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THE EFFECTS OF A COLD HIP BATH ON ACCURACY  
IN BASKETBALL SHOOTING

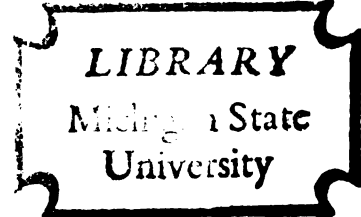
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## ABSTRACT

### THE EFFECTS OF A COLD HIP BATH ON ACCURACY IN BASKETBALL SHOOTING

by Duane Conrad Milne

The purpose of this study was to assess the effects of a cold hip bath on the accuracy of basketball shooting. It was hypothesized that since a cold hip bath had been shown to have beneficial effects upon depth perception, there would be sufficient improvement to affect accuracy in basketball shooting.

Fifteen college males with basketball backgrounds were used as subjects. All shots were taken one-handed, and directly from the side of the basket at a distance of 15 feet 7 inches, so that the backboard could not be used as a means of judging distance.

The study was designed to have each subject shoot three times to complete a series. A series was made up of one free control day, one bath or experimental day, and one placebo control day (dextrose capsule announced as a potent drug). On any one particular day the subject would shoot 75 times, take a 15-20 minute break during which he would either take a hip bath, a placebo, or a free rest. A second series of 75 shots were then taken and the

difference calculated in per cent gained or lost. A total of 60 free control days, 60 experimental hip bath days, and 60 placebo control days were recorded.

Mean values and their standard deviations respectively for the averaged scores were: free control  $2.28\% \pm 3.82$ ; experimental bath  $5.53\% \pm 6.68$ ; and the placebo control  $3.68\% \pm 5.05$ .

A one-way fixed-effects model of the analysis of variance detected no significant differences between the control day, the hip bath day, and the placebo day at the .05 level. A two-way mixed-model analysis of variance detected no significant differences between the three groups at the .05 level but did detect a significant difference among the subjects at the .05 level which was expected with men ranging in basketball skill from average to expert. The power of the F-test on the one-way fixed-effects method was calculated to lie outside the .10 level and the outcome may then be placed in the reserve judgment region.

If there is improvement in depth perception due to the cold hip bath as reported in the literature, the present study would indicate that any such improvement cannot be demonstrated in improvement of accuracy of basketball shooting within the limitations of this study.

THE EFFECTS OF A COLD HIP BATH ON ACCURACY  
IN BASKETBALL SHOOTING

By

Duane Conrad Milne

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## CHAPTER I

### INTRODUCTION

Kneipp therapy\* has been used for many years in Germany as a form of hydrotherapy for physical ailments as well as a conditioner for factory workers to postpone fatigue. The German Luftwaffe used the cold hip bath during training of their air crews for improved performance during World War II.

Steinhaus and Kelso (10) reported the first study in the United States in 1943 on the effects of the cold hip bath. They found a temporary improvement in visual acuity, depth perception (stereopsis), visual efficiency, lateral eye muscle balance, critical fusion frequency, as well as improved psychomotor functions.

Shooting directly from the side of the basket has always been, percentage wise, one of the most difficult shots in basketball. This shot requires a keen depth perception. Rarely does the ball go in after hitting the rim. Shots that are taken from nearer the front of the basket have the advantage of gaining assistance from the backboard if the shot is too long, as well as giving

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\* Kneipp therapy--a cold water therapy developed by German monk, Sebastian Kneipp.

assistance in depth perception. Most coaches frown on their players shooting from the side of the basket because of the low percentage of successes and often fashion their offense around the center shot.

Since depth perception had been shown to be temporarily improved by a cold hip bath, this study's research hypothesis was to determine whether there was sufficient improvement in depth perception and other visual functions to affect the accuracy of this difficult side shot in basketball.

#### Limitations of the Study

1. Many factors will affect accuracy in basketball shooting such as strength, skill, motivation, mood, background noise, etc.
2. Time and facilities in this study did not permit measurement of the lasting effects of the hip bath over a period of 2-3 hours as was done by Steinhaus et al. (10,11).
3. The study was not conducted under game conditions which would have a tremendous effect.

## CHAPTER II

### RELATED LITERATURE

No previous studies of the relationship of the effects of a cold hip bath on the accuracy of basketball shooting were discovered.

The original study of the effects of the cold hip bath by Steinhaus and Kelso (10) which has already been cited, found a temporary improvement in visual acuity, depth perception (stereopsis), lateral eye muscle balance, critical fusion frequency, tapping rate, and 'eye to leg muscle' reaction times. Their data recorded improvements noted over a span of 2 1/2 hours but were also able to show an improvement lasting up to six hours if no meal was taken during this time.

Steinhaus and Wendhut (11) reported in a later study that the cold hip bath slowed the resting pulse rate in reclining and in standing positions, increased the differences between the systolic pressure in reclining and in standing, and reduced the increase in the pulse rate that normally occurs when a reclining person assumes the standing position. An increase in visual efficiency was demonstrated in performance on a driving test in subdued light.

Happ, Tuttle and Wilson (4) found that when cold ice packs were applied to the abdomen there was facilitated recovery from strenuous work, a decrease in basal metabolic rate, the amount of oxygen required to perform a given amount of moderate work was decreased, an increase both in resting diastolic and venous blood pressures, and a decrease in the resting and recovery pulse rates.

Rosen (8) applied a cold abdominal spray in which the temperature of the water, 70° F., was gradually lowered in five minutes to approximately 45° F. and maintained for five minutes. He found that the average time for the 16 subjects was faster for the second 400 yd. race on the day when a 10 minute cold abdominal spray was applied than for the second 440 yd. race on the non-spray day. In some instances it was found that the average fall off in time for a second 440 yd. race was less after a cold abdominal spray was applied between races than when a cold spray was not used between races.

Sills and O'Riley (9) found that physical performance as measured by spot running was improved more by cold spray applications where the water was applied to the abdomen for 8 minutes at a temperature between 44-48° F., than by either rest or exercise. The cold applications were also found to be more effective for the recovery of fatigue than either the rest or the exercise period.

Robbins (7) using over-all cold shower baths on high school students found a body temperature drop, a decrease in heart beat, a slight decrease in diastolic blood pressure, and a slight increase in grip strength and systolic pressure.

Muido (6) found that cold over-all shower baths had detrimental effects upon swimming times (decrease of 3.6% to 6.3%) over times on control days. He felt that this was due to a decrease in body blood temperature.

Michael (5) studying the effects of cold over-all showers (60° F. for 2 minutes) on circulation of conditioned and non-conditioned men, found that the conditioned group had lower systolic blood pressures after the cold showers, and in both groups the pulse rates decreased with more significance in the conditioned group.

Grose (3) found that immersion of the forearm in cold water 10° F. for 10 minutes decreased the initial strength 11 per cent without altering the observed fatigue level.

## CHAPTER III

### RESEARCH METHODS

The purpose of this study was to assess the effects of a cold hip bath on the accuracy of basketball shooting. It was hypothesized that since a cold hip bath had been shown to have beneficial effects upon depth perception, there would be sufficient improvement to affect accuracy in basketball shooting.

#### Experimental Design

Fifteen male college students ranging in age from 18 to 25 with a good basketball background served as subjects. Each subject shot at least one series (a series includes one free control day, one experimental day, and one placebo control day), while four of the subjects shot the series as many as seven times. Each subject shot 75 times and immediately after a 15 minute interval would shoot another set of 75 shots. All shots were taken directly to the side of the basket (right handed shooters from the left side and the one left handed shooter from the right side) at a set distance of 15 feet 7 inches. During the 15 minute interval the subjects would either rest (free control day), take a cold hip bath (experimental day), or take a placebo

(control day). The subjects were not informed before their initial shooting as to what treatment they would receive during the interval. A complete randomization of assignment of subjects to the order of the three treatments was carried out.

On the free control day the subjects rested for 15 minutes during the interval.

On the experimental days the cold hip bath was self-administered as described by Steinhaus (10). The subject would sit on one chair, hips and knees sharply flexed and feet resting on a second chair. In this position the subject would adjust the temperature of the water with his right hand while his left hand directed the water spray from a flexible rubber hose connected to the shower head. The water would be directed slowly back and forth from the side of one hip across the lower abdomen to the other side. Starting with body temperature, the water was gradually made warmer in 3 minutes to the point of maximum endurance with comfort. Then the water temperature was gradually decreased in 4 minutes to the point of tap coldness and then maintained at this temperature for 5 minutes. All subjects followed the same procedure with the total bath time being 12 minutes. The temperature extremes of the water for each subject was between  $64^{\circ}$ - $116^{\circ}$ F.

On the placebo control day a gelatin capsule containing 8 grains of dextrose was administered to each subject during the interval. The subjects were informed at

the time that the effects of the drug on accuracy in basketball shooting would be recorded as well.

The difference in the number of successes between the before and after sets of shots was expressed in percent of the before set. A total of 60 free control days, 60 experimental days, and 60 placebo control days were taken from the 15 subjects.

Each subject was administered the Howard-Dollman Peg Test in order to measure his depth perception. The subject would sit on the gym floor ten feet from the testing apparatus which was at eye level on the table. Lighting conditions were held constant. By pulling two strings he would attempt to align two pegs in the apparatus. His error in recording absolute alignment was recorded in millimeters for ten trials and the average taken. This was done before the first set of shots and immediately before the second set of shots for one complete series for 9 of the 15 subjects.

#### Statistical Treatment of Data

Because the number of series completed by the 15 subjects varied from 1-7, the data were subjected to two different forms of treatment. To give equal weight to the performance of each subject only the means of all his scores were used for the first treatment which was a one-way fixed-effects model of the analysis of variance, to detect significance at the .05 level. In the second



treatment, in order to give equal weight to each series, a two-way mixed model of the analysis of variance was used to detect significance at the .05 level.

## CHAPTER IV

### RESULTS AND DISCUSSION

The purpose of this study was to assess the effects of a cold hip bath on the accuracy of basketball shooting. It was hypothesized that since a cold hip bath had been shown to have beneficial effects upon depth perception, there would be sufficient improvement to affect accuracy in basketball shooting.

#### Results

The one-way fixed-effects analysis of variance detected no significance between the control day, the experimental hip bath day, and the placebo control day at the .05 level. The results of this analysis together with each subject's average score are found in Appendix A.

Results of the two-way mixed model analysis of variance detected no significant differences at the .05 level between the control day, the experimental hip bath day, and the placebo control day, but as was expected, did detect significant differences among the subjects. The results of the analysis together with the data of all 60 series are found in Appendix B.

The Howard-Dollman Peg Test results for depth perception differences are recorded in Appendix C.

Both the above analysis of variance tests as well as the depth perception test showed a marked improvement in the means in favor of the hip bath but not significant at the .05 level.

### Discussion of the Results

The power of the one-way fixed-effects model analysis of variance was calculated to be below the .10 level. Since the data did in effect go in the direction predicted, the outcome should not be disregarded but placed in the reserve judgment region. The main assumption is that an insufficient number of cases were used in the test to detect significance of the hip bath in shooting performance.

The Howard-Dollman Peg Test for depth perception pointed in the same direction but again the insufficient number of cases would not allow a proper analysis to be calculated.

Examination of individual's data shows that seven subjects did show improvement in accuracy in basketball shooting with the hip bath, while five subjects showed improvement with the placebo, and three with the rest. If, by chance, only certain subjects had been used in this study, results could have been either definitely in favor of or definitely against the effects of the cold hip bath.

Steinhaus (10) found depth perception changes in favor of the cold hip bath over an interval of 2 1/2 hours. It was not possible in this study, due to time and facilities, to retest the subjects 2-3 hours after the cold hip bath. The 15 minute interval in the present study did not allow sufficient time for possible fatigue on non-bath days to be contrasted with likely postponement of fatigue on bath days induced by the cold hip bath.

Another possible factor that may have influenced the study was the temperature of the cold water. Steinhaus's study (8) used cold water temperatures of 45-65° F.; Rosen (7) used 45° F.; and Sills (10) used 44-48° F. The coldest water available in this study was 62.6° F. The highest temperature of the hot water interval was 114.8° F., which was similar to that used by Steinhaus.

The slight improvement in the mean of the placebo control days, though not statistically significant, may be due to: (1) pure chance, (2) psychic effect of the Hawthorne type, and (3) possible effect of the sugar on the functioning of the central nervous system as discussed by Christensen, Krogh and Linhard (2). Even though these men used much more sugar (100 gms.) compared to .7 gms. used in this study, we cannot overlook the possibility that even this small amount of sugar in a subject with little or no breakfast, may have produced a favorable blood sugar change with effects similar to those observed by these workers.

## CHAPTER V

### SUMMARY AND RECOMMENDATIONS

#### Summary

The purpose of this study was to assess the effects of a cold hip bath on the accuracy of basketball shooting. It was hypothesized that since a cold hip bath had been shown to have beneficial effects upon depth perception, there would be sufficient improvement to affect accuracy in basketball shooting.

Fifteen college males with basketball backgrounds were used as subjects. All shots were taken one-handed, and directly from the side of the basket at a distance of 15 feet 7 inches, so that the backboard could not be used as a means of judging distance.

The study was designed to have each subject shoot three times to complete a series. A series was made up of one free control day, one bath or experimental day, and one placebo control day (dextrose capsule announced as a potent drug). On any one particular day the subject would shoot 75 times, take a 15-20 minute break during which he would either take a hip bath, a placebo, or a free rest.

A second series of 75 shots were then taken and the difference calculated in per cent gained or lost. A total of 60 free control days, 60 experimental hip bath days, and 60 placebo control days were recorded.

Mean values and their standard deviations respectively for the averaged scores were: free control  $2.28\% \pm 3.28\%$ ; experimental bath  $5.53\% \pm 6.68$ ; placebo control  $3.68\% \pm 5.05\%$ .

A one-way fixed effects model of variance detected no significance between conditions at the .05 level. A two-way mixed model of the analysis of variance detected no significance between conditions at the .05 level but did find significance among the subjects which was expected with men ranging in basketball skill from average to expert.

Due possibly to certain differences in the experimental design this study found no significant temporary improvement in depth perception due to a cold hip bath as reported in the literature. These differences are discussed.

#### Recommendations

Future research into the effects of a cold hip bath either on depth perception and/or accuracy in basketball shooting should be directed along the following lines:

1. The time interval between the first and second tests should be at least 2 hours to disclose any possible fatigue postponing effects of the bath.

2. Because of large individual differences, a larger number of subjects should be used.
3. The cold water temperature should be kept at approximately 45° F. or 7.2° C.

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## LITERATURE CITED

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## APPENDICES

## APPENDIX A

CHANGES IN SHOOTING PERFORMANCES OF 15 SUBJECTS  
EXPRESSED AS THE AVERAGE PERCENT DIFFERENCE OF  
THE AFTER TEST OVER THE BEFORE TEST IN ALL  
SERIES PERFORMED BY EACH SUBJECT

Subjects	Free Control	Cold Hip Bath	Placebo
R.M.	3.75	6.65	- .45
S.H.	.88	-1.57	1.33
D.J.	2.86	.17	2.83
R.H.	-4.61	- .19	1.71
R.M.	3.98	3.98	6.45
R.K.	3.03	5.34	- .97
T.D.	5.77	4.87	4.43
D.A.	0.00	8.24	6.38
E.D.	- .65	13.60	-4.65
R.F.	7.95	-2.65	6.00
M.B.	8.00	24.00	16.00
B.P.	1.30	8.00	4.00
R.G.	5.30	2.15	-2.00
J.B.	1.33	.43	4.87
W.S.	-4.65	9.95	9.30
Total	34.24	82.97	55.23
Mean	2.28	5.53	3.68
$\sigma$	3.82	6.86	5.05

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One-Way Fixed-Effects Analysis of Variance

Source	Sum of Squares	Degrees of Freedom	Mean Squares	F	F(.95)
Total	1300.70	44	29.56		
Test	79.66	2	39.83	1.38	3.24
Error	1221.04	42	29.07		

APPENDIX B

CHANGES IN SHOOTING PERFORMANCE OF 15 SUBJECTS IN  
A TOTAL OF 60 SERIES EXPRESSED AS PERCENT  
DIFFERENCE OF AFTER TEST  
OVER BEFORE TEST

-



## APPENDIX C

HOWARD-DOLLMAN PEG TEST FOR DEPTH PERCEPTION  
IMPROVEMENT OF AFTER TEST OVER BEFORE TEST  
EXPRESSED IN MILLIMETERS



Subjects	Free Control			Cold Hip Bath			Placebo		
	Before	After	Diff.	Before	After	Diff.	Before	After	Diff.
R.M.	13.3	13.6	-.3	12.2	14.8	-2.6	16.9	16.5	.4
S.H.	7.7	4.7	3.0	5.5	1.7	3.8	7.2	14.0	6.8
D.J.	8.4	8.6	-.2	16.4	7.1	9.3	16.7	10.8	5.9
R.H.	6.8	6.6	.2	3.9	6.2	-2.3	4.5	4.5	0.0
R.M.	9.6	13.7	-4.1	18.2	18.4	-.2	19.5	6.5	13.0
R.K.	5.1	3.4	1.7	4.3	3.4	.9	4.2	4.2	0.0
T.D.	3.1	3.5	-.4	3.0	7.4	-4.4	3.3	4.4	-1.1
D.A.	8.0	3.7	4.3	3.3	3.0	.3	4.9	4.0	.9
R.G.	13.1	18.8	-5.7	17.4	17.2	.2	8.0	17.0	-9.0
Total			-1.5			5.0			3.3
Mean			- .17			.56			.37

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