Administration. The questionnaires were distributed in a large-group session. Subjects were given the following written directions which were similar to those used by Fleishman and Marwell (1977):

> What I would like you to do is to fill out this questionnaire, which is concerned with role-taking ability. Role-taking ability is the ability to see things as someone else sees them, to share his/her perspective, or to empathize with him/her. Essentially, this questionnaire contains a brief description of a situation involving men and women. There follows a set of questions which ask you to predict how you think one of those individuals will react to the situation described. In order to do this, you will have to take the role of the other imaginatively.

Manipulation Check. Each vignette was followed by a question

which asked subjects to estimate the attitude of the minority member regarding the ratio of men to women on that academic faculty. This constituted the manipulation check. The following answers were provided to subjects after they were reminded of the ratio presented in the preceding vignette.

1) There are way too many men (women), not nearly enough women (men)
2) There are slightly too many men (women), a few more women (men) are needed
3) Just about right
4) Too many women (men)

If the ratio was 19:1, (1) was the expected response; if the ratio was 6:1, (2) was the expected response; and if the ratio was 1:1, (3) was the expected response. Seventy-four percent (74%) of the respondents correctly identified the skewed condition (19:1). Fifty-nine percent (59%) of the respondents correctly identified the tilted condition (6:1), and 78% of the respondents correctly identified the balanced condition (1:1). The fact that fewer subjects correctly identified the tilted condition was probably because it was not as extreme a situation as the other two conditions, and thus not as easy to identify. Nevertheless, the results of the manipulation check are satisfactory because a clear majority correctly identified the three conditions.

## Results

### Confirmatory Factor Analysis

The first step in analyzing this data was to confirm the factor structure and establish the reliability for the chief measurement instrument, the Situational Communication Apprehension Measure (SCAM). The items from the SCAM scale were subjected to a principal components

analysis for each sex ratio condition. As expected, all items loaded on single dimension for each sex ratio condition. In the skewed condition, the first factor accounted for 73% of the variance. In the tilted condition, the first factor accounted for 69% of the variance. Finally, in the balanced condition, the first factor accounted for 71% of the variance. The standardized item alphas were .92 for the skewed condition, .91 for the tilted condition, and .91 for the balanced condition. The factorial stability and reliability of the SCAM scale appears consistent with previous research.

Analysis of Variance

The second step in data analysis was to analyze the two between, one within subjects design. The analysis of variance presented in Table 1 reveals a three-way interaction between sex ratios, sex, and order ($F(4,226)=2.48$, $p=.045$). This threat to internal validity is not so formidable as it might first appear. However, this argument must wait until order effects have been examined.

Order Effects. The analysis of variance in Table 1 reveals a sex ratio by order interaction ($F(4,226)=3.21$, $p=.014$) and a significant main effect for order ($F(2,113)=7.33$, $p=.001$). The means plotted in Figure 1, which are collapsed on sex, demonstrate this. The source of the sex ratio by order interaction appears to be caused by Order 3 (1, 19, 6). When this order was deleted from the sample, the interaction term disappeared ($F(2,152)=.12$, $p=.887$). Significantly, the three-way interaction also disappeared when the third order was removed ($F(2,152)=1.12$, $p=.329$).

In addition to the sex ratio by order interaction, there are significant differences between orders within sex ratio conditions. This was established by reviewing one-way analysis of variances which tested for significant order differences within sex ratio conditions and Scheffe's test which provided an a posteriori test for specific differences among orders.

In the skewed sex ratio condition (Table 2), there is a near significant difference between orders ($F(2,119)=3.02$, $p=.053$). Had the error component not been somewhat larger than the other two conditions, significance would probably have been achieved easily. The conservative Scheffe procedure revealed non-significant differences between orders at the .05 level but Order 1 was significantly different from Order 3 at the .10 level.

In the tilted condition (Table 3), there was a significant difference between orders ($F(2,118)=3.30$, $p=.04$). The Scheffe procedure yielded no significant differences between orders at the .05 level, but Order 1 was significantly different from Order 2 and the .10 level.

In the balanced condition (Table 4), there was again significant differences between orders ($F(2,116)=16.93$, $p=0.001$). The Scheffe procedure yielded a significant difference between Orders 1 and 3, and Orders 2 and 3 at the .05 level. All orders were significantly different from one another at the .10 level.

Both the main effect for order and the sex ratio by order interaction, can be explained by the anchoring effect of the first sex ratio condition administered to subjects. For Order 1 (19, 6, 1), the anchor

was the skewed condition; for Order 2 (6, 1, 19), the anchor was the tilted condition; and for Order 3 (1, 19, 6), the anchor was the balanced condition. The anchor worked in the following manner. The first condition evaluated by subjects served as the reference point for subsequent evaluations. In all orders, the skewed condition was deemed the most apprehensive (i.e. had the highest SCAM score), the balanced condition was deemed the least apprehensive, and the tilted condition was moderately apprehensive. Also to be considered is the fact that all three anchors start out at approximately the same level of apprehension. This is largely because the sex ratio is not apparent as the sole distinctive aspect of the vignette until after the second vignette has been encountered. Thus, giving a mid-range answer is a safe move until more aspects of the situation are identified.

As a result, Order 1 differed from Orders 2 and 3 because the skewed condition served as the anchor for Order 1 and thus set the upper bound for subsequent evaluations.

For Order 2, the tilted anchor served as the midpoint for the skewed and balanced evaluations, the former falling somewhere above the tilted mean and the latter falling below it.

For Order 3, the situation changed only slightly. The balanced anchor served as the lower bound for the tilted and skewed evaluations, the former falling above the balanced man, and the latter falling above the tilted mean. In this order, however, subjects evaluated the two extreme conditions first (skewed and balanced) and designated less variability between them than they did in other orders where the evaluation of the extreme conditions was always separated by the more moderate tilted

condition. Consequently, the slope of the line for Order 3 means differs from the slope of the line for the means for Orders 1 and 2, thus accounting for the sex ratio by order interaction.

The anchoring effect which produced a main effect for order and a sex ratio by order interaction is also thought to be chiefly responsible for the sex ratio by order by sex interaction. This is because the latter interaction term disappears when Order 3, the cause of the sex ratio by order interaction, is removed from the data.

The effects of order, including the three way interaction, are felt to be theoretically explainable and practically trivial, thus representing no threat to internal validity. This argument is based on the observation that the raw score differences do not mitigate against the descending pattern of the means found for all orders and both sexes across sex ratio conditions. However, subsequent findings are tempered by two realizations. The first is that only three of six possible orders were tested due to constraints in the sample size. Thus, we must assume that the non-tested order effects would behave in the same way as the tested order effects. This may not be an unreasonable assumption given anchoring effects would always be present under conditions of comparative evaluations. The three non-tested orders duplicate the three tested orders in that one of the remaining orders requires evaluation of the two extreme conditions (skewed and balanced) first, and the other two require evaluation of the tilted condition in the first or second place. The second realization is that when we dismiss order effects, we cannot totally dismiss the influence of the three-way interaction on the other effects. However marginal its influence is felt to be, its presence

must still be noted. Order effects notwithstanding, we may proceed on to a test of our hypotheses with some confidence.

Hypothesis 1. Hypothesis 1 stated the greater the imbalance in the sex ratio, the greater the performance pressure. The analysis of variance in Table 1 revealed a significant sex ratio effect ($F(2,226)=89.06$, $p=.001$) which persisted even when Order 3 was removed ($F(2,152)=76.18$, $p=.001$). While we can say there are significant differences between sex ratio conditions, we cannot speculate as to the linear or non-linear pattern of the means. Accordingly, a trend analysis was performed on the data. Table 5 presents the analysis of variance which partitions the sum of squares for sex ratio into those effects which are linear and those which are nonlinear. Both the main effect for sex ratio ($F(1,113)=139.91$, $p=.001$) and the sex ratio by sex interaction ($F(1,113)=5.71$, $p=.019$) are linear in nature, while the other effects which contain the influence of order are nonlinear. These are sex ratio by order ($F(2,113)=3.90$, $p=.023$) and sex ratio by order by sex ($F(2,113)=3.17$, $p=.046$). Based on the linear and descending pattern of the means, Hypothesis 1 is supported.

Research Question. The alternative hypothesis for the Research Question stated males and females should respond to the performance pressure differentially, expecially in the skewed condition. The analysis of variance in Table 1 did not reveal a significant sex effect ($F(1,113)=1.20$, $p=.275$), however, there was a significant sex ratio by sex interaction ($F(2,226)=4.07$, $p=.018$). Three t-tests were computed between males and females within sex ratio conditions. There were significant differences between sexes in the skewed condition ($t = -2.15$,

$p = .034$, $df = 119$). near significant differences between sexes in the tilted condition ($t = -1.93$, $p = .056$, $df = 118$), and non-significant differences in the balanced condition ($t = 0.06$, $p = .952$, $df = 116$). Thus, the alternative hypothesis for the Research Question is supported.

## Discussion

Order effects aside, the data are supportive of Kanter's thesis: performance pressure is directly related to the degree of imbalance in the proportional representation in collectivities. Ever since Simmel's (1950) classic analysis of the effects of numbers on social life, we have known absolute numbers (i.e. group size) affect social interaction. Now the effects of relative numbers must also be recognized. Specifically, the behavior of tokens must be reconsidered in light of the prevailing numerical contextual conditions. Further, any research employing mixed groups of males and females (or blacks and whites, old and young, etc.) should also control for the influence of relative proportions on the group behavior.

The research question in this paper was proposed in light of Kanter's assumption that all tokens respond in a similar manner to token conditions, and evidence to the contrary that males and females may respond differently. The significant differences found between men and women in the skewed condition does not seriously damage Kanter's theory because the descending pattern of the means is consistent for both sexes. It does suggest an amendment to the effect that the performance of individual minority group members is affected both by the proportion of minority members in the group and by gender. Females

appear to experience greater performance pressure.

The question of sex differences also becomes appropriate to ask when considering Kanter's other two propositions. Would male tokens be subject to the same degree of social isolation as female tokens? Would male tokens be subject to the same degree of role entrapment as female tokens? Obviously, male role entrapment would be qualitatively different than female role entrapment. The former is marked by dominance while the latter is marked by passivity if socialization followed traditional lines.

Before full support can be lent to Kanter's theory, field work is required for all three propositions on both sexes. It would appear from this research that Kanter needs to clarify her theory of tokenism with respect to gender. Actually, gender may not be the best point of clarification because other groups besides females occupy the double deviancy status referred to by Laws (1975). For example, blacks, the elderly, gays, and the handicapped could also be considered double deviants, while whites, the young, straights, and the non-handicapped could not be. If there has been large scale discrimination against any group in our society such that they would be forced into a double deviancy status when they sought a majority group position, then they should experience greater performance pressure under conditions of numerical imbalance than a single deviancy group. Should an individual lack membership in more than two preferred groups, the effects of tokenism should be compounded because the experience of being different is compounded. For example, it is possible to conceive of "triple deviants" -- black females aspiring to a male dominated profession.

Clearly, the degree of deviancy with respect to tokenism merits research attention as it may contribute, along with numerical imbalance, to token dynamics.

A final word should be said about the limitations of this study. First, the effects of order could have been more fully known, and possibly eliminated from consideration, had the a priori limit on the sample size not prevented us from testing all possible orders. Second, the possibility exists that demand characteristics accounted for the experimental effect. That is, because subjects received all three sex ratio conditions, they were able to decipher the experimental hypothesis and respond accordingly. While it is impossible to determine the validity of this rival hypothesis, pretesting results strongly suggested this was not a factor. The majority of the subjects in the pretested sample did not feel numerical proportions influenced social interaction under any condition. Some even felt numerical imbalance gave minority members greater power. Finally, since simulation research is not how people actually respond under token conditions but a projective estimate of how they would respond, its proper role in terms of the conclusions one draws must be recognized. We regard this data as only suggestive of what we are likely to find under field conditions.

Figure 1

Plot of the Means for SCAM Scores By Sex Ratio Conditions And Order

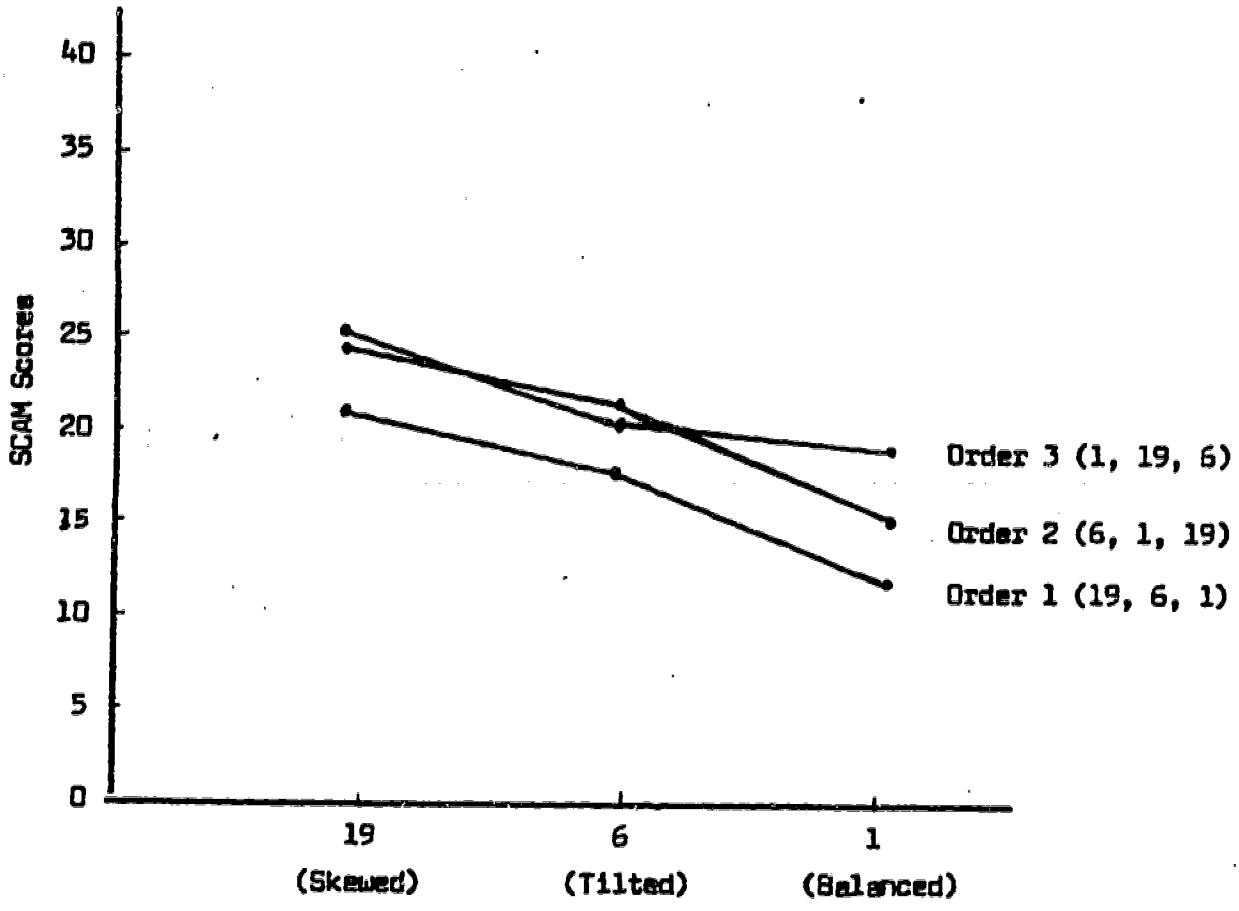

Table 1

Analysis of Variance for Sex Ratio, Sex, and Order

| SOURCE | DEGREES OF FREEDOM | MEAN SQUARE | F | TAIL PROBABILITY |
|---|---|---|---|---|
| Mean | 1 | 124054.37750 | 1101.57 | 0.0000 |
| Order | 2 | 825.29629 | 7.33 | 0.0010 |
| Sex | 1 | 135.26248 | 1.20 | 0.2754 |
| Order x Sex | 2 | 69.67894 | 0.62 | 0.5404 |
| Error | 113 | 112.61585 | | |
| Sex Ratio | 2 | 1350.69523 | 89.06 | 0.0000 |
| Sex Ratio x Order | 4 | 48.63958 | 3.21 | 0.0138 |
| Sex Ratio x Sex | 2 | 61.74636 | 4.07 | 0.0183 |
| Sex Ratio x Order x Sex | 4 | 37.62624 | 2.48 | 0.0448 |
| Error | 226 | 15.16648 | | |

Table 2

One-Way Analysis of Variance of Order Within the Skewed Condition

| SOURCE | DEGREES OF FREEDOM | MEAN SQUARE | F | TAIL PROBABILITY |
|---|---|---|---|---|
| Between Orders | 2 | 189.6178 | 3.021 | 0.0525 |
| Within Orders | 119 | 62.7656 | | |
| Total | 121 | | | |

Table 3

One-Way Analysis of Variance of Order Within the Tilted Condition

| SOURCE | DEGREES OF FREEDOM | MEAN SQUARE | F | TAIL PROBABILITY |
|---|---|---|---|---|
| Between Orders | 2 | 152.7734 | 3.299 | 0.0404 |
| Within Orders | 118 | 46.3157 | | |
| Total | 120 | | | |

Table 4

One-Way Analysis of Variance of Order Within the Balanced Condition

| SOURCE | DEGREES OF FREEDOM | MEAN SQUARE | F | TAIL PROBABILITY |
|---|---|---|---|---|
| Between Orders | 2 | 574.1299 | 16.934 | 0.0000 |
| Within Orders | 116 | 33.9042 | | |
| Total | 118 | | | |

Table 5

Trend Analysis

| SOURCE | DEGREES OF FREEDOM | MEAN SQUARE | F | TAIL PROBABILIT |
|---|---|---|---|---|
| Mean | 1 | 124053.00000 | 1101.57 | 0.000 |
| Order | 2 | 825.26758 | 7.33 | 0.001 |
| Sex | 1 | 135.28125 | 1.20 | 0.275 |
| Order x Sex | 2 | 69.67383 | 0.62 | 0.540 |
| Error | 113 | 112.61435 | | |
| Sex Ratio (L) | 1 | 2697.76465 | 139.91 | 0.000 |
| Sex Ratio (L) x Order | 2 | 54.13098 | 2.81 | 0.065 |
| Sex Ratio (L) x Sex | 1 | 110.06128 | 5.71 | 0.019 |
| Sex Ratio (L) x Order x Sex | 2 | 40.18005 | 2.08 | 0.129 |
| Error | 113 | 19.28194 | | |
| Sex Ratio (NL) | 1 | 3.53882 | 0.32 | 0.573 |
| Sex Ratio (NL) x Order | 2 | 43.14624 | 3.90 | 0.023 |
| Sex Ratio (NL) x Sex | 1 | 13.43506 | 1.22 | 0.273 |
| Sex Ratio (NL) x Order x Sex | 2 | 35.07117 | 3.17 | 0.046 |
| Error | 113 | 11.05080 | | |
| Sex Ratio | 2 | 1350.64884 | 89.06 | 0.000 |
| Sex Ratio x Order | 4 | 48.63861 | 3.21 | 0.014 |
| Sex Ratio x Sex | 2 | 61.74817 | 4.07 | 0.018 |
| Sex Ratio x Order x Sex | 4 | 37.62561 | 2.48 | 0.045 |
| Error | 226 | 15.16638 | | |

L = Linear

L = Nonlinear

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