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Apparent Motion as a Measure of Visual Preference for Dinnerware Patterns

Robert G. Schulz

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APPARENT MOTION AS A MEASURE OF VISUAL PREFERENCE FOR DINNERWARE PATTERNS

by

Robert G. Schulz

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment
of the
Degree of Master of Arts

Western Michigan University
Kalamazoo, Michigan
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Robert G. Schulz
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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>CHAPTER</th>
<th>PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>I  INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>II  METHOD</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Subjects</td>
</tr>
<tr>
<td></td>
<td>Apparatus</td>
</tr>
<tr>
<td></td>
<td>Procedure</td>
</tr>
<tr>
<td>III RESULTS</td>
<td>13</td>
</tr>
<tr>
<td>IV DISCUSSION</td>
<td>16</td>
</tr>
<tr>
<td>V  SUMMARY</td>
<td>22</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>23</td>
</tr>
<tr>
<td>APPENDIX A</td>
<td>25</td>
</tr>
<tr>
<td>APPENDIX B</td>
<td>26</td>
</tr>
</tbody>
</table>

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CHAPTER I

INTRODUCTION

The measurement of consumer reaction to visual characteristics of products and advertising copy has been of continuing interest to advertising and marketing researchers. The basic problem, however, has been the difficulty of assessing the effect of visual impressions from strictly verbal or opinion data. It involves the traditional dilemma of determining the difference between what an observer actually sees in his environment, and what he reports he sees. Motivated by both this distrust of self-report responses, as well as a need for more objective measures, researchers have been drawn to a variety of non-verbal, physiological techniques.

While the use of physiological measures in advertising research is not new (Eckstrand & Gilliland, 1948; Ruckmick, 1939), their potentiality seems to have been undervalued. Caffyn (1964) used the psychogalvanometer to measure emotional responses to alternative advertising approaches of three newspaper ads. Interviews, used to evaluate the positive or negative appeals of the different approaches, showed that the highest galvanic skin response (GSR) index reflected a negative emotional appeal, but the second highest index clearly indicated a positive emotional response to the ad. However, due to the small sample, the results were not statistically significant.

Greeno (1972) disputed Caffyn's assumption that the GSR reflected only emotional responses. Greeno argued that physiological
measures are best evaluated in terms of arousal and attention, and he proposed the use of the orienting reflex (OR). The physiological components of the OR, evoked by the perception of novel stimuli are: (1) lowered skin resistance, (2) dilation of blood vessels in the head and constriction of the vessels in the limbs, (3) increase in pupil diameter, and (4) change in heart rate. These four measures were experimentally measured in Greeno's study of the positive or negative value of word sets. Although the GSR was the only significant change observed (p < .05), the results had important implications for consumer psychophysicists in their attempts to experimentally evaluate alternative package or product designs. The OR provided a physiological framework for measuring attention to visual characteristics of products. However, there still remained the difficulty of determining whether the physiological response reflected positive or negative appeals.

The more promising of Greeno's OR measures for differentiating between positive or negative reactions is pupil dilation. Developed by Eckhard H. Hess, of the University of Chicago, the science of pupillometrics is based on the finding that the pupils of the eyes dilate when one observes something pleasant or positive, and constrict when one observes something unpleasant or negative. In their first published paper, Hess and Polt (1960) reported that "increases in the size of the pupil of the eye have been found to accompany the viewing of emotionally toned or interesting visual stimuli."

Numerous studies have been conducted involving a number of different
factors found to be related to pupillary changes (Hess & Polt, 1964; Hess, 1965; and Hess & Polt, in press).

Working within the communications research organization of Interpublic and Marplan, Hess and his associates further developed the technique for both basic and applied research. Hess (1967) cited studies conducted in the Marplan laboratories in the area of package and product designs of watchbands, watches, and silverware patterns. Positive correlations were found with the sale of the items being tested.

Krugman (1964) described one of the more than 70 studies conducted at Marplan Research. A comparison was made of sales, pupil responses and verbal ratings of ten sterling silverware patterns, for a group of shoppers and a group of browsers. For both categories of consumers, the correlation between sales rank and pupil rank was numerically larger than the correlation between sales and verbal ratings, although not statistically significant.

Van Bortel (1968) effectively used pupil measurement to predict which of two encyclopedia advertisements would pull the most postcard returns in split-run tests.

Adler (1971) used a more simplified pupillometric technique to measure the visual effectiveness of print advertisements. The rank order correlation coefficient was .81 between pupil response and professional opinion (p < .05).

The application of the pupil technique to a number of other problems has been reviewed by Hess (1968), and investigated by Scott (1965) and Paivio and Simpson (1966).
The extensive amount of research conducted in the area of pupilometrics has indicated the potentiality of the technique in providing a non-verbal assessment of visual impressions. In a review of the research on pupil dilation, Blackwell, Hensel, and Sternthal (1970) agreed to the usefulness of the technique in determining the effectiveness of advertising. However, they expressed some doubt as to just what psychological processes are being monitored by pupillary responses.

The approach of indirectly measuring interest or effectiveness of visual stimuli, afforded by pupillometrics and other physiological techniques, provided the basis for the present investigation.

Research by Novak (1971), concerning visual effects of photographic stimuli on apparent motion, suggested a possible quantitative technique for measuring subjective, perceptual impressions. Novak used speed of an oscilloscope blip as an S controlled, dependent measure of apparent motion of aversive and non-aversive photographic stimuli. Novak found that the aversive stimuli were perceived as moving slower than non-aversive stimuli.

Intrigued by Novak's results, it was hypothesized that "interest" in the visual stimuli was the effective factor influencing differential apparent motion speeds. Greater interest in a particular photographic stimuli seemed to result in slower apparent motion speeds. If this assumption is valid, then Novak's technique provides a non-verbal, quantitative measure of interest or preference similar to the previously cited physiological methods.
To test this hypothesis, a set of photographic stimuli was needed that had been ranked on a continuum of visual preference. In a study by Harris (1962), dinnerware designs were used in constructing a verbal preference index, which was validated by six month sales.

The present investigation was designed to explore the use of Novak's technique as a possible objective, laboratory method for scaling preference for fine china patterns. Dinnerware was chosen as a convenient product that provided a reasonable degree of control in terms of price, quality, and simplistic design.

In testing Novak's technique, it was necessary to establish that perceived apparent motion speeds were differentially affected by photographic slides of china patterns. The experimental hypothesis was that the apparent motion speeds would be significantly different for the selected china patterns.

The general expectation was that slow apparent motion speeds would reflect high preference, and fast speeds would reflect low preference. As a validation of the laboratory measure, it was hypothesized that the scaled speed ranks would positively correlate with a local store's eight month china sales and bridal registry ranks, for the same patterns. As an additional evaluation of the technique's validity in measuring preference, a third hypothesis was that verbal preference rankings would correlate positively with the speed ranks.

A fourth hypothesis was that sales and bridal registry ranks would yield higher positive correlations with the speed rank than with the judgmental ranks.
Other relationships between the laboratory measure, sales, and bridal registry will be explored.
CHAPTER II

METHOD

Subjects

The Ss consisted of 60 female students and 21 female clerical employees between the ages of 18 and 24, from Western Michigan University, Kalamazoo, Michigan.

Apparatus

The stimulus figures were 36 35-mm. color slides of china dinner-plates. A set of nine patterns were selected from the top ranked 40 patterns sold in a local department store from February through September, 1971. The dinnerware was manufactured by the same company, priced from $9.95 to $12.95 for a five piece place setting, and represented a large portion of the store's sales of fine china.

Four slides of each of the nine patterns were prepared by photographing the dinnerplates on a grey background. The mounted slides were masked on two sides to form a 15/16 inch square, and labeled for identification. One slide from each set was mounted on a 19 inch, square slide viewer, such that position was randomly assigned to each slide. A 1 inch identification letter was stenciled above each slide, directly on the viewing surface. The viewer and attached slides were placed on a table in one corner of the experimental room. The stimuli are shown in Figure 1.
Figure 1

China patterns: actual slides in color
The remaining three slides of each pattern were used in a phi phenomenon presentation device, manufactured by Psychological Instruments, Inc. The device consisted of four 2 1/2 inch diameter, cylindrical canisters, containing a light, and fitted with a translucent plastic face. The duration, intensity, and flashing of the lights was controlled by a separate panel. One of the canisters was eliminated, and the remaining three were placed horizontally on a mounting stand, such that the centers of all canister faces were 8 1/2 inches from the surface of the apparatus table. The canisters were placed equidistant from each other, such that the total distance from the outside edges of the first and third canisters was 12 inches.

A masking device was attached to the mounting stand, and extended across the front of the canisters, reducing the 2 1/2 inch circles to 1 1/4 inch squares. A slotted, cardboard panel was fixed to the base of the mounting stand, so that the slides could be placed directly in front of the 1 1/4 inch square openings.

The flash sequence was from left to right, with a 260 msec. recycling delay between the disappearance of the third flash and the appearance of the first. The duration of each flash was set at 150 msec., and the interval between flashes was 55 msec. The 100 msec. duration and 60 msec. interval, used in the study by Novak (1971), were altered due to the smaller visual stimuli used in the present study. The changes complied with Korte's (1915) fourth law of beta movement, which stated that as flash duration is increased, the interval between flashes must be decreased, to maintain optimal apparent motion. The selected duration and interval times were
within the limits set by Kahneman (1967) and Wertheimer (1912) in achieving optimal apparent motion.

Apparent motion speed was quantified by use of a modified RCA, WO-56A, 6 inch oscilloscope. A two-stage potentiometer was inserted to allow an S to remotely control horizontal sweep speed of the blip. The control mechanism was mounted on a movable stand that could be placed before an S's preferred hand.

A Weston, model 741-60, microamphere meter was connected to the control device and used as the response measure. Slow horizontal blip speeds were reflected by low microampheres, and fast blip speeds were reflected by high microampheres. The response range was 25 to 51 microampheres.

The oscilloscope was positioned on S's left and the phi phenomenon device on the right, directly in the S's line of sight. The oscilloscope and presentation device were placed side by side, 26 inches and 30 inches, respectively, from the front edge of the table. The amp. meter was placed on an arm desk-chair, adjacent to the apparatus table (Figure 2).

A questionnaire was used to obtain absolute judgments of the Ss' preferences for the nine china patterns, as presented on the slide viewer (Appendix A).

Procedure

The 81 Ss were randomly assigned to one of nine groups. Each group was presented only one stimulus slide to control for any possible interactions between stimuli, and to control for satiation.
Figure 2

Apparatus
of the apparent motion effect. The stimuli were randomly assigned to each group.

The S was admitted to the dark experimental room and seated in front of the apparatus, which remained on at all times. The following instructions were read to the S:

This study is designed to investigate the possible use of a psychological laboratory technique for market research. The technique involves some of the factors associated with the perception of apparent motion, which is the principle behind flashing neon signs and motion pictures. In front of you is a control knob that controls the horizontal speed of the green blip on this oscilloscope. By turning the knob to the right, the blip slows down; turning the knob to the left, the blip speeds up. You may adjust the control while I continue. Your task is to adjust the horizontal speed of the blip to match the horizontal speed of the stimulus object on the right. Since it is electronically impossible to match the starting and stopping points of the object and the blip, do not waste time trying to do so. Concentrate only on matching the horizontal speed from left to right. You will be asked to make five adjustments. When you have completed an adjustment, tell me, and remove your hand from the control, while I record the setting and reposition the control knob. If you have no questions, you may begin.

Questions were answered until the S understood her task.

After the S made five adjustments and the results were recorded, she was asked to be seated in front of the table that held the slide viewer, and given the preference questionnaire. When the S had ranked the patterns on the questionnaire, she was asked to circle the letter of the pattern that had been presented in the apparent motion apparatus. The S was then thanked for her cooperation and dismissed.
CHAPTER III

RESULTS

A one-way analysis of variance was computed to analyze the speed differences for the nine china patterns, and is summarized in Table 1. The significant $F$ value ($p < .05$) indicates that the observed speed differences were not due simply to chance.

Table 1

<table>
<thead>
<tr>
<th>Source</th>
<th>df</th>
<th>MS</th>
<th>$F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patterns</td>
<td>8</td>
<td>25.39</td>
<td>3.31*</td>
</tr>
<tr>
<td>Error Within</td>
<td>72</td>
<td>7.66</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>80</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p < .05

Tukey's multiple comparison test was used to pinpoint the significant differences between patterns (Table 2). For the thirty-six comparisons, significant differences were obtained between patterns F-D, F-I, and G-I ($p < .05$).

The pattern ranks of the five preference measures are presented in Table 3 in descending order of preference. Perceived speed ranks are expressed in microampheres and represent group means. The sales and bridal registry ranks were obtained over an eight month time period, from February through September, 1971. Bridal registry ranks are represented by the total number of registrants that
Table 2
Tukey's Multiple Comparison Test Between Pairs of Mean Perceived Speeds

<table>
<thead>
<tr>
<th>China pattern</th>
<th>F</th>
<th>G</th>
<th>E</th>
<th>C</th>
<th>A</th>
<th>H</th>
<th>B</th>
<th>D</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>.60</td>
<td>1.18</td>
<td>1.71</td>
<td>1.23</td>
<td>3.14</td>
<td>4.17</td>
<td>4.53*</td>
<td>5.20*</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>.70</td>
<td>1.23</td>
<td>1.84</td>
<td>2.65</td>
<td>3.33</td>
<td>4.15</td>
<td>4.71*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>.53</td>
<td>1.14</td>
<td>1.96</td>
<td>2.63</td>
<td>3.49</td>
<td>4.01</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>.61</td>
<td>1.42</td>
<td>2.10</td>
<td>2.92</td>
<td>3.48</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>.82</td>
<td>1.49</td>
<td>2.31</td>
<td>2.87</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H</td>
<td>.67</td>
<td>1.50</td>
<td>2.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>.83</td>
<td>1.38</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D</td>
<td></td>
<td>.55</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note.--Patterns are presented in ascending speed rank order.

*p < .05

selected a china pattern which they wish to receive as bridal gifts.
The first ranks of the questionnaire were totaled to represent the "most preferred" measure, for the 81 Ss. The composite preference rank was computed from the questionnaire by adding the rank numbers for each pattern, across all Ss to give a weighted, subjective measure of preference.

Spearman rank order correlation coefficients were computed between the five measures and are summarized in Table 4. Although the correlations were all positive, none were statistically significant.
### Table 3

#### Pattern Rank of Preference Measures

<table>
<thead>
<tr>
<th>Measures of preference</th>
<th>Speed</th>
<th>Sales</th>
<th>Bridal Registry</th>
<th>Most Preferred</th>
<th>Composite Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F=41.62</td>
<td>H</td>
<td>H=22</td>
<td>A=15</td>
<td>H=319</td>
</tr>
<tr>
<td></td>
<td>G=42.07</td>
<td>E</td>
<td>G=11</td>
<td>F=14</td>
<td>A=321</td>
</tr>
<tr>
<td></td>
<td>E=42.71</td>
<td>G</td>
<td>F=10</td>
<td>G=12</td>
<td>E=373</td>
</tr>
<tr>
<td></td>
<td>C=43.20</td>
<td>C</td>
<td>A=8</td>
<td>I=12</td>
<td>F=377</td>
</tr>
<tr>
<td></td>
<td>A=43.76</td>
<td>A</td>
<td>B=8</td>
<td>E=8</td>
<td>B=383</td>
</tr>
<tr>
<td></td>
<td>H=44.51</td>
<td>I</td>
<td>E=7</td>
<td>H=7</td>
<td>C=425</td>
</tr>
<tr>
<td></td>
<td>B=45.13</td>
<td>D</td>
<td>I=6</td>
<td>C=6</td>
<td>I=451</td>
</tr>
<tr>
<td></td>
<td>D=45.89</td>
<td>F</td>
<td>D=5</td>
<td>D=4</td>
<td>G=460</td>
</tr>
<tr>
<td></td>
<td>I=46.40</td>
<td>B</td>
<td>C=5</td>
<td>B=3</td>
<td>D=536</td>
</tr>
</tbody>
</table>

**Note.**—Rank orders are scaled from most preferred to least preferred.

### Table 4

#### Spearman Rank Order Correlation Matrix

<table>
<thead>
<tr>
<th></th>
<th>Speed</th>
<th>Sales</th>
<th>Bridal Registry</th>
<th>Most Preferred</th>
<th>Composite Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>.25</td>
<td>.40</td>
<td>.49</td>
<td>.23</td>
<td></td>
</tr>
<tr>
<td>Sales</td>
<td>.28</td>
<td></td>
<td>.15</td>
<td>.38</td>
<td></td>
</tr>
<tr>
<td>Bridal Registry</td>
<td></td>
<td>.36</td>
<td>.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most Preferred</td>
<td></td>
<td></td>
<td>.29</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The results of Table 1 confirm the first hypothesis that apparent motion speeds are significantly different for the photographic slides of the nine china patterns. Tukey's multiple comparison method indicated that pattern F was perceived as moving significantly slower than patterns D and I, and pattern G was perceived as moving significantly slower than pattern I (Table 2).

The second and most important hypothesis was concerned with validating the laboratory technique as a measure of preference. The correlations between the speed ranks, sales, and bridal registry ranks were positive, but not statistically significant (Table 4). Since sales and bridal registry are direct measures of preference for the different china patterns, it does not appear that differential apparent motion speeds reflect degrees of preference. However, Table 3 shows that patterns F and G, which were perceived as moving the slowest, were among the top three most frequently chosen patterns by bridal registrants. Patterns D and I were perceived as moving the fastest, and were among the bottom three patterns in the bridal registry. Pattern G was also the third highest selling pattern.

As an additional evaluation of the technique as a measure of preference, the third hypothesis was that the verbal preference rankings of the experimental Ss correlate positively with the speed ranks. Table 4 shows that the correlations were positive, but not significant.
The fourth hypothesis was that sales and bridal registry measures yield higher positive correlations with perceived speed, than with judgmental measures. Referring to Table 4, the correlation coefficients between speed, bridal registry, and sales are higher than between subjective judgments of "most preferred" and bridal registry and sales. Krugman (1964) found similar results comparing pupil dilation to subjective rankings, using absolute judgments. However, composite subjective ranks correlated more highly with sales and bridal registry ranks than the laboratory measure did. In view of this result, it does not seem that the laboratory technique is any better a measure of market preference for china patterns than a composite judgment by a sample of Ss, particularly in the case with the bridal registry measure. The laboratory measure does appear to be a better indicator of market preference than using absolute judgments of what pattern is most preferred. The lack of any significant correlation between these measures, however, makes any extension of the data purely speculative.

Inspection of the relationship between sales and bridal registry ranks reveals an unexpectedly low correlation coefficient of .28 (Table 4). This result suggests that bridal preference is a rather poor indicator of actual purchase behavior, and raises the issue of determining whether sales or bridal registry is the more valid criterion to evaluate the laboratory technique.

The difficulties encountered in gathering the sales data lends credence to the possibility of having used a contaminated sales criterion measure. The main problem was obtaining sales data for individual china patterns. Not only do many retailers fail to record
sales for each pattern, but accessibility to the raw sales data was limited by its confidential nature. Although the retail store involved in the present investigation did record sales for each pattern, it was impossible to determine what portion of sales was attributed to the bridal market. This may be an explanation for the low correlation obtained between sales and the bridal registry.

The bridal registry appears to be a more direct and uncontaminated criterion measure of dinnerware preference than sales. The results of Table 4 show that the laboratory measure correlated more highly with bridal registry than with sales, although neither coefficient was statistically significant.

In retrospect, it seems possible that the use of a contaminated sales criterion may have contributed to the low validity coefficient between the laboratory measure and sales. The higher correlation coefficient between the laboratory measure and bridal registry may have been due to the less contaminated nature of preference in the registry data. It is also likely that the similar characteristics between the sample of bridal registrants and laboratory Ss contributed to the closer relationship between the laboratory measure and the bridal registry. The laboratory sample consisted of females between the ages of 18 and 24, which closely matched the female sample in the bridal registry, which ranged in age from 18 to 27.

In sum, the hypotheses were generally confirmed in terms of positive relationships, but the only meaningful conclusion was that the different china patterns reflected significantly different apparent motion speeds. Although there is some question as to the
validity of the criterion measures, it appears rather tenuous that
the differential speeds were reflecting preference.

Based on the evidence that apparent motion speed was not a
measure of preference, it was hypothesized that perhaps visual
dominance of the pattern design was the effective variable influ-
encing perceived motion. In a paired comparison test, five judges
rated 36 pattern pairs, in terms of which pattern was the most
visually dominant. All five judges selected pattern G as the most
visually dominant, and pattern D as the least visually dominant, for
all comparisons (Appendix B). The judges' ranks were combined into
a composite, visual dominance rank, and correlated with the speed
rank. The rank order correlation coefficient was .62 between the
two factors, but was not statistically significant.

The relatively high correlation between apparent motion speed
and visual dominance suggests that differential speed was more a
result of the perceptual qualities of the patterns than preference.
However, the failure to obtain a significant correlation between
visual dominance and speed does not rule out the possibility of
visual preference being an underlying factor for different apparent
motion speeds.

This difficulty in isolating what is actually being measured
by the non-verbal technique is a similar problem that has confronted
psychophysicists in the area of pupillometrics (Blackwell et al.,
1970).

A possible explanation for not validating the laboratory
technique as a measure of preference was the technical difficulties
encountered in obtaining true, photographic facsimiles of the dinnerware. Even with the services of a professional photographer, a straight overhead shot with controlled lighting was not sufficient to produce a close resemblance of the actual dinnerplate. In spite of the care taken to remove any surrounding shadows and to use a background that would allow for maximum emphasis of the china patterns, the slides still lacked visual clarity (Figure 1).

Consequently, the indistinct nature of the stimulus slides contributed to the inability of the Ss to recognize what they were observing in the apparent motion apparatus. Upon presentation of the nine slides, 43% of the 81 Ss incorrectly identified the pattern that had been presented in phi sequence. Future research of the technique should be concerned with obtaining clearer photographic slides of the stimulus objects. Perhaps the use of photographic air brushing techniques would provide a means of highlighting the designs for maximum visual effect.

The present investigation offered encouraging results in the ability of the phi phenomenon technique to detect differences in perceived apparent motion for dinnerware patterns. The positive correlations obtained between the laboratory measure, sales, and bridal registry data suggest possibilities in validating experimental results, using measures of market preference. However, the choice of the criterion measure is an important concern for further research. It was evident that the bridal registry may be a more valid criterion than sales to evaluate the laboratory technique as a measure of preference. In addition, the need for larger samples
is apparent in possibly improving reliability of the laboratory measure.

Results indicating the importance of the visual characteristics of the patterns offer a possible direction for further research in using perceived apparent motion as a perceptual measure of a product's visual dominance. Perhaps the value of the investigation to retailers of fine china is the important role bold pattern design seems to play in affecting consumer reaction.
CHAPTER V

SUMMARY

The present investigation was designed to explore the possible use of perceived apparent motion as a dependent measure of preference for nine china patterns. Using a randomized group design, 81 female Ss were assigned to nine groups, and were presented photographic slides of the china patterns in a modified, phi phenomenon presentation device. As a validation of the laboratory technique for measuring preference, the differential apparent motion speeds were ranked and correlated with eight month sales and bridal registry ranks. An additional validation was computed by correlating speed rank with subjective judgment ranks. The results showed that perceived apparent motion speeds were significantly different for the nine china patterns. The validity coefficients were positive, but not statistically significant. In a paired comparison test, five judges ranked the patterns as to their visual dominance. The judges' ranks were combined and correlated with the speed rank. Although positive, the correlation coefficient was not statistically significant. Other relationships and suggestions for further research were discussed.
REFERENCES


23


In front of you are nine slides of fine china, dinnerware patterns. They are all manufactured by the same company and are similar in price. Based on your preference, rank the patterns from 1-9 using the letter code identifying each pattern. Select only one pattern for each rank.

<table>
<thead>
<tr>
<th>RANK</th>
<th>PATTERN CODE</th>
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<tr>
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</tr>
<tr>
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<tr>
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<td>___</td>
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<td>9</td>
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COMMENTS:
APPENDIX B

Pattern Ranks of Paired Comparison
Measure of Visual Dominance

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Note.—Pattern ranks are in descending order of visual dominance.
Ranks are represented by the frequency each pattern was chosen as the more visually dominant between the 36 pattern pairs.