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CHARACTERISTICS OBSERVED OF INFANT'S SWIMMING ABILITY

Thesis for the Degree of M. A.

MICHIGAN STATE UNIVERSITY

Virginia Lee Scheunemann

1961

THESIS

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CHARACTERISTICS OBSERVED OF INFANT'S SWIMMING ABILITY

A Four Month Study Conducted In Order To Establish Teaching Methods For This Level

by

Virginia Lee Scheunemann

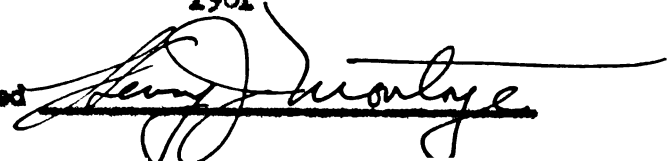
AN ABSTRACT

Submitted to the School of Graduate Studies of Michigan State University of Agriculture and Applied Science in partial fulfillment of the requirements for the degree of

MASTER OF ARTS

Department of Health, Physical Education, and Recreation

1961

Approved 

ABSTRACT

The Problem

The problem was to observe the characteristics of infants swimming ability over a period of four months in order to establish teaching methods for this level. Also, it was hoped to determine the feasibility of preliminary water training in the home as a factor in reducing the age at which a child can be taught to swim.

Review of Literature

Psychological: "Specific and recognizable emotional patterns are not present at birth". The responses present are of a general type shown as pleasantness or unpleasantness, approach or withdrawal. Learning and maturation cause these general states to become specific as early as the 6th, 8th, 10th, or 15th month. (8, p. 143) At or about six months of age, fear develops. Fear is said to be elicited by three factors: (1) unexpected loud sounds, (2) pain, (3) loss of support.

Physiological: Literature in this area agrees, to a great extent, with regard to most basic physiological characteristics of children under one year of age. However, there is little agreement relative to the physical control necessary for an infant to swim.

Methods

The infants were brought to the pool one day a week. Each child spent ten to twenty minutes in the pool. The other six days a week, the mothers spent an additional ten minutes in the tub, after the bathing

period, going through the same process as was done in the pool. Each mother was given a chart to record that the process was followed and to note any new developments in the way of reactions or movements.

Conclusions

From the analysis of the data, the following conclusions were drawn:

1. Infants, age two and a half months and older possess natural leg and arm movements in the water. These are modified forms of the conventional style of swimming known as "dog-paddle".
2. There is a definite progression in maturation which predisposes the form of leg and arm movements in relation to swimming.
3. Breath control is not automatic but develops with repeated experiences of submersion.
4. The use of home facilities for preliminary water training to reduce the age at which a child can be taught to swim is impractical.
5. It is possible to develop methods of progression as a means of training infants to be self sufficient in the water.
6. Consistent and frequent experiences in the water are desirable to promote rapid learning of swimming skills.
7. Water temperature plays an important part in the reactions of the child to the water. A high temperature of 90 degrees causes the child to relax and increases the amount of movement with the arms and legs.
8. A four month period is not sufficient to develop complete self sufficiency in the water.

9. Based on this study of two month, 6 month, and year old infants, it was found that adaptability to water tended to decrease with age.

8. Merry, Frieda Kiefer. From Infancy To Adolescence. New York: Harper and Brothers Publications, 1940.

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ACKNOWLEDGMENTS

It is with deep appreciation for the educational opportunities made available to me, and the sincere help and guidance of the instructors in my field, that I dedicate this project to my parents, and to Miss Dorthy Kerth, Miss Pauline Hess, Doctor Henery J. Montoye, and Doctor Roy Hiemeyer.

V.L.S.

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CHAPTER I

INTRODUCTION

Statement of the Problem

This project was designed with the intent of observing characteristics pertaining to swimming ability of infants under one year of age. The final outcome will result in the establishment of teaching methods for this level.

Motivating Reason for this Study

Primarily, the deciding factor was the author's own personal interest which resulted from teaching children and adults to swim.

Also, there has been the lack of teaching methods for children of this age group.

Finally, of strong influence, were feelings of freedom, creativity, and control of body gained through experiences in the water and the desire to share these with others.

Need for this Study

Unfortunately, there is a great lacking in the area of accurate data, or any data, for that matter, essential to this problem. What little information that can be gleaned is filled with inconsistencies and contradictory statements. The majority of contributions have come from work done in California, and, to some extent, Florida. The results were inadequately presented in "lay" magazines, that is, Life, Better

Homes and Gardens, Ladies Home Journal, Coronet, and Look. The one exception being the book, Swimming Fundamentals, by Matt Mann II. (7, pp. 1-98)

One also finds a noticeable gap in the materials and methods for swimming. The great majority of information pertains to children of five and above. The reason being that the two largest contributors, the American Red Cross and the "Y's", design and direct their programs for older children (five and above). In the last few years the "Y's" have had a few programs for children in the three year old age range.

The appropriateness of this study can be attributed to current demands arising from an increase in the number of family pools, plus the statistical accounting of drownings. Twelve years ago the United States had 10,000 pools. Since then close to 175,000 have been built. It was established in 1959 that an additional 46,000 families would install pools that year. (12, pp. 97-101) Statistics disclose that for 1960 there was a total of 6,400 drownings. Of this number, 700 infants and children under four years of age died. This included drownings of persons swimming, playing in the water, or falling into the water, except on home premises. (1, p. 6.) Michigan alone, contributed thirty six fatalities. (17)

Purpose of the Study

1. To study the physical capabilities of infants under one, in the water, in relation to swimming.
2. The feasibility of preliminary water training in the home as a factor in reducing the age at which a child can be taught to swim.

3. To develop methods of progression for training infants to be self sufficient in the water.

Limitations of this Study

1. Scarcity of background information contributed to the lack of organized methods to be used for the study of infants in the water.
2. The short duration of the observation was a limiting factor. Also involved was the availability of the pool, and schedule conflicts between the subjects and the observer.
3. The fact that photographic observation was only partial.
4. The fact that some of the parents lived quite some distance from the pool limited the frequency of swimming observations.

TERMS

SELF-SUFFICIENCY.....the ability to hold one's head out of the water long enough to obtain a breath of air, to be able to hold on to an object for support, and to have a sense of direction in the water.

CHILDREN.....ages one year old and above.

INFANTS & BABIES.....under one year of age.

WATER TRAINING.....adjustment to the water, holding the breath, and a floating position in the water.

"CASE STUDY" AGE.....refers to the age the child was at the time it was first introduced to water for the purpose of learning to swim.

BREATH CONTROL.....submerging the face in water without any discomfort.

SWIMMING.....relaxing in the water, keeping the mouth closed, flailing arms and legs while floating alone.

CHAPTER II

REVIEW OF LITERATURE

Psychological

The primary interest in this area is the topic of fear as it is related to swimming. The predominant feeling seems to indicate that "specific and recognisable emotional patterns are not present at birth". The responses present are of a general type shown as pleasantness or unpleasantness, approach or withdrawal. "A combination of learning and maturation causes these general states to take a specific pattern and become differentiated clearly, as early as the 6th, 8th, 10th, or 15th month." (8, p. 143) A scheme of emotional development, which was based upon three years study of emotional behavior in nursery school children and extensive study of emotional responses among infants of the Montreal Foundling and Baby Hospital, corresponds to the general attitudes expressed in the literature. It was also concluded that at or about six months of age, fear develops. It is believed that the child learns to associate feelings that come from fear, with fear. It was also felt that if fear is to develop, a child must have sufficient perceptual growth to discriminate an undesirable form of stimulus and sufficient motor development to make the necessary withdrawal movement. Although the psycho-physio structures which are necessary for visceral responses are matured at least at three months of age the differentiation of fear from distress does not appear until six months of age. (11, p. 296-297) Fear also may be influenced by learning experiences. (6, p. 265-266)

It has been stated that fear changes with age. Even though the number of fears increase, there are fewer overt signs of fear as a child grows older. If an infant is forced to carry out a specialized move before the central nervous system or the muscles are sufficiently mature, the attempt will most likely result in the emergence of fear and the child will resist such action again. Fear negatively affects the development of motor control and coordination and produces a delay. (9, p. 73) Behaviorists, notably John B. Watson, state fear is instinctively elicited by three factors: (1) unexpected loud sounds, (2) pain, (3) loss of support.

Fear develops during the first bath when the baby is immersed too rapidly; there is a sudden temperature change between the room and the bath, or when loss of support of the child occurs during the bath. (10, p. 4) Keeping the water away from the nose and avoiding soap in the child's eyes are also important. Mrs. Jen Leven states "Few babies have an inherent fear of water, but they can acquire fear easily if startled or forced." (16, p. 185)

Physiological

The literature in this area agrees, to a great extent, upon the basic physiological characteristics of children under one year of age. The inconsistencies arise when this information is related to the capabilities of infants in the water.

At Birth

The child undergoes great physical and mental adjustment after birth due to the birth process. It takes ten to fourteen days to recover from this experience and to adjust to the environment.

The baby's head is one fourth of the total length of its body. The proportions of the head also cause it to appear larger (high forehead, flat nose, and receding chin).

The skeletal structure is pliable; growth is markedly altered by sustained pressure.

The muscles comprise two thirds of the total body weight.

There is no instinctive behavior in man. Those actions we assume are instinctive are due to structural or environmental factors.

Reflex movements are present at birth or soon after. These may exist at a primitive or atavistic level. These disappear in a few weeks and then emerge later as a part of the development pattern.

Maturation must occur before learning can take place. Neural and muscular maturation comes first before locomotion. There is a regular sequence in the developmental process. Maturation causes the appearance of each stage. Motor neurons work with the musculature of the head, neck, trunk, and extremities in that order. In other words, growth proceeds from the head downward; upper parts coming first. The trunk and torso will come before the extremities. It might better be stated that growth is cephalo-caudal and proximal-distal in its trend.

Head: Upward movement is more pronounced than downward. The mouth will eject any bad taste.

Trunk: The head moves with the trunk and the hips follow in the same direction.

Foot-leg: Stimulation to the foot tactually causes the foot and leg to flex.

Motor development is bilateral to unilateral in terms of strength, speed, and coordination. In the more immature one finds that an increase

in the task causes an increase in the muscular involvement, which increases the expenditure of energy, and there is an increase in the amount of cross-purpose muscular involvement.

Smooth muscle (involuntary) is fairly advanced, while the skeletal or striped (voluntary) muscle is comparatively less well coordinated. Motor responses involve large muscle groups.

1 Month

Motor tightening occurs when the child is picked up. He can lift his head while in a prone position (the chin is lifted up). There is incomplete head control as it tends to go to one side. The preferred position of the child is on his back. He breathe regularly. The eyes follow an object through 90 degrees. There is a negative reaction to pain and denial.

2 months

The chest can be lifted up. Twenty-five children were tested. Three fourths of the infants at this age could lift their head up from the table while in a prone position. One half of the infants lifted and held their head up for one minute. (2, p. 155) The main axis of the trunk lies nearly parallel to the platform.

3 months

For many, this is a period of brief disequalibrium. When the stomach is on the floor he kicks and struggles awkwardly. The child has control of the ocular muscles. There is a stage through which the child passes where movements similar to swimming have been observed. The child draws the feet up frog-like and kicks out suddenly. The feet are not used alternately. This "swimming

action" can be observed after the child has matured enough to lift the head and chin but before he is able to roll over. (2, p. 163) The concave arch of the trunk is forming due to the progressing erection of the head and upper chest. The fulcrum in prone activities shifts from the head to the feet as the infant grows older.

4 months

Infants like to sit with support for brief periods. Posture expresses good to excellent equalibrium. For brief moments the child will maintain poised positions known as swimming. (both legs are extended full length, arms flexed with fists at the shoulders, and lower abdomen lifted well off the floor). The head can be raised almost perpendicular and upward from a prone position. Perception has developed and the child will notice sounds. Infants do not like the water too deep when bathing. The late afternoon is the best time for a bath. The waking hours are spent in activity. Kicking is a favorite pastime. His head prefers a midline position. Of fifty children, ninty-six per cent raised their head at least one inch or two inches when in a prone position. (2, p. 156) The hands are occasionally lifted from the platform. Fifty-four per cent of the infants rested their arms on the platform. (4, p. 56) Upper arms and forearms are passively lifted by pulling of back extension. The legs extend at the hips and are flexed at the knees with the feet raising occasionally. He rests on his thigh, abdomen, lower chest, and forearms.

5 months

Head and chest can be lifted; the support being obtained from the hands. He can hold onto the side of the bath. Waking hours are spent in activity. Peter Fries, a five and a half month old infant, established reflex breathing. (7, p. 70)

6 months

The infant will hold his head erect and turn it if he is supporting himself with his hands. He is also able to turn from the stomach to his back to his stomach. Control of the posture of the trunk and indirect activities develop between six and eight months. The child has a swimming stage at the median age of six months. Legs are out and kicking; hands are fists at the shoulders. One sees the knee push or swim movement when placed on the abdomen.

7 months

The infant rolls from back to stomach (on land).

8 months

The head and chest are lifted. The infant can now do this with the support of one hand.

9 months

Imitation sets in if the movement or action is simple.

10 months

There is balance of the head and trunk. He is content to lie down, but prefers the prone position in the bath. He splashes

vigorously with hands and sometimes the feet. He has the ability to sit up at this level. Motor activity is enjoyed. There is slight control over the center of gravity. There is evidence of instability of emotions, and therefore he is easily excitable. He is also sociable and likes to be handled back and forth. The baby will respond to more than one person at a time. He likes rhythm.

12 months

He pulls himself upright by means of furniture. He has command of his legs and feet.

Swimming Experiments

1. A baby five or six days old showed rhythmic treading in the water with alternate feet. There were other studies which showed the same thing. Babies tend to turn on their back. (2, p. 126, 127, 162)
2. A few weeks-old baby that was submerged made rhythmically coordinated reflex movements in the upper and lower extremities. This resembled swimming. (5, p. 160)
3. A few minutes after birth a child was placed in warm-cold water in order to start breathing. Nothing was displayed but fear. (2, p. 126)
4. "Studies have been made of the presence at birth, or soon after, of reflex movements which can be classified as stepping, swimming, crawling, or sitting motions. The literature suggests this is a fertile field for further investigation. It indicates that such reflexes may exist at a primitive or atavistic level at birth, only to disappear in a few weeks, until they emerge later as part of the developmental pattern. (2, p. 124)

The two major figures mentioned repeatedly in non-professional literature in connection with methods of swimming for infants are Mrs. Jen Loven and Crystal Scarborough. Each has a swimming school in California. Of the two, Mrs. Loven has had the greater number of publishings. One other figure of importance is Charles C. Fries, who contributed one chapter in the book Swimming Fundamentals by Matt Mann II and Charles C. Fries. This was a detailed report of the step-by-step methods used to teach his small son Peter to swim at five and a half months.

Distributed practice is said to be superior to massed practice. Locomotion occurs by reward along with repetition. For instance, in the studies of two infant twins where one was trained and the other was not, it was suggested that training in motor skills increased the rate of development. Also, similar training was given at a later date to the twin that was not taught. This appeared to be the more efficient method according to: (1) amount learned, and (2) amount of time it took to reach a given degree. (11, p. 105)

Mrs. Jen Loven

These classes for infants range in age from four months to one year of age. The best age is between three to six months. "Even at a comparatively helpless age, a baby can be taught the rudiments that will keep him afloat and alive if he falls into the water." (16, p. 185) Mrs. Loven mentioned that although orthodox strokes or stylized techniques cannot be learned, an infant can do the following: (1) relax in the water, (2) keep the mouth closed, and (3) flail with arms and legs.

These are the very rudiments of swimming. Parents go into the pool with the babies. The instructor must remain calm and patient, keeping his voice low and confident. One begins by placing him gently in the water. "He gets an occasional mouthful but soon learns to keep his mouth closed and to hold his breath and relax." (16, p. 185) Following this, the infant is placed face down and allowed to wiggle alone. The instructor remains close to the infant. Small babies cannot hold their head up to breathe out of the water, so one must take them out every few seconds. As the breath control increases, the distance they can swim increases also. (16, p. 185)

Crystal Scarborough

This swimming instructor specialized for thirty eight years in teaching young children to swim. "Swimming comes as naturally as breathing to a small child." (15, p. 95-96) She teaches infants as young as two months. She believes, however, that one and a half years is an ideal age because the child is curious and is beginning to explore. There are two "musts" in teaching an infant to swim: (1) "the pool must be heated to a comfortable 90 degrees at all times", and (2) "learning to swim must always be a game, played by teacher and beginner". (15, p. 95-96)

Other

"Learning is largely accomplished through imitation or response to certain sensations". (3, p. 44) The child's bath is his first introduction to swimming. The stage will be set here and the child will have a negative or positive attitude about the water established; therefore,

the first experience should be associated with pleasure and fun. All early efforts should be directed toward having the child learn breath control, which is the most fundamental achievement.

A child can be taught to float in the tub in water six inches deep by the following methods: (1) place a rolled towel under the child's head. Place hands under his body. (2) Later, hold the head with both hands and gradually take away the hands.

Case I

Infant	Julie Sheldon
Age	10 days old. (Later Mrs. Jen Loven stated that she thought ten days too young to begin teaching to swim.)
Instructor	Mrs. Jen Loven (child's grandmother)
Water Temperature	90 degrees in an outdoor pool
Time	Once a day for twenty minutes after the morning nap.
Procedure	The daily lesson begins with slow immersion of the baby in the pool. Next, the infant is released face down and the instructor walks behind, lifting the child up to breathe every few seconds.
Characteristics	At nine weeks of age the child instinctively holds its breath and moves arms and legs up to a distance of ten feet. At nineteen months, Julie was submerging underwater for as long as seven seconds. The latter was brought about by placing toys on the bottom of the pool at a four foot depth. Such items as a tricycle and teeter-totter were used. (14, p. 35)

Case II

Infant	Sherry Lynn Whitford
Age	6 weeks
Instructor	Crystal Scarborough (Sherry Lynn's cousin. Crystal has taught some forty odd babies to swim)
Location	Los Angeles, California
Procedure	Early instruction consists of teaching her to use her arms for propulsion. The child caught on after the arms were moved back and forth some five hundred times. At eleven months she swims across a thirty foot pool, doing the dog paddle. This is done several times a day.
Characteristics	Although the baby revealed aquatic talent at six weeks of age, she swam for the first time at the age of seven months. No sense of direction was evident, but she wasn't strong enough to raise up for air, she swims across the pool in one breath. She gets into the pool by sitting on the edge of the pool and flopping in. At eleven months of age she has not yet walked. Later diving was learned by being dropped into the water head first by the instructor. The latter was not attempted until the baby had learned to extend her arms to break the shock of the water. (13, p. 80-82)

Case III

Infant	Peter Fries
Age	7 weeks
Instructor	Charles C. Fries
Location	University of Michigan, Ann Arbor, Michigan
Procedure	Peter began his water experiences in a tank five feet long, thirty inches deep. The water temperature was ninety-five degrees Fahrenheit. He moved from side to side. Next, when laid on his back there was a noticeable reaction. Duration of time in the water was ten minutes. He weighed ten pounds thirteen ounces.
2 months	Water temperature was ninety degrees. He was in the water daily for ten minutes at 7:30 p.m. There was foot motion in the water.
3 months	He splashes with his hands. Water at times will cover his mouth and nose. There is a reflex breath control that is due somewhat to instinct; he automatically stops breathing when the water covers the mouth.
4 months	Very definite breath control is evident. Balance reaction on land is beginning.
5 months	Breath control is so complete that they tried complete submerging of the head and played "peek-a-boo". He submerged four times. The maximum time under water was three seconds.
6 months	Played "peek-a-boo" with submerging. He was allowed to float to the surface before being re-supported.
7 months	He balanced in the water. He also floats on his back alone with no support for five to ten seconds when his attention is taken with a person in such a position that it allows him to be completely relaxed.

Generalizations

Charles C. Fries believes the sequence in which the child adjusts to the water seems to be determined by the general physical development. If a child walks at the time, he will begin an alternate leg kick in the water rather than a double one.

The earliest age an infant can swim, even in a rudimentary way, is about the age of eight to nine months; near the time he is ready to walk. However, this is true only after a long period of carefully directed and regular water experience (at least six months). Teaching at this age does not refer to method, but to giving the infant experience in the water.

Principles

1. The child must never be frightened in any way. The head should be carefully supported at first so no water gets into the face.
2. The teacher should be in the water also with his face on the level of the child's. This gives the child confidence.
3. Water temperature should be 83 to 90 degrees. In the summer time it should not fall below 80 degrees.
4. One must expect slow progress; don't attempt to speed up the development of the child. There will be approximately two and a half months between the recognition of the first breath control and the first complete submerging of the face.
5. Concentrate on developing only one thing at a time. Otherwise confusion will result.
6. To the very small child the dog paddle will seem the most natural. The kick is the source of power while the hands aid in breathing. No attention should be paid to the stroke until after the child swims with considerable amount of freedom. (7, p. 70-75)

CHAPTER III

PROCEDURE

A local pediatrician approved of this experiment with infants as being medically unobjectionable. Parents were encouraged to obtain the consent of their own physicians for their infants to participate in this study.

Five infants, a boy (two and a half months), a boy (five months), two girls (six months) and a boy (one year old), were the subjects. Availability, willingness, and an age limit of one year of age were the only criteria for selection of subjects.

The study was conducted in a pool at the Women's Intramural Building at Michigan State University. The pool was thirty yards by ten yards and three and a half feet deep at the shallow end. All sessions took place at the shallow end of the pool. Water temperature was maintained at eighty-eight degrees fahrenheit.

An office adjacent to the pool was used for dressing and undressing of the babies. The temperature of this room was maintained by means of an electric heater at about a temperature of ninety-two degrees.

The babies wore diapers and plastic pants in swimming for sanitary purposes. Each infant was checked first to see that the diaper was dry before entering the water.

Toys were used as a means of gaining the infants' attention as well as contributing to making the experience in the water pleasurable and fun.

The toys consisted of a large plastic yellow ball, plastic rattle and rubber animals that floated.

These infants were brought to the pool one day a week, the same day each week. Each child spent from ten to twenty minutes in the pool. The other six days a week the mothers spent an additional period of approximately ten minutes in the tub, after the bathing period, going through the same process as was done in the pool.

At each session the baby was taken to the edge of the pool deck. The parent or the instructor entered the water and the infant was handed down. The baby was held in an upright position close to the instructor and supported by means of one arm under the buttocks and the other hand supporting the baby's neck and head. Both instructor and infant slowly submerged, stopping at various body points until adjustment to the water had been made and the infant seemed relaxed. These adjustment points were the feet, thighs, waist, chest, and shoulders. At this point toys were placed in the water within reach of the infant and he was allowed to play with them and to splash until all signs of tension disappeared. Following this, the instructor changed her hold on the infant by placing her hands on either side of the infant's chest just under the arm pits. Still holding the baby in an upright position so that he was facing the teacher, the instructor strove to bring the infant to a point away from her and directly in front of her at arms length away. Both are at neck depth in the water. The child's arms and legs were now free for movement. Again one waited for the baby to relax before continuing. Still holding the baby in this last position, the instructor rotated her hands so the baby's feet rose, and he was in a prone position on top of the water. Next, the baby's position was changed. Still prone, he was held by one

hand on either side just above the waist. The instructor was standing and reached down over his back to do this. In this position the baby's side was to the instructor. Later, both hands supported the child under the abdomen and chest. At this point there are two very important factors to keep in mind. (1) When holding the infant in a prone floating position, the body must be supported as low in the water as possible; yet still having the head out of the water. This is vital to simulating an unsupported prone float. (2) The baby will occasionally drop his head into the water so that the mouth or the mouth and nose will go under water. This is necessary for the child to learn to close its mouth and hold its breath. When the child swallows the water, coughs, or cryes, he should be picked up and held closely until he recovers. It should be remembered that his experiences in the water must be more positively than negatively oriented. After the child has learned to close its mouth, when covered with water, he must be held low enough in the water so the water covers his mouth constantly but leaves his nose free for breathing. The head will still occasionally drop into the water and this is how the reflex of complete breath holding will be learned.

Toys placed a yard or so away promote an effort on the child's part to obtain them. When kicking or splashing and paddling with the hands occurs, the child should be moved through the water with some speed. The child will soon learn to associate feet and hand movements with locomotion through the water. When the child reaches the toys, they should be taken away within a few minutes or use of the hands will be negligible.

The following procedure may be followed to introduce floating on the back. The baby is cradled in the arms and held very close to the instructor while on his back. One hand must be underneath the child's

neck and head for support. From a standing position, both slowly lower until the baby is in the water. The instructor should lean over the baby so that her head is directly over the baby's face. Some means of facial expression should be used to hold the baby's attention in order that its head will remain back and in line with its body. This is necessary for a correct floating position to be assumed. Gradually, one should work up to the point where the child is held away from the instructor's body, being supported with one hand under the buttocks and the other under the head and neck. Another person holding a toy directly above the eyes will keep the head in the correct position and distract the child. As soon as an adjustment has been made in this position, so that all tension is gone, the hand supporting the buttocks should be removed, leaving only the head and neck supported. However, if the baby's legs are not extended in line with the body he will have a tendency to sink. One should strive to keep the lower half of the body under water. In this position the ears and lower half of the head will be submerged. The infant may occasionally be lowered in the water to such a depth that only the area around the mouth, nose, and eyes remains above the water. When it is found that the infant remains relaxed in this position, and the instructor feels that the infant is near to being completely supported by the water, she should very slowly and carefully lower her hand beneath the infant's head so that the baby will float of its own accord for a brief period. The baby's head is quickly resupported so that its face is not allowed to sink beneath the water. With time, this period of no support should be lengthened and eventually the child may be allowed to submerge beneath the surface of the water for a second before being resupported. The latter experience results in learning to hold the breath.

The procedure used with the one year old child differed from the other methods due to the fact that he expressed fear of the water. The process was exactly the same as for the other babies up to the point where he was held in an upright position, close to the instructor, and supported with one hand under the buttocks and the other behind the back. From this point on there is little similarity in method. Starting in the upright position, the child was held tightly but in such a manner that his arms were free to push a ball back and forth with another person. After adjustment to this situation was made and tension disappeared the next step was begun. This consisted of holding him in the same manner just mentioned while both he and the instructor bobbed up and down in the water. This was made into a "game-like" situation by singing and pretending to be "bunnies" hopping up and down. The depth of the bob increased with time. The first objective was to have the water cover the mouth for a brief period. As time went on the bobbing continued in depth until the head was completely submerged.

Observations were recorded by means of movies, check lists and in essay form. Also, each mother was given a chart on which she would record during the week the number of times this same process was attempted at home. She was instructed also to record any new behavior or movement shown by the infant.

Figure I

The Upright Position First Used For Introduction and Adjustment To The Water

Figure II

The Upright Position Assumed To Allow

Freedom of Arm and Leg Movement

Figure III

The First Introduction To Prone Floating

Figure IV

The Second Step In Prone Floating

Figure V

The Most Advanced Method Used In Prone Floating

Figure VI

Introductory Position Used For Floating On The Back

Figure VII

The Second Step In Floating On The Back

Figure VIII

The Most Advanced Method Used In Floating On The Back

Figure IX

A Method For Developing Partial Breath Control

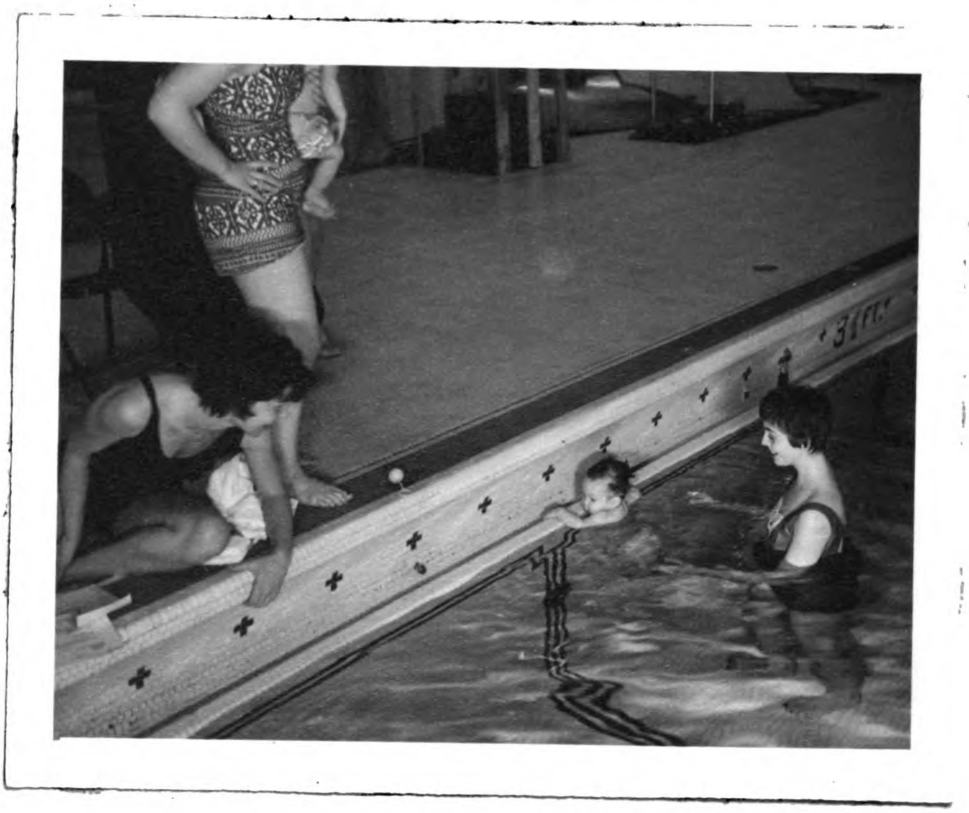


Figure X

Infant Supports Self On Edge Of Pool

CHAPTER IV

RESULTS

This study began with five children. After the first three or four meetings one infant was unable to continue and thus the conclusions of this study are based upon four subjects. A detailed description of the individual cases follows.

Subject: Michaele Spaun
Sex: Female
Age: 6 months

DATE: January 10, 1961

The first experience in the water lasted 10-15 minutes. When initially put into the water she looked bewildered; as if she could not make up her mind how to react. The first time she was held in an upright position there was no movement of the hands and legs. Later, however, leg movements in an alternate fashion resembling "treading water" occurred. In a prone floating position the head began to drop into the water and she was returned to the upright position.

There was no negative reaction to being placed on her back other than a blinking of the eyes. There was an alternate frog kick backward in line with the body.

DATE: January 17, 1961 (1 week later)

Time spent in the water was approximately 15-20 minutes. Water temperature was 86 degrees F. This time there was no evidence of bewilderment.

She splashed with her hand in an upright position. Held in a prone position she kicked alternately backwards. There was one flutter kick (up and down with one leg once). Still in the same position, she would splash with one hand or the other.

When placed on her back she not only continued to kick frog-like backwards alternately, but occasionally kicked both feet together or in an alternate up and down movement. A new movement appeared, namely, pulling her feet up to her body and keeping them there.

The baby missed two weeks when vaccinated. Reactions after missing were somewhat similar to the first time in the water.

AGE: 7 months
DATE: February 7, 1961 (1 month, 3 days later)

15-20 minutes were spent in the water, the temperature being 86 degrees. In a prone position the baby's head was almost always held upright. For the first time she learned to close her mouth when water covered it and to breathe through her nose. She was still kicking alternately back and forth frog-like style although now periodic rather than occasionally. The arms still splash, one at a time, as before.

In a floating position on her back she no longer kicked at all. She stretched her legs out straight behind her in line with the body. There was no movement of the arms. When first placed on her back she frowned but later relaxed.

DATE: February 21, 1961 (1 month, 2 weeks later)

Water temperature remained at 83 degrees F. In the prone floating position, the infant's kick had changed from one frog-like to a paddling

fashion with alternate legs. The action changed from periodic to almost constant. The arm motion changed too, from occasionally to periodically.

When placed on her back she still maintained her position with no movement of the hands or legs. The legs are drawn up to her body.

AGE: 8 months
DATE: February 28, 1951 (1 month, 3 weeks later)

Length of time in the water was 20 minutes. Water temperature was 88 degrees. In the prone position the legs alternated, frog-like, back and forth to some degree. One also would observe the alternate flutter kick more often during the almost constant kicking. Use of arms was still periodic but now had altered from splashing to the first sign of paddling. (Reaching out and beginning to pull down through the water.) Breathing alternated between closing her mouth, breathing out through the mouth, and occasionally swallowing water when both nose and mouth were submerged.

Floating on her back, one now saw the return of a kick which was mostly backward, both feet together and frog-like. Some alternate frog-like motions were also evident. This was the first real use of the legs in the back position. Arms still remained unused. If water went into her mouth she closed it.

She could hold on to the side of the pool in an upright position with only slight support under the buttocks.

DATE: March 7th and 14th

(The baby missed two weeks due to a cold and she was kept out of the water.)

DATE: March 31, 1961 (2 months, 2 weeks later)

Observations were recorded by means of movies.

AGE: 9 months
DATE: April 3, 1961 (3 months later)

Water temperature dropped to 84.2 degrees due to mechanical difficulties. Time spent in the water was 20 minutes. In prone floating position, one saw the return of constant alternate peddling motion with the legs. The hands still showed evidence of some alternate splashing but mostly paddling periodically. Breath control: The nose and mouth together were going under the water more frequently. The infant coughed or exhaled. She was not frightened in the least by this.

She reacted negatively to being placed on her back. (The cooler temperature of the water in the infants ears was distressful.)

DATE: April 10, 1961 (3 months, 1 week later)

Twenty minutes were spent in 83 degree water. In the usual prone float position, the legs had now altered from peddling to a constant flutter kick. The arms, too, converted from an attempt to paddle periodically to a constant and distinct paddle motion. Nose and mouth continued to go under the water quite often. Still there were no signs of being disturbed or complete breath control.

She was able to hang on to the side of the pool in an upright position with no support.

She laughed, smiled, and thoroughly enjoyed the water.

Subject: Randy Arend
Sex: Male
Age: 2½ months

DATE: January 17, 1961

The baby spent 3 to 4 minutes in 86 degree water. No look of surprise was evident as with the others but his lower lip quivered. The mother stated that he does this when he is cold. When placed in a prone position in the water he kicked rapidly alternately and backward in a frog-like movement. His hands, in a clenched position, splashed in front and to either side of his head.

When floating on the back he kept his fists quietly by his head. His legs stretched out behind him in line with his body. He splashed once or twice with one leg but this was not a regular occurrence.

If his mouth went into the water; he coughed but did not cry.

DATE: January 31, 1961 (2 weeks later)

Ten to twelve minutes were spent in the water. In a prone position, his legs kicked alternately backward and frog-like as before. His arms were used to splash alternately with vague paddling motions mixed in. This was his first use of the arms for paddling. His mouth went under the water six or seven times. Apparently he was swallowing the water.

On his back in the water, the legs kicked alternately and frog-like as previously. For the first time they were pulled to his body or held up in the air motionless. The arms still remained quietly at the head. With only his head supported he nearly floated alone. Only the area of the eyes, nose and mouth were not submerged.

He showed only pleasure on his back. He also smiled.

DATE: February 7th and 14th

(The baby was absent due to a cold.)

AGE: 3 months
DATE: February 21, 1961 (1 month, 1 week later)

The infant spent 20 minutes in 88 degree water. Movies were taken. The baby's adjustment to the water was very similar to the first time. Just like starting over from the beginning. One noticed when the infant was placed in a prone position that there was no movement of the legs, these being stretched out directly behind and in line with the body. The father stated that he had been holding the infant in a similar position over his head in the air and the infant had developed this same body position (legs stretched out behind and rigid) in the water. His hands were used to splash a little. The head was held upright periodically.

The infant naturally kept his head extended in line with his body when placed on his back to float. His legs again were kept stretched out behind him. For the first time the hands did not remain clenched by the head, at the sides, or across his chest; but were extended out laterally from the shoulders at his side. He was completely relaxed and quiet.

AGE: 4 months
DATE: February 28, 1961 (1 month, 2 weeks later)

Fifteen minutes were spent in 88 degree water. He still showed signs of tenseness just for a few seconds at first and his lip quivered. This most likely was due to the water being colder than he was used to. Otherwise he smiled, laughed, and expressed enjoyment. Since the author worked with the infant, observations were limited. It was believed that when the infant was on his back in the water, had he been released he would have floated.

DATE: March 7, 1961 (1 month, 3 weeks later)

Experience in the water took place for 15 minutes in 88 degree temperature. Placed in a prone floating position he did not kick nor move his arms. The head was still held upright periodically. When the mouth dropped into the water he coughed or breathed out. Once the whole face went in the water.

Movement of the arms and legs on the back while floating were the same as for the prone float. The mother said he had been less active at home also. She attributed it to teething or, in this instance, to the fact that he had just finished eating. The mother had been moving his hands fifteen times a day in a dog paddle motion. At home he showed evidence of slapping the water. The legs were kept straight out behind and in line with his body. His hands were in his mouth. When the instructor's hand was removed from beneath his head he floated alone for a second. Due to the fact that he moved slightly, his body submerged for an instant. After this his legs were pulled up to his body and his position was stiffer and less relaxed.

AGE: 4 months
DATE: March 14, 1961 (2 months later)

The infant was in the water for 30 minutes this time. Floating prone he kept his head up for greater periods of time, almost to the point of holding it up constantly. For the first time in several weeks he showed signs of kicking, both feet together and backward frog-like, as well as alternately frog-like. This was similar to the beginning movement expressed during the first lesson. Still no movement of the arms occurred.

The mouth was in the water six times. There was no coughing. He only exhaled or spit the water out.

He floated alone for 1½ seconds. While on his back he moved for the first time in several weeks. He kicked both feet together backward frog-like as well as alternately backward frog-like. Occasionally the arms splashed and pulled under water. Movement resulted from "hunching" along on his back. Both the above movements were new. He now bent slightly at the hips in order to sit up and thus his mouth and nose went under. This happened 3 times and there was no coughing. This was the first sign of breath control. At home he rolled over under water in the tub and did not choke.

AGE: 5 months
DATE: April 3, 1961 (2 months, 3 weeks later)

Water temperature was only 84 degrees. It had been noticed that while in a prone floating position his kick had periodically changed from a simultaneous frog-like kick backwards, or an alternate frog-like kick, to a somewhat alternate flutter kick. Frequent use of the legs heretofore had been only sporadic. Arm movement was still noticeable. He seemed to be close to learning to close his mouth when the water covered it. At home he blew bubbles in the water. He did not like water in his eyes.

Cold water caused negative reaction to floating on the back.

DATE: April 10, 1961 (3 months later)

Water temperature was 83 degrees. He almost cried when first put in the water. Unlike the others, he always had a tendency to have a blank look for the first few seconds. In the prone position he had abruptly changed from a periodical kick to a constant one. It was usually

alternate back and forth and frog-like but occasionally both legs were kicked together in a frog-like manner. The only movement of the hands while being held at the sides, a little in front of the shoulders, was in clenching and unclenching of the fists. No breath control was evident yet.

On his back in the water he kicked mainly alternately backwards frog-like. Use of both feet together as in the past was disappearing. While on his back, the kick was observed to occur more constantly. With very little support under the head the infant was almost propelling himself through the water by means of the leg movement. When the hand was removed movement through the water occurred. The second time this was tried he went under the water.

Subject: Ann Roberge
Sex: Female
Age: 6 months

DATE: January 10, 1961

The infant remained in the water for 20 minutes. A "blank" look or one of bewilderment accompanied her adjustment to the water. When placed in a prone position in the water, hand and leg movements were noticeable from the start. There was an alternate slapping and splashing with the hands while the feet propelled themselves in an alternate frog-like kick backwards. An occasional two beat flutter kick was evident also.

When placed on her back the arms were clutched over her head. Her legs stretched out behind her for a short period but later were pulled up to the body or placed up in the air.

DATE: January 17, 1961 (1 week later)

Ten minutes were spent in the 86 degree water. As the infant was lowered to the water her breathing speeded up but returned to normal in a minute or so. When placed in a prone position it was noted that the inside arm often moved less because it was hindered by the instructor supporting her. She kicked both legs together and backward in a frog-like manner. This was something new. Once or twice an alternate backward kick occurred as before.

Unlike the last time the baby did not enjoy being placed on its back in the water. Tenseness was evident.

DATE: January 31, 1961 (3 weeks later)

Water temperature was 86 degrees. Time spent in the water amounted to 15 minutes. In the prone floating position the legs were still kicking alternately and together backward in a frog-like motion. The kick was almost as constant as it was from the beginning. Arms varied in style between splashing alternately, splashing together, and the newest phase of paddling alternately. Frequency of the arms could be labled periodic. The head was almost always in an upright position. The mouth was covered with water eleven times. Reactions were coughing, swallowing, and exhaling. Both nose and mouth went under six times. There was no reaction three of the times, she coughed twice, and cried once.

On her back the legs still remained pulled up to her body or extended up in the air. Hands were in the mouth. She still did not like being on her back.

AGE: 7 months
DATE: February 7, 1961 (1 month later)

In the prone position the legs have changed from the previous together or alternate frog kick to an alternate peddling fashion. The movement was still almost constant. Periodic splashing of hands continued. Her head was only being held up periodically. Breathing reactions to submersion resulted in coughing and swallowing.

She continued to show dislike for floating on the back. There was a tightening of muscles when placed in this position. No kick was evident yet.

DATE: February 14, 1961 (1 month, 1 week later)

Observations were not recorded.

AGE: 8 months
DATE: February 28, 1961 (1 month, 3 weeks later)

The infant spent 15 to 20 minutes in water of 83 degrees. On the stomach in the water, the kick was mainly an alternate peddling. Rarely was a frog-like kick with both feet together evident. Arms splashed alternately as before. Both arm and leg movement was constant. There was no new development in breath control.

This was the first development of a kick on her back. It varied between an alternate frog kick and both legs together kicking backward frog-like fashion. Arm movement commenced also. Splashing occurred with both hands simultaneously at her sides, as if an exagerated waving "goodby".

Emotions were expressed with smiles, laughter, relaxation, and enjoyment.

DATE: March 7, 1961 (2 months, 1 week later)

When placed in a prone position her kick remained as before. Hands had developed for the first time from a splashing to an alternate paddling movement. There was no change from periodically holding her head upright or in her breath control.

She regressed back to tension when placed on her back. She bent at the hips and kept her head forward. She seldom stretched out into a supine position.

DATE: March 14, 1961 (2 months, 2 weeks later)

Twenty minutes were spent having her lesson in the water. In the prone float there was still evidence of an occasional kicking together and backward along with the main alternate peddling kick. The newest innovation was peddling with both legs. There was no change in arm motion. There was finally sufficient strength to hold up the head almost constantly.

On the back, the legs were still held up in the air. Relaxation in this position was beginning to occur.

AGE: 9 months
DATE: April 3, 1961 (3 months later)

Water temperature was 84 degrees and the infant remained in the water for 15 minutes.

When prone in the water one noticed far more use of the arms in a definite paddle motion. There was still no evidence of any breath control.

DATE: April 10, 1961 (3 months, 1 week later)

The strength of the neck was developing so that her head was held higher when she was in a prone position.

This was the first time on her back that she seemed somewhat relaxed. Also she kicked with her feet and splashed with her hands in this position for the first time.

She held onto the side of the pool unsupported for a couple of seconds.

Subject: Jeff Thiede
Sex: Male
Age: 1 year old

DATE: January 10, 1961

The child remained in the water for 15-20 minutes. Although he did not appear unduly frightened of the water he still clung tightly to the instructor. He did not progress any further than an upright position.

DATE: January 17, 1961 (1 week later)

Water temperature was 83 degrees. He cried more than any other time that he had been in the pool. It was finally decided that he should not be forced and so he was allowed to play on the deck at the side of the pool until he voluntarily showed signs of wanting to go into the water.

DATE: February 14, 1961 (1 month, 3 weeks later)

Water temperature was 83 degrees. At this point his mother decided to take him in the water whether he liked it or not. He cried vigorously. As time went on and he realized he would not be taken out of the water the crying subsided but still occurred periodically. It appeared that while the mother was holding him in an upright position and bobbing up and down that he might be learning to close his mouth when partially submerged. He then swallowed some water and coughing followed. Toward the end of the session in the pool he relaxed somewhat. He not only began looking around the pool but also talked.

DATE: March 28, 1961 (2 months, 1 week later)

He had definitely learned to close his mouth in the water. He was no longer clinging as tightly to his mother. In fact, he removed one arm from around her neck in order to play ball. He still remained in an upright position. If this same position was tried at arms length from the instructor, he cried. The second time this was repeated he eventually stopped crying.

When first placed in a supine position in the water, he cried. Later, although water occasionally covered both the mouth and nose he did not cry.

DATE: April 3, 1961 (2 months, 2 weeks later)

Water temperature was 84 degrees. Jeff remained in the water for 10 minutes. Crying took place only for a short time when first put into the water. He smiled and played catch with his father. Both mouth and nose went under the water but he did not cry. The father played "peek-a-boo" by ducking under the water and then jumping up. Both the mother and child tried the same procedure. If he was held away from his mother he cried. For the first time he allowed his feet to float up behind him. This occurred as his mother swam on her back and Jeff clung to her shoulders thus floating above her.

DATE: April 10, 1961 (2 months, 3 weeks later)

Twenty five minutes were spent in water 88 degrees in temperature. He cried when first put in the water. For the first time he completely submerged with his mother while bobbing up and down. He did not cry. This same procedure was repeated 3 or 4 times. When he was held in a prone position facing his mother so that his feet trailed behind him, there was no movement of his feet. He clung with both hands to his mother.

SUMMARY

The general progression of the infants indicated that at the very beginning the head was not always held up when the body was in a prone position. As strength developed with age the ability to hold the head upright increased.

Breath control was lacking. Instead of swallowing water constantly and coughing, the baby exhaled, spit the water out, or swallowed it without any ill effects. As the experiment continued, he learned to close his mouth when it was covered with water. Breath control involving both nose and mouth at the same time, developed along identical lines.

Little or no movement of the arms and legs was seen. As time went on, the use of the legs developed first, with the arms following. General progression of the legs developed from no movement, to occasional movement, to periodic movement, and finally to constant movement. Specific progression of the legs was as follows: No movement, together or alternate frog-like kick backward in line with the body, alternate peddling fashion, and flutter kick.

General progression of the arms was identical to the legs. Specific progressions indicated no movement, splashing with one hand and then both hands, both hands paddling (reaching outward and pulling downward through the water as in the dog-paddle), and finally alternate paddling with the arms.

In the case of emotional reactions, one saw bewilderment at the onset, later changing to enjoyment and relaxation with each ensuing lesson.

Figure XI: Progression of Leg Movement

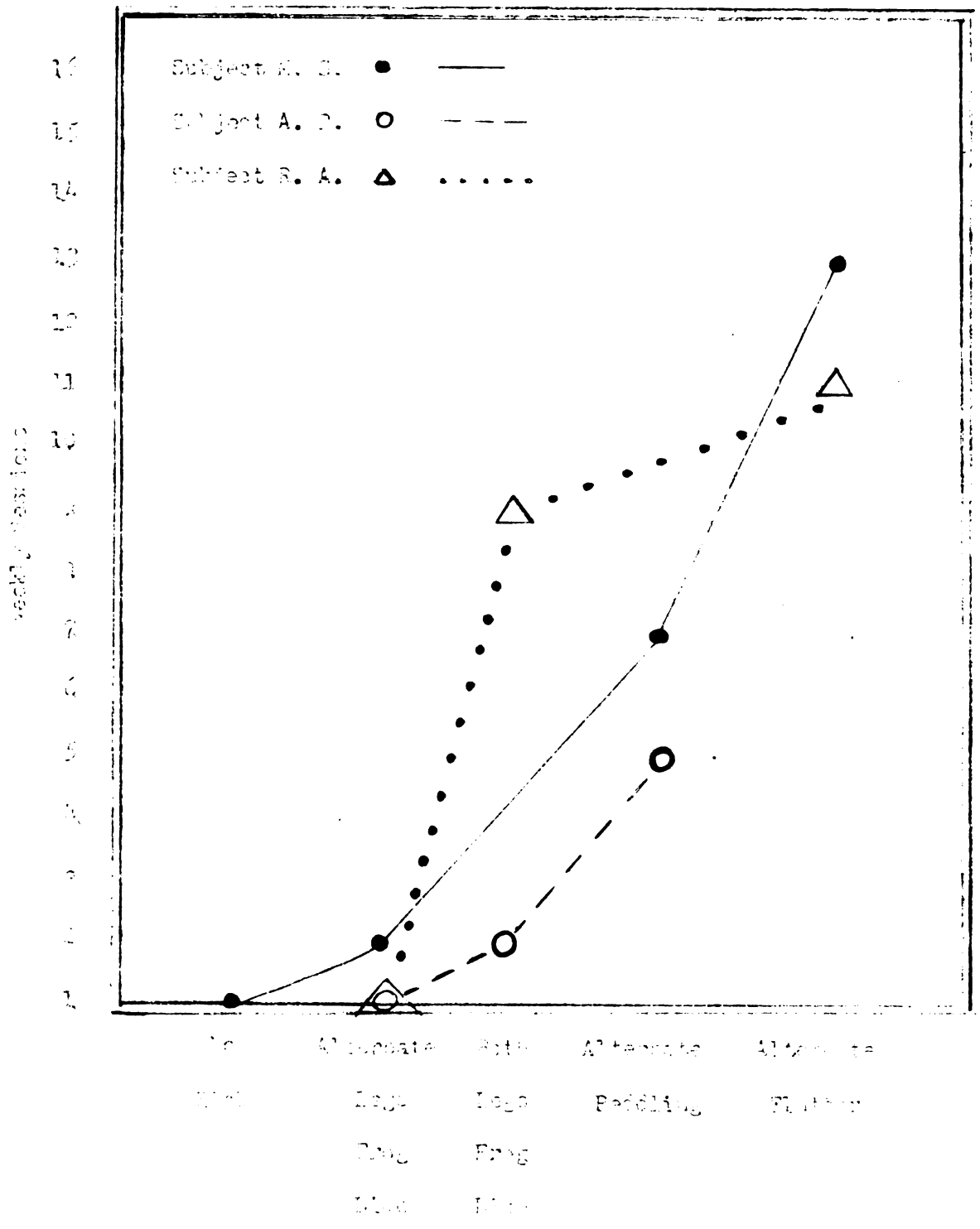
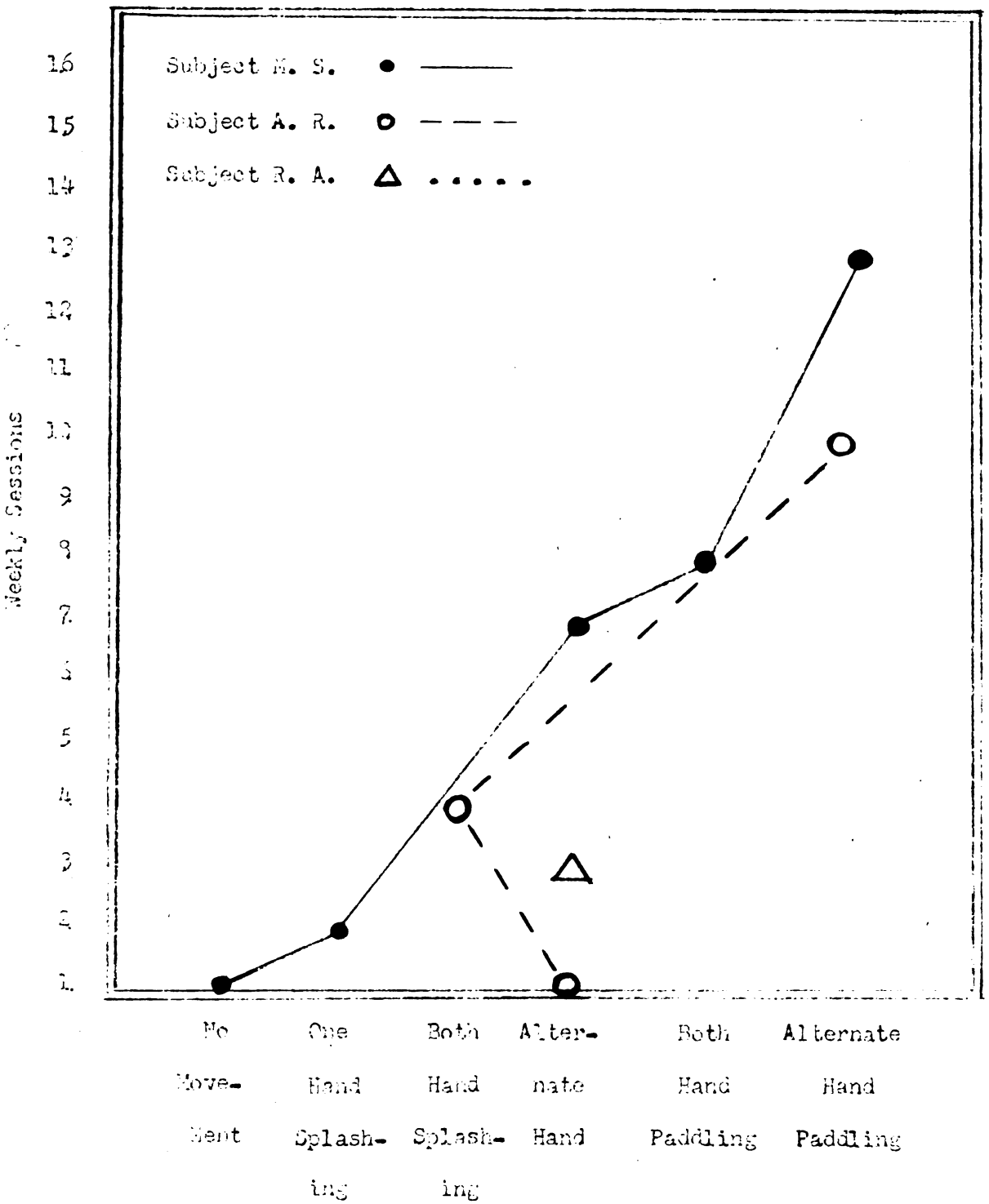


Figure XII: Progression of Arm Movement



CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

Characteristics of the swimming ability of five infants were observed during a four month period. The object of this study was threefold: (1) to study the physical capabilities of infants under one, in the water, in relation to swimming; (2) to determine the feasibility of preliminary water training in the home as a factor in reducing the age at which a child can be taught to swim; and (3) to develop methods of progression for training infants to be self-sufficient in the water.

The subjects who participated in this study were a boy two and a half months old, two girls six months old, and a boy one year old.

These infants were brought to the pool one day a week. Each child spent ten to twenty minutes in the pool. The other six days a week, the mothers spent an additional ten minutes in the tub, after the bathing period, going through the same process as was done in the pool. Each mother was given a chart to record each day that the process was followed and to note any new developments in the way of reactions or movements.

CONCLUSIONS

From the analysis of the data, the following conclusions were drawn:

1. Infants, age two and a half months and older, possess natural leg and arm movements in the water. These are modified forms of the conventional style of swimming known as "dog-paddle".

2. There is a definite progression in maturation which pre-disposes the form of leg and arm movements in relation to swimming.
3. Breath control is not automatic but develops with repeated experiences of submersion.
4. The use of home facilities for preliminary water training to reduce the age at which a child can be taught to swim is impractical.
5. It is possible to develop methods of progression as a means of training infants to be self sufficient in the water.
6. Consistent and frequent experiences in the water are desirable to promote rapid learning of swimming skills.
7. Water temperature plays an important part in the reactions of the child to the water. A high temperature of 90 degrees causes the child to relax and increases the amount of movement with the arms and legs.
8. A four month period is not sufficient to develop complete self sufficiency in the water.
9. Based on this study of two month, 6 month, and year old infants, it was found that adaptability to water tended to decrease with age.

RECOMMENDATIONS

1. Further studies should be conducted based upon a larger number of infants not exceeding one year of age.
2. A study should be developed using two identical twins; one to be the experimental subject and the other a control subject.
3. It should be determined if these methods are applicable to group instruction of infants.

4. In future studies movies should be taken periodically from the beginning of the experiment to the end.
5. An orientation period should be set aside for the parents at the beginning of the lessons.
6. Teaching aids should be developed which are practical, inexpensive, and adaptable for home use.

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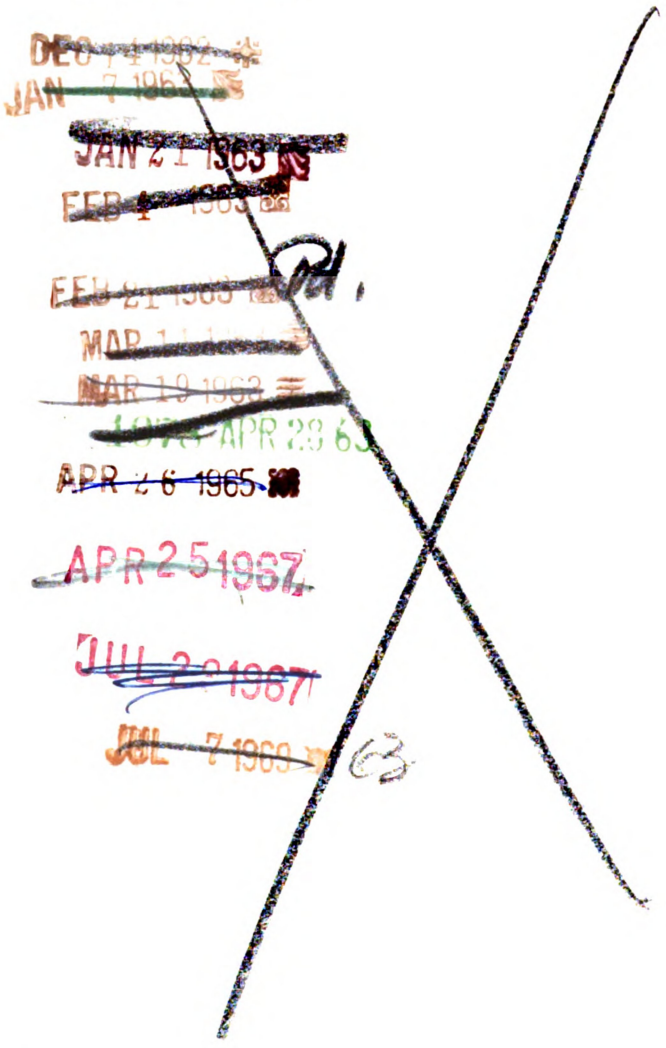

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