THE EFFECT OF VISUAL CUES ON THE PERFORMANCE OF A KIP IN SYNCHRONIZED SWIMMING

Thesis for the Degree of M. A.

MICHIGAN STATE UNIVERSITY
VIOLET ANN MUETZEL

1968

ABSTRACT

THE EFFECT OF VISUAL CUES ON THE PERFORMANCE OF A KIP IN SYNCHRONIZED SWIMMING

by Violet Ann Muetzel

The purpose of this study was to determine the effect of visual cues on the attainment of the vertical position of a kip in synchronized swimming. This study was designed to determine if a statistically significant difference existed between the performance of an experimental group (N=6) learning the kip blindfolded and a control group (N=8) learning with eyes open.

After six weekly practice sessions, each subject performed two kips blindfolded and two kips non-blindfolded. Performances were scored by three judges and also recorded on film for analysis. Angle measurements were taken to determine the vertical position.

Four one-tailed t-tests revealed no significant differences in the two groups between blindfold and non-blindfold performance scores in degrees and judges scores. The Pearson Product Moment method of correlation revealed that no significant correlation existed between performance scores, judges scores, and performance and judges scores.

THE EFFECT OF VISUAL CUES ON THE PERFORMANCE OF A KIP IN SYNCHRONIZED SWIMMING

By

Violet Ann Muetzel

A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

MASTER OF ARTS

Department of Health, Physical Education
and Recreation

1968

ACKNOWLEDGMENTS

The writer wishes to express her appreciation to Dr. William Heusner for his guidance and the opportunity to complete this thesis under his direction and encouragement and to Miss Beatrice Tarbell for her interest and advice.

The participation of the volunteer subjects and judges is also appreciated.

DEDICATION

To my family, especially my father, who is so proud of the eldest daughter.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

Many beginning synchronized swimmers lack the necessary development of a kinesthetic sense underwater. They experience difficulty and often fail to perform stunts correctly, particularly those involving an inverted position. Due to the nature of water, distortion of the surrounding pool markings can cause confusion and delay adjustment. Since there is no solid base of support to provide a gravitational foundation, kinesthesis in water is somewhat similar to that experienced by an astronaut locating himself in space.

A vertical position is to be assumed within the execution of fourteen competition stunts listed by the Amateur Athletic Union. In performing synchronized swimming stunts, a performer must know her position both above and below the water. Clues from the surroundings are used to interpret body position. Pressure on the sinuses, ears and eyes, the decreasing amount of light, buoyancy and the path of bubbles supply clues for distinguishing ascent and descent. Integration of these clues with the kinesthetic awareness produces controlled movements and proper body alignment to attain the vertical.

Statement of the Problem

The purpose of this study was to determine the effect of visual cues on the performance of a kip in synchronized swimming. The study was designed to determine if a statistically significant difference in attaining the vertical position when performing a kip both with and without a blindfold could be found between an experimental group learning the kip with blindfolds and a control group learning with eyes open. The research hypothesis stated that the blindfold group would perform significantly better in achieving the vertical.

Need for this Study

It is often necessary for purposes of competition or show presentation to execute stunts under conditions not ordinarily experienced in regular practice sessions, e.g. little light, deep water, and congested formations. The ability to perform a stunt without visual cues seems appropriate when considering the difficulties of orienting to each new situation. Orientation underwater can be lost from the distracting influences of pool markings, drains, ladders, and lights. The kip was chosen because it is a basic, easy-to-learn stunt which is generally a prerequisite for entry into a synchronized swimming club.

Limitations of the Study

1. The small size and available selection of the sample may not have provided a true random sample from the population.
2. The height of the subject's extended body (legs and hips) above the water line was not a consideration in this study.
3. It could not be determined whether the subjects opened or closed their eyes during non-blindfold performances.
4. Film analysis was made only on that part of the body extending above the water level as no underwater camera was used.
5. The selection of the film frames for analysis containing the best extended vertical position before descent was subjective.
6. The judges were not expert or considered highly competent as their judging experience had been limited to try-outs and one interscholastic meet.
7. Some subjects practiced additionally to "make up" for the regular sessions missed during which time the investigator was not present.

Definition of Terms

1. Kip--From a back layout position, a tuck is assumed. The body is rotated backward until an upside-down position is assumed (one-quarter somersault). The trunk is straightened; the legs are extended

vertically upward before the body descends in a vertical position.

2. Vertical--From the film, that part of the body extending above the water level, perpendicular to the surface of the water.

CHAPTER II

REVIEW OF LITERATURE

The lack of literature pertaining to synchronized swimming and kinesthesis is unfortunate. Related studies provide little support upon which to base an investigation.

The importance of kinesthesis and its relation to motor ability has been investigated. From her study, Scott (6) concluded that kinesthesis is composed of many elements and is not a general capacity. Phillips (5) found certain elements of kinesthesis to be related to performance of the golf putt and drive. McCloy (2) recognized kinesthesis as a factor in motor performance.

Young (7) found low inter-correlations between test items and no significant correlation between kinesthesis and general motor ability. In studying positional measures of kinesthesis applied to bowling and motor learning, Phillips and Summers (8) found a significant relationship.

Concerning specific physical education skills, Darling (9) studied the effects of blindfold versus non-blindfold training on the execution of trampoline stunts. From his results he concluded that there was no significant difference in performance or in the learning pattern between the two groups.

In an attempt to discover the relationship between kinesthesis and performance in synchronized swimming stunts, Simec (12) conducted a training program with junior-senior high school girls. She concluded that subjects who possessed a greater degree of kinesthetic perception had greater ability to perform stunts (alternate ballet legs and back dolphin).

CHAPTER III

PROCEDURE

The subjects for this study were volunteers from the women's physical education activity classes at Michigan State University. They were paired according to a buoyancy and floating test, described in Appendix I and randomly placed in one of the two treatment groups. All had been rated as intermediate swimmers by Red Cross standards, and none had previous synchronized swimming experience. Although two subjects in the blindfold group (N = 6) were unable to complete the training program, the corresponding partner in the non-blindfold group (N = 8) was not eliminated.

Each member attended forty-five minute instructional sessions once a week for six weeks. One group learned the kip blindfolded; the other group learned the conventional way without blindfolds. To insure that both groups received the same instructions, a tape recording of the directions was used during the practice sessions. The investigator commented on performance, offered individual help, but did not provide additional instructions to either group.

The outline of procedure for the training period is provided in Appendix II. It should be noted that the blindfold group did not require additional time to become

adjusted to the blindfolds. Subjects who missed a regular instructional session voluntarily practiced at a convenient time to "make up" for their absence and to maintain equal practice times for the two groups.

At the conclusion of the six-week training program, two filming sessions were conducted to collect performance data. A practice period of fifteen minutes was allowed while testing materials were organized. After directions were given concerning the testing procedure, no practice trials were allowed. Immediately preceeding the testing, each subject was permitted a warm-up consisting of swimming a few laps.

Each subject performed four kips; the first two according to the way she had learned, and the last two according to the alternate method. An interval of approximately ten minutes separated the first set of two kips from the second set. No previous adjustment to the blindfolds was permitted for those subjects in the non-blindfold group.

If a subject did not feel that the stunt would be performed correctly or was unprepared for the extension from the inverted tuck position, she did not extend, but continued over in a complete somersault. This was not counted as a trial.

Performance was recorded on Kodak Tri-X Reversal Film with a Bell and Howell 16 mm. Camera (model 70) set at 16 exposures per second. The camera was placed on a tripod

at sitting eye level approximately five feet from the pool edge. The depth of water for all testing performances was ten feet.

A Bell and Howell 16 mm. Motion Analyzer (model 173 B) was used to project the selected frame on graph paper. In each of the two non-blindfold and two blindfold performances of a subject, the frame containing the best vertical extended position before descent was selected subjectively. A vertical reference line had been constructed to appear on the film in each frame and was aligned with the graph paper.

Measuring the near (left) leg, with ankle plantarflexed, a line was drawn from the toes through the lateral malleolus, the midline of the lower leg, the midpoint of the knee, and the upper leg to the hip. Measurement of the angle of the leg to the surface of the water was done with a protractor. The angle was recorded to the nearest whole degree.

Three members of the Green Splash Synchronized Swimming Club acted as judges, rating each performance on execution only. Points were awarded from one to seven. The judges had no previous knowledge of the testing design or to which group the subject belonged. Scores were totaled and multiplied by the degree of difficulty (1.6).

For each subject, the angle measurements of the four kips and the corresponding judges scores were recorded. The investigator selected one kip each from the blindfold and

non-blindfold performances whose angle measurement was closest to 90 degrees.

Statistical Analysis

Four one-tailed t-tests were used to determine any significant difference between blindfold and non-blindfold performance in degrees and judges' scores in the two treatment groups. The Pearson Product-Moment method of correlation was used to correlate 1) the degrees with the judges' scores for the blindfold performances of both treatment groups, 2) the degrees with the judges' scores for the non-blindfold performances of both treatment groups, 3) the judges' scores of the blindfold performances with the judges' scores of the non-blindfold performances of both groups, and 4) the degree measurements obtained for the blindfold performances with the degree measurements of the non-blindfold performances of both groups.

CHAPTER IV

ANALYSIS OF DATA

The corresponding judges' scores (multiplied by the degree of difficulty) are recorded in Tables 1 and 2. Four one-tailed t-tests were calculated to detect any significant difference between the means of the two treatment groups when performing kips with and without blindfolds. None of the t-values were significant at the .05 level with 12 degrees of freedom (see Table 3).

TABLE 1.--Performance Scores of the Blindfold Group.

Subject	Best Blindfold Performance		Best Non-blindfold Performance	
	Degrees	Judges Score	Degrees	Judges Score
1	95	13.6	83	14.4
2	97	17.6	84	18.4
3	88	16.0	103	9.6
4	68	4.0	73	6.4
5	113	8.8	91	16.0
6	92	12.8	97	11.2
Mean	92.16°	12.1	88.50°	12.6
S.D.	14.61°	4.9	10.76°	4.2

TABLE 2.--Performance Scores of the Non-blindfold Group.

Subject	Best Blindfold Performance		Best Non-blindfold Performance	
	Degrees	Judges Score	Degrees	Judges Score
7	92	13.6	91	13.6
8	73	12.8	71	5.6
9	62	9.6	113	15.2
10	67	12.8	61	11.2
11	83	11.2	78	14.4
12	102	11.2	92	19.2
13	102	11.2	87	10.4
14	104	9.6	93	15.2
Mean	85.62°	11.5	85.75°	13.1
S.D.	16.84°	1.47	15.83°	4.05

TABLE 3.--T-test Values of the Difference Between Means of the Two Treatment Groups (N=14).

Non-blindfold Performance		Blindfold Performance	
Degrees	Judges Scores	Degrees	Judges Scores
-.382	.221	.759	.303

This indicates that neither treatment had a significantly greater effect on either the blindfold or the non-blindfold performances when evaluated either in degrees from the film or by the judges.

Calculation of the reserve judgment regions for each of the four t-tests revealed that only the t-value of .759 was within the reserve judgement region when alpha is set at .05 and beta at .10. This indicates that further study is needed to determine whether or not there is a possible effect on the attainment of the vertical, as measured in degrees, when kips are performed blindfolded by the two treatment groups.

Four Pearson Product-Moment correlation coefficients were calculated to test the strength of the relationship between factors. A correlation, pooling the degree measurements for both groups, between the blindfold and the non-blindfold performances yielded a coefficient of only .276. As an indication of overall skill ability, this low coefficient is expected. A good blindfold performance by a subject in the non-blindfold group was contrasted by a poor non-blindfold performance and vice versa.

Further evidence of this is provided by the even lower coefficient obtained from the correlation between the blindfold performance and the non-blindfold performance, using the judges' scores of both groups. The obtained coefficient was .191.

The obtained correlation coefficient between the degree measurements and the judges' scores for the blindfold performance of both groups was .183. This low coefficient indicates that the judges' scores did not agree with the degree ratings from the film. The large variability found in the judges' scores suggests that the judges may not have been able to critically score the blindfold performance. A high score by the judges was often accompanied by a low degree rating.

The obtained correlation coefficient between the degree measurements and the judges' scores for the non-blindfold performance of both groups was .418. This moderate correlation indicates that some agreement did exist between the judges' evaluation and the degree ratings from the film for the non-blindfold performances.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The purpose of this study was to investigate the effects of a blindfold and non-blindfold training program on the attainment of a vertical position during the performance of a kip in synchronized swimming.

Fourteen college women volunteered as subjects and participated in a six-week training program. Six subjects learned the stunt blindfolded; eight subjects learned with eyes open. At the conclusion, the subjects were tested twice under both conditions. The four performances were scored by three judges and also filmed for analysis. Angle measurements were taken from the film. The investigator selected one kip each from the blindfold and non-blindfold performances of each subject. The performances chosen for analysis were those in which the angle measurement was closest to 90 degrees. The corresponding judges' scores (multiplied by the degree of difficulty (1.6) were used.

The research hypothesis stated that the blindfold group would perform significantly better in achieving the vertical. Four one-tailed t-tests were used to detect

any significant difference between the group means when the subjects were tested under both conditions. Pearson Product-Moment Correlation Coefficients were employed to correlate the degree ratings with the judges' scores for both the blindfold and non-blindfold performances pooling the two treatment groups, judges' scores for the blindfold performances with those of the non-blindfold performances of both groups, and the degree measurements of the blindfold performances with those of the non-blindfold performances of both groups.

Conclusions

Within the limits of this study, no significant difference between the two treatment groups was noted in the attainment of the vertical position during the performance of a kip when the subjects were blindfolded or non-blindfolded.

1. No evidence was found to support the research hypothesis that the blindfold group would perform significantly better than the non-blindfold group in achieving the vertical.
2. Calculation of the Reserve Judgment Region for the t-tests revealed that the hypothesis can not be rejected that the attainment of the vertical, as measured in degrees, is achieved better when kips are performed blindfolded by the blindfold group.

3. A moderate correlation existed for the non-blindfold performance between the degree measurements and the judges' scores when the two treatment groups were pooled. This indicates some agreement between the judges' evaluation and the degree ratings obtained from the film for the non-blindfold performances.
4. The large variation between the judges' scores for a single performance greatly affected the correlations with the degree ratings. This variation can be attributed to a lack of experience in judging and consequent inability to critically evaluate the kips.
5. The low correlation between the non-blindfold and the blindfold performances of both groups, as indicated by the judges' scores and degree ratings, may account for the presence of no significant differences between groups.

Recommendations

1. The study should be repeated with a larger sample.
2. The training period should be extended to eight weeks.
3. It is suggested that an underwater camera also be used to record the performances.

4. The height of the extended body position above the water level should be measured as an additional indication of ability.
5. Five highly competent judges who score according to A.A.U. Synchronized Swimming Rules should be secured.
6. A period of adjustment to the blindfolds should be permitted for the subjects in the non-blindfold group before the blindfold performance testing.

BIBLIOGRAPHY

Periodicals

1. Official A.A.U. Synchronized Swimming Handbook. New York: Amateur Athletic Union of the United States, 1966.

2. McCloy, Charles. A Preliminary Study of Factors in Motor Educability. Research Quarterly, 11:28-40, May, 1940.

3. McFarland, Joseph, Wapner, Seymour, and Werner, Heinz. Relation Between Perceived Location of Objects and Perceived Location of One's Own Body. Perceptual and Motor Skills, 15:331-341, October, 1962.

4. Mumby, H. Hugh. Kinesthetic Acuity and Balance Related to Wrestling Ability. Research Quarterly, 24:327-334, October, 1953.

5. Phillips, Bernath E. The Relationship Between Certain Phases of Kinesthesis and Performance During the Early Stages of Acquiring Two Perceptuo-Motor Skills. Research Quarterly, 12:571-586, October, 1941.

6. Scott, M. Gladys. Measurement of Kinesthesis. Research Quarterly, 26:324-341, October, 1955.

7. Young, Olive G. A Study of Kinesthesis in Relation to Selected Movements. Research Quarterly, 16:277-287, December, 1945.

8. Phillips, Marjorie and Summers, Dean. Relation of Kinesthetic Perception to Motor Learning. Research Quarterly, 25:456-469, December, 1954.

Unpublished Material

9. Darling, Thomas B. "A Study of Teaching Free Body Movements by an Overload on the Kinesthetic Sense." Unpublished Master's thesis, Michigan State University, 1960.

10. Keller, Neill L. "A Study of the Relationship of Ability in Synchronized Swimming Stunts to Motor Ability, Buoyancy, and Sculling Ability." Master's thesis, Smith College, 1962.

11. Lent, Joanne I. "An Analysis of Selected Synchronized Swimming Stunts." Master's thesis, State University of Iowa, 1960.

12. Simec, Lois-Jean. "The Relationship Between Kinesthesis and Performance in Certain Synchronized Swimming Skills." Master's thesis, Northern Illinois State Colllege, 1957.

APPENDICES

APPENDIX I

Buoyancy Test

In ten feet of water, subjects descended feet first. Upon touching the bottom, they clasped their knees (jelly-fish float fashion) and rose to the surface without exhaling. Each subject performed the test three times. The average time in seconds from lift-off to surfacing was recorded.

Floating Test

Each subject assumed a horizontal position with arms at sides in ten feet of water and remained floating without the use of arm movements. Time was recorded from the beginning of the motionless float until the feet descended and the subject submerged. Three trials were permitted. The average score was calculated.

APPENDIX II

Outline of Procedure

Session Number 1:

Presentation of study, discussion, scheduling of practice times
Buoyancy test
Subjects paired and randomly assigned to a group

Session Number 2:

Sculling practice--two laps in horizontal and tub positions
Complete back somersault in shallow and deep water
(Blindfold group performed with blindfolds on).

Session Number 3:

Sculling practice
Review back somersault from tuck position
Hold vertical in inverted position

Session Number 4:

Review tuck and rotation backward to the vertical
Emphasis on smooth, controlled movement
Introduce extension of hips, legs
Practice complete kip with tape recorded directions

Session Number 5:

Review complete kip
Emphasis on extension from inverted tuck, controlled vertical descent, and head position

Session Number 6:

Emphasis on smooth execution, slow, controlled movements and vertical extension
Individual attention to height and sculling underwater

Session Number 7 and 8:

Testing of groups; filming and judges' rating

APPENDIX III

Tape Recorded Directions for Performing a Kip

Start in the back layout position. Use a flat scull at your hips. Tuck the chin as you bend both knees to the chest. Keep the legs from the knees to the toes on the surface of the water. Drop the arms to shoulder level. With a straight arm, pull toward your hips to rotate the body backward in an inverted one-quarter somersault position. Your toes should be pointing to the ceiling. Scull between the hips and shoulders, pressing downward with palms facing the bottom of the pool. Straighten the head. Now extend the legs at the hips and knees so that you will descend perpendicular without arching your back.

Tape Recorded Hints for Performing the Kip

The tuck and rotation backward to the inverted position should be one smooth movement. In the inverted tuck position, part of the buttocks and legs should remain above the surface. Do not extend the legs until you are completely upside down. Your body should be straight as you descend. Do not arch your back!