EFFECTS OF AN AQUATIC PROGRAM ON THE SPATIAL AWARENESS OF A PERSON WHO IS BLIND

By

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The purpose of my study was to see whether an aquatic program can improve spatial awareness in a person who is blind. The aquatic program was conducted for 8 weeks. Aquatics skills taught included "the modified free crawl" and "the modified back crawl." Detailed notes were taken during and after each aquatic session to evaluate any change in performance and perceived ability. Interviews were also conducted, after the program was completed, to determine if a difference was occurred in the way the participant feels about his own spatial awareness. In addition, The Wayfinding Skill Task was administered before and after the aquatic program to see whether there was an improvement in the spatial awareness of participant. Notes were taken on the number of errors made during The Wayfinding Skill Task.

These observation notes were analyzed using the constant comparative method of qualitative analysis. The data from The Wayfinding Skill Task, which was the number of errors made while walking the route, were summarized and compared for each trial.

Results of this study indicate that the spatial awareness of the person who is blind was improved after the aquatic program by showing the enhancement of body image, hearing awareness, self-confidence. In addition, it was shown that the sense of distance and direction became more instinctive than before the aquatic program.

Implications for future studies are discussed and the following two topics were suggested. To measure the primary differences of an aquatic program upon children who are blind, versus adults who are blind and To compare the various differences of the effects of an aquatic program upon people who were born blind, versus those who became blind later in life

CHAPTER 1
INTRODUCTION

It is often assumed that the spatial senses (vision, hearing and the tactual senses) operate as distinct and independent modalities, and moreover, that vision is crucial to the development of spatial abilities (Jones, 1975). Therefore, one can conclude that people with visual impairments need to expend a specific effort to develop proper spatial awareness. Many studies have indicated that various kinds of spatial task training can affect spatial awareness of in people who are visually impaired, or blind. However, there are few studies using physical activity as a strategy, which can improve this ability even though according to Krebs (1979), concepts of spatial movement are most meaningful when experienced through physical and tactile activity.

The following two studies show exercise can help develop the spatial concepts of people with visual impairments. The first study was conducted by Chin (1988). This study indicated that a program of instruction in dance movement can enhance the spatial awareness of visually impaired elementary-school students. Sixteen visually impaired students were randomly assigned to two groups. The Hill Performance Test of Selected Positional Concepts was administered before and after the dance program to estimate the spatial awareness of the subjects. Eight students participated in traditional physical education and received no dance instruction. Eight students received dance instruction in addition to traditional physical education. The dance program was given to the students for 20 hours over a period of 10 weeks. One group met after school on Monday and Wednesday for an hour each day. The second group met on Tuesday and Friday for an

hour each day. For 10 weeks, the students alternated the Monday-Wednesday, Tuesday-Friday schedules. This procedure was utilized to control for any effects associated with participation on a certain day of the week. The dance program included body warm-up techniques, exercises based on dance techniques, locomotor movements across the dance floor, short dance combinations, and one three-minute dance routine. No significant difference was found between two groups with respect to the mean pretest scores on the Hill test. However, a Scheffé analysis of variance revealed significant difference between the pretest and posttest scores of the group that received dance instruction. Krebs (1979) also show that a Hatha Yoga exercise program, which emphasized body image and spatial/movement concepts, proper posture and relaxation techniques, was able to get positive effect on improving the body image and spatial awareness. The Hatha Yoga program for visually impaired students was administered for 6 weeks and consisted of 12 exercises that have been selected, sequenced, and adapted to meet special needs.

1.1 Statement of the Problem and Purpose of the Study

Although physical activity is effective in improving the spatial awareness in a person who is blind, there are few studies tried to enhance this ability using physical activity as a strategy. Therefore, the purpose of this study is to investigate the improvement of spatial awareness in a person who is blind using the aquatic program, which emphasizes the body image and spatial /movement concepts.

1.2 Research Hypothesis

The research hypothesis is that the aquatic program can contribute to the improvement of spatial awareness in a person who is blind.

1.3 Definition of Terms

The following terms will be frequently referred to throughout the text, which should be considered according to the following definitions:

Body image: refers to ideas and feelings that individuals have about their bodies and the relationship of their body parts (Eichstaedt & Kalakian, 1987). In addition, the term body image is used in at least three ways, and in combinations of the three, and it is necessary to provide some perspective on the uses of the term. Hapeman (1967) used the term to refer to a child's knowledge of the parts of his body and of the relationships among those parts(for example, the fingers are connected to the hand). A second use of the term is as represented by Garry and Ascarelli (1969). They wrote about "awareness of body position – which is awareness of the spatial relationships of parts of the body to its axes, and of the body as a whole to other bodies." This use differs from that of Hapeman in that it refers to external space, not just to the body. A third level of meaning is characteristic of the psychoanalytic literature, and it has to do with the differentiation of the ego from the external world. This use is similar to the second use, but it carries a somewhat stronger implication of a developmental process (Warren, 1977).

Spatial awareness: is the internalization of our own location in space as well as object localization (Martin, 2002). If we see this term more in detail, the spatial awareness refers to the ability to work within one's own space and the ability to organize people and objects in relation to one's own body. In other words, spatial awareness is a knowing where you are in relationship to other objects in your surroundings and how that relationship will change in the near future as you and objects around you change positions (Lisa, 2000).

1.4 Significance

The investigation of the benefits of aquatic program on the spatial awareness in a person who is blind is of critical significance, since this has not been investigated by many researchers. It is ultimately expected that a person who is blind is able to get more confidence, freedom and independence to move around having proper spatial concepts through the aquatic program.

CHAPTER 2
REVIEW OF THE LITERATURE

2.1 General Understanding of Visual Impairments

When one thinks about visual impairments and blindness, one might imagine someone who sees nothing at all and must use adaptive techniques for tasks that typically require vision, such as for reading or a cane to detect objects when traveling. It is often surprising to learn that most individuals with legal blindness have some usable vision and that most students who have visual impairments are print readers.

Two different definitions describe visual impairment. The legal definition of blindness is based on a clinical measurement of visual acuity. Acuity is determined by having the individual read the letters on a chart, each line of which is composed of letters written with a certain size of print. The ability to read the 20 line from a distance of 20 feet is typical, and a person who can read at that line is said to have 20/20 acuity. Individuals who can read only the top line from 20 feet, where the print size is 200 (the big E), when using both eyes and wearing their glasses, have 20/200 acuity: these people are legally blind. People are also legally blind if their field of vision (the area around them that they can visually detect when looking straight ahead) is less than 20 degrees (normal is 160 degrees), even if their visual acuity is normal. These individuals have tunnel vision.

The legal definition of blindness, as established by federal law in 1935 (Kuestler, 1976), is an arbitrary clinical measure that is used to determine eligibility for special government allowances, such as an extra income tax deduction, specialized job training,

and eligibility for certain support services such as Talking Book Program. Many state, local, and private agencies also use legal blindness as their eligibility requirement. A person who is legally blind may have a great deal of useful vision: The legal definition of blindness is imply an eligibility standard; it does not provide meaningful information about the way in which a person experiences and learns about the world (Huebner, 2000).

How a person experiences and learns about the world is however, at the core of the definition of visual impairment in the Individuals with Disabilities Education Act (IDEA). IDEA defines visual disability (including blindness) as "an impairment in vision that, even with correction, adversely affects a child's educational performance. The term includes both partial sight and blindness." Key to this definition is that the student has some kind of disorder of the visual system that interferes with learning.

Student with visual impairments represent a wide range of visual abilities. Educators classify these students by their ability to use their vision of their tendency or need to use tactile means for learning (Lewis & Allman, 2000b).

Low vision: describes individuals who can generally read print, although they may depend on optical aids, such as magnifying lenses, to see better. A few read both and print; all rely primarily on vision for learning. Individuals with low vision may or may not be legally blind.

Functionally blind: describes individuals who typically use for efficient reading and writing. They may rely on their ability to use functional vision for other tasks, such as moving through the environment or sorting items by color. Thus, they use their limited vision to supplement the combination of tactual and auditory learning methods.

Totally blind: describes those individuals who do not receive meaningful input through the visual sense. These individuals use tactual and auditory means to learn about their environment. Generally, they are able to read.

These broad categories are only minimally useful. Every individuals with visual impairment uses differently and in a way that is difficult to predict.

2.2 The Characteristics of Persons with Visual Impairments

Individuals with visual impairments are, of course, individuals first; therefore, the array of their personality characteristics, intellectual abilities, educational aptitudes, and physical abilities is in general similar to that of the population as a whole. However, young children with limited vision may experience delays in certain areas of development.

Persons who either lose their vision or have severely restricted vision prior to age 5 have little remembered visual imagery on which to draw when learning, which affects the formation of certain concepts (Lowenfeld, 1980). In addition to the age of onset, the degree of the impairment and the presence of additional impairments affect the development of intellectual, physical, language, and social abilities. The degree of functional vision students have affects their use of visual information that can be used in conjunction with other sensory input in all areas of learning. The presence of such additional impairments as hearing loss, mental retardation, communication disorders, learning disabilities, or physical disorders further complicates the learning process for that individual. It has been suggested that more than one-half of all children with visual impairments, including those not yet old enough to attend school, have additional developmental handicaps (Gearheart, Mullen, & Gearheart, 1992).

The total development of an individual depends on a complex interaction of various domains: motor, cognitive, communicative, and social. At different ages or developmental stages one domain may dominate the others, but all are continuously present. Because of this complex interaction, it is misleading to discuss separately the effects of impaired vision on the development of the various domains and their relationship to learning. However, for the purpose of conveying the impact low vision or blindness can have on spatial awareness, we will consider "Motor" and "Cognitive" domains and the manner in which they may be affected.

Motor: Very young infants use sight to become aware of and develop interest in their environment. They observe, look at, and reach toward objects, developing neck muscles and head control; they later learn to creep or walk toward those objects that arouse their curiosity. Infants without sight or with severely restricted vision depend more on audible or tactile cues to stimulate their curiosity or arouse their interest. If parents and teachers are aware of the increased need for such stimulation and provide it, they can help develop early motor abilities. Nonetheless, young children with visual impairments usually lag somewhat behind their sighted peers in motor development (Ferrell, 1986; Fraiburg, 1977). Young children with vision disorders are also less aware of their position in the environment and their relationship to it, which inhibits their development in creeping, standing, and walking. Unless specific stimulation activities are provided, they may not adequately develop body awareness and physical coordination and will tend to move hesitantly in their environment.

Eye/hand coordination and fine motor muscles may also be slower to develop, resulting in a delayed mastery of eating utensils, buttons and zippers, and – later –

computers or writers. Early planned experiences can ameliorate the effects of reduced vision on these skills.

Congenitally blind children seem to be more susceptible to poor muscle tone, obesity, poor awareness of the body's position in space, and general lack of physical fitness. Factors such as these can lead to developmental problems with posture, overall coordination, and walking patterns (Hill, Rosen, Correa, & Langley, 1984). Perceptual-motor skills in relation to form identification, spatial relations, and perceptual-motor integration may also be compromised, especially in congenitally blind children. However, they may be as skilled as their sighted peers in areas more dependent on other senses – such as in discrimination of weight, texture, and sound – if sufficient experiences have been provided. Millar (1981) suggests that such abilities may be developed and enhanced until the child's mental images are similar to those of sighted children. The belief that persons with visual disorders develop a "sixth sense" or have extraordinary sensory compensation has little validity. The skills that seem to be heightened or strengthened more likely reflect past training – for example, in listening or in paying more attention to cues that sighted persons regard as irrelevant (Telford & Sawrey, 1981).

The establishment of one's position in space and position relative to other objects in the environment- and mobility – self-generated movement from one fixed position to another in the environment – are both delayed, but these skills can be learned by individuals with visual disorders. Orientation is a continuous process. For example, as we begin to move from one place to another, we visually scan the environment with little conscious awareness. We may note a table obstructing our path to the door, the width of

the door relative to our body size, the steps down from the door, the width of the space between the porch railings near the steps, and similar factors. As each step is taken we reestablish our position in relation to those factors. Once they are passed, they are no longer of concern. In contrast, if we travel from the porch to the street, we may encounter moving objects such as neighborhood pets, automobilies, or other persons, and we must assess their position relative to us after each step. This is why we say that orientation to the environment is continuous.

Self-generated movement occurs simultaneously with orientation but requires additional skills. Proper heel-and-toe gait, control of the body's center of gravity, and upright posture are some of the skills exercised in locomotion or mobility. The combination of orientation and mobility allows an individual to move about independently; these skills must be learned by individuals with vision disorders.

Cognitive: Cognitive development includes the formation of concepts, objects permanence, cause and effect, spatial relationships, classification, and conservation. According to Tuttle (1984), blindness itself does not impair an individual's ability to intellectually manipulate sensory information and develop conceptual information, but rather is the result of impoverished interaction with the environment, which decreases the amount of sensory data received. Vision plays an important role in cognitive development that cannot be fully compensated for by hearing or touch. Concepts related to distance or height beyond arm's length are difficult to develop without sight. Hearing may provide some clues to location such as the distance of an approaching car, but the various sizes and shapes of cars, trucks, and vans cannot be fully developed without sight. Vision allows for the perception of the whole: the total car, van, or truck, its

various parts (sunroof, wheels, bumper, hood ornament), and the relationship of the parts to each other as well as to whole.

2.3 The Possible Explanations of The Reason Why People with Blindness Lack Spatial Awareness

Youngsters with visually impairment share the same delight in, and have the same need to, use movement freely and imaginatively as do their sighted peers. Without movement, the child's world is limited to the length of their arms (Leong, 1996). To travel efficiently, the individual needs proper spatial and body awareness. However, children with visually impairments have a greater need for assistance in developing body and spatial awareness, "since they cannot imitate through seeing what others do and must have a safe environment in order to experience free and vigorous action" (Duggar, 1968, p.29). Research on the development of spatial cognition in blind preschoolers has also been limited. Hapemans (1967), Hill (1983, 1986), and Hill and Blash (1981) noted that blind preschoolers may have difficulty acquiring body image, understanding spatial concepts, and learning about the environment because of their limited experience with the environment.

Hill (1980) also says that vision is an important perceptual system in developing awareness of objects and one's own body, including its parts, relationships, movements, and functions. Besides that, it has been estimated that as much as 60 percent of the information presented to humans arrives through the visual pathway (Zeevi & Kronauer, 1975) and as much as 50 percent of the nerve fibers entering the brain originate in the eyes (Weiskrantz, 1972). Another possible explanation for the lack of spatial awareness is that congenitally blind subjects do not have visual imagery, while sighted subjects do have and use visual imagery (Drever, 1955; Mckinney, 1964). The presumed use of

visual imagery by the sighted can therefore be implicated as the critical factor responsible for the superior performance of sighted subjects relative to congenitally blind subjects on a variety of spatial tasks (Marmor & Zaback, 1976; Millar, 1975; Worchel, 1951).

Furthermore, Garry and Ascarelli (1969) found that children with visually impairments seemed to be unaware of, or at least unconcerned about, the upright position and the top, bottom, left, right, and back of objects. That is, with position, both relative and absolute.

Therefore, they claim that body image and spatial awareness must be specifically taught to the children with visual impairments.

2.4 The Importance of Having Proper Body Image

Several investigators have reported attempts to produce better body image through training. Turner and Siegel (1969) described the use of a life-size mannequin for training and implied some success in its use, although no objective evaluation of improvement of body image was reported. Walker (1973) presented a structured set of lessons in body image training to groups of kindergarten and early elementary grade blind children. The body image test developed by Cratty and Sams (1968) was used for evaluation. The results for the kindergarten children indicated that the program was effective in improving the body-image of kindergarten-age blind children (Walker, 1973).

Cratty and Sams (1968) presented perhaps the best justification for body image training, arguing that a well developed body image forms a basis from which the child can learn to structure external of space. In other words, body image can become an effective basis for the development of good spatial relations abilities.

2.5 The Effects of the Deficiency of Body Image and Spatial Awareness

The deficiency of body image and spatial awareness can also result in motor development delay of visually impaired child.

Several investigators have studied the acquisition of motor and spatial abilities in the first year of blind children's lives. The motor development of blind infants in the first few months of life is not very different from that of the sighted infants. However, Ferrell (1986), Fraiberg (1977), and Griffin (1981), pointed out some problems in the development of postural control and body rotations in blind infants. In later motor development, differences between blind and sighted infants are important; The locomotor abilities of visually impaired infants- creeping, crawling, and walking – are considerably delayed (Ferrell, 1986; Fraiberg, 1977; Griffin, 1981; Norris, Spauliding, & Brodie, 1957). For example, Fraiberg found that her subjects crawled at an average age of 13 months and walked at an average age of 19months. In addition, studies have found that congenitally blind children and adults are deficient in particular areas of motor development. For example, blind individuals scored significantly below sighted norms in various tests that require balance (Myler, 1936).

Duehl (1979) noted that visually impaired persons have problems in balance, compared to sighted individuals, and indicated that weakness in the development of large-muscle control and balance results in poor body posture, gait and locomotion, as well as a lack of coordination. In addition, it has been also observed that young blind children have motor problems, such as the lack or trunk and pelvic rotation, use of shuffling gait patterns, limited arm swing, dependence on a wide base of support for stability (Adelson & Fraiberg, 1976; Anthony & Gense, 1987; C. Brown & Bour, 1986; Campbell, 1970; Cratty, 1971; Eichorn & Vigaroso, 1967; Warren, 1976).

2.6 Comparison of Body Image and Spatial Awareness Between Persons with Visual Impairments and Sighted Persons

It is more evident that the visually impaired children have the deficiency of the proper body image and spatial awareness when we compare the spatial concepts ability of the visually impaired with the sighted. There are some studies, which try to show the difference in the spatial concepts of the blind and sighted people in order to estimate the effects of loss or absence of vision.

The studies of spatial mapping skills in blind and sighted persons are typically selected to show the difference. Bigelow (1991) reports 15-month study of the spatial mapping skills of totally blind, visually impaired, and normally sighted children. The children were asked to point to familiar locations in four areas in and around their homes. The blind children never mastered all the conditions; the visually impaired children mastered them, but one of them did so over a year after the sighted children did so; and sighted children easily mastered all the conditions. The results suggest that blindness interferes with the development of spatial knowledge in which Euclidean directions between locations are known.

There are also a number of studies comparing sighted and blind subjects on spatial tasks, sighted and late blind subjects have typically performed more accurately than congenitally blind subjects. For example, Rieser, Lockman, and Pick (1976) asked sighted, late blind, and congenitally blind adults to make comparative distance estimates among locations in a highly familiar large-scale environment. The three groups performed with equivalent accuracy when comparing functional distances. However, congenitally blind subjects were less accurate than the other two groups on direct distance estimates. In another study Casey (1978) found that congenitally blind young

adults were unable to construct a table-top model of their school campus as well as partially sighted students. Most of the congenitally blind subjects constructed separate, piecemeal sets of objects while partially sighted subjects constructed more holistic and organized models. (Herman, 1983)

Moreover, numerous studies have assessed the performance of spatial tasks among congenitally blind, adventitiously blind, and sighted persons. Cleaves and Royal (1979) asked subjects to learn a maze with right-angle turns by following it with their fingers and then to point directly from the start to locations within it (such as the goal or first turn), with the maze imagined either in its learned orientation or rotated. These researchers found that the congenitally blind subjects had a higher amount of spatial errors, and the degree of error was correlated with the duration of their blindness. However, Brambring (1976) discovered that congenitally blind subjects were less subject to distortions from feeling the legs of a right triangle, when estimating the length of the hypotenuse, than were sighted or adventitiously blind subjects. He concluded that persons who are congenitally blind clearly have spatial imagery. Whereas the studies just described dealt with knowledge about spatial layout that was not explored directly, Dodds and Clard-Carter (1983) found that their subjects who were congenitally blind were at a disadvantage even in replicating previous movements between vertices of a felt triangle, after a retention interval of several seconds.

2.7 Improving Awareness and Developing Visual Imagery for Persons with Visual Impairments

Several studies have indicated the ability of people who are blind to update the positions of felt objects after a change in the subjects' relative position or orientation. Heller and Kennedy (1990) used a version of the Piagetian three-mountain task, which

requires participants to identify or draw raised pictures of three objects from novel vantage points after having felt them from an initial location. They found that the congenitally blind subjects performed nearly as accurately as, although more slowly than, the sighted and adventitiously blind subjects. In an analogy to a locomotor task of Rieser, Guth, and Hill (1986) discussed later, Hollins and Kelly (1988) and Barber and Lederman (1988) had subjects learn the locations of objects on a table relative to one location and then point to them from a new location after imagined or real movement. If the position was updated during the real movement, the subjects' performance should have been better than with the imagined one. Hollins and Kelley found that when asked to replace, rather than point to, objects after walking to the new location, the blind subjects had a substantial ability to update. Barber and Lederman asked congenitally blind; adventitiously blind; and blindfolded, sighted subjects to move their fingers to a new location and point from it or to imagine that they were pointing from the new location. They concluded that all three groups performed similarly and had fewer errors in the movement condition than in the imagination condition.

Blind individuals' imagery ability was assessed by Kerr (1983), using a variety of tasks devised for sighted subjects. With regard to "mental scanning" between locations after memorizing the layout on a tabletop, Kerr found a strong relation between distance and scanning time for both the blind and the sighted subjects, although the blind subjects were slower. Two other verbal tasks indicated strong evidence of imagery. First, like the sighted subjects, the blind subjects took less time to verify physical features in an image when the imagined object was large than when it was small. Second, in a recall task with object names, the blind subjects had higher cued recall when they initially imagined the

cue and target objects to be spatially contiguous; in this task, the blind and sighted subjects' levels of recall were similar, although the latter reported forming the images faster.

Although it is common to find that blind subjects perform more slowly or at a higher error rate than do sighted subjects on tabletop tasks, blind subjects show patterns that are indicative of spatial understanding and imagery capability on a wide range of tasks. Passini, Proulx, and Rainville (1990) observed that their congenitally blind subjects outperformed their sighted and adventitiously blind subjects on wayfinding tasks in a labyrinthian layout. Landau, Spelke, and Gleitman (1984) reported that a congenitally blind child could take shortcuts between familiar locations within a room.

Even though it is hard to develop proper spatial awareness for visually impaired and blind people, there are still some possibilities. In other words, in the cases of the blind, greater difficulty would be experienced in acquiring the needed information, but it may be possible to develop a holistic conceptualization of a space if the proper training techniques have been used (Casey, 1978).

Landau, Gleitman, and Spelke (1981, 1985) conducted longitudinal research on the development of spatial cognition in a blind girl. From age 3 to 4, the girl had acquired adequate perceptual control over her locomotion and began to demonstrate important spatial abilities. Several mobility studies have in fact shown that the blind may have adequate spatial abilities. Leonard & Newman (1967) found that the blind boys could follow a two detour problems en route. Clearly the blind matched ordinary criteria for spatial orientation abilities and the difficulties which they may sometimes have in spatial perception and orientation may be due to a lack of adequate experience rather than to a

lack of vision. Support for the experiential hypothesis comes from Gomulicki's (1961) study of sighted and blind children in the age range 5-15years using both a stylus and a life-size maze. Though performance in both mazes was initially inferior in the blind, they had surpassed the sighted level of performance by 15 years. If the blind develop spatial orientation skills more slowly than the sighted, there is no evidence that they cannot develop such skills (Jones, 1975).

Ochaita and Huertas'(1993) study also shows the evidence, which the people with visual impairments can improve their spatial awareness. They tested the ability of 17year olds with visual impairments to learn a route between seven landmarks placed in a public square. The participants were given one guided experience along the route and then three or four trials in which they walked the route on their own. At the end of the trials, they were asked to make a scale model of the layout of the landmarks and give verbal estimates of the distances between them. The participants were accurate at making the model and estimating the distances. This finding suggests that visually impaired adolescents are capable of learning a route and its configuration after several repeated trials.

Espinosa, Ungar, Ochaita, Blades, and Spencer (1998) conducted two studies of route learning in real environments. In one study, visually impaired adults walked 1.2km route through an unfamiliar suburban area. After one guided experience, they had two trials in which they walked the route on their own, and the number of times they deviated from the route was noted. By the second trial, the participants' performance was very good, with less than one error per route. In the second study, Espinosa et al. (1998) asked visually impaired adults to walk a 2km route through the Madrid city center. The

participants had one guided experience of the route and then retraced it on their own in three subsequent trials. By the last trial, they made only two deviations from the route. The studies by Ochaita and Huertas (1993) and Espinosa et al. (1998) showed that visually impaired participants can learn routes through real environments effectively.

Another study was conducted by Passini and Proulx (1988) compared how totally blind and sighted people learned a 250-meter route along corridors on two floors of a university building. The participants given two guided experiences along the route and then walked it on their own. Overall, the totally blind group made four times as many errors and hesitations as did the sighted group when walking the route on their own. Nevertheless, a third of them retraced the route without error, and a third was able to make a completely accurate map of the route. This finding indicates that some people who are totally blind can learn routes in large environments as effectively as can sighted people. However, the participants in Passini and Proulx's study retraced the route only once on their own, so they had no opportunity for further learning. These studies all suggest that route learning by visually impaired people in large environments can be effective, but as was pointed out, there are limitations to all the studies.

To overcome these limitations, the authors conducted two studies of route learning in which the performance of visually impaired groups was compared to a control group of sighted participants over several learning trials. The first study (Jacobson, Kitchin, Garling, Golledge, & Blades, 1998) was carried out in Belfast, Ireland, where groups of participants who were totally blind or sighted or had low vision learned a novel 1.6km route that included up to 16choice points (e.g., left turns, and road crossings). The participants were guided along the route once by the experimenter. During the course of

this guided experience, they were not given any information about the route or advice about how to learn it. They were just told that they would be expected to retrace the route another three times on their own. These were the three trials. During each trial, the participants' accuracy at each choice point was noted. And the participants' knowledge of the route was tested by asking them to point between places on the route, give a verbal description of it, and make a "model" of the route using magnetic pieces on a metal board. The study found that the participants who were blind or had low vision took slightly longer than the sighted participants to learn the routes, but by the third trial, all the groups could retrace the route almost without error. Furthermore, by the third trial, there was no difference in accuracy between the performance of the sighted and the two visually impaired groups on any of the three spatial tests (verbalizing, pointing, or modeling).

In the second study (Golledge, Jacobson, Kitchin, & Blades, 2000), the authors repeated the procedure of the Belfast experiment in Santa Barbara, California, and the pattern of results in Santa Barbara was the same as was found in Belfast. They therefore concluded that in real-world contexts, people who are visually impaired can learn novel environments quickly and effectively and that they need only one or two additional experiences (more than sighted people) to acquire sufficient route information for independent travel. The findings of Jacobson et al. (1998) and Golledge et al. (2000) support the results of Ochita and Huertas (1993) and Espinosa et al. (1998) that people who are visually impaired can learn routes successfully.

Therefore, the reason why the totally blind participants in Passini and Proulx's (1988) study did not perform as well (compared to the sighted participants) as did the

visually impaired participants is perhaps because the participants in Passini and Proulx's study were given only one trial on their own. As the authors found, participants who are visually impaired may require one or two additional trials to reach the same level as do sighted people. Nonetheless, the authors emphasize that only a small amount of additional experience is needed and that visually impaired people have the potential to learn new environments quickly.

2.8 The Relationship between the Cognitive Mapping Skill and the Spatial Awareness

Although very little effort has been directed toward developing a theoretical framework for using and interpreting cognitive maps, the environmental mapping exercise appears to be one which is capable of providing a great deal of information about the spatial constructs and abilities of blind individuals. Cognitive mapping involves knowing the spatial relations among objects or landmarks and one's position in space in relation to the relevant objects or landmarks (Bigelow, 1991). The current philosophy in the field of environmental cognition contends that human spatial behavior is largely a function of the nature and quality of the internal cognitive map used by the individual (Downs & Stea, 1977). Cognitive mapping abilities may therefore serve as reliable predictors of spatial behavior. Those individuals capable of producing an accurate and well-organized map of a large environmental setting might be expected to have superior orientation in that environment (Casey, 1978).

2.9 The Importance of Developing Spatial Awareness of the Persons with Visual Impairments

It is necessary for visually impaired and blind people to develop proper spatial awareness enhancing their quality of life since they can have freedom of movement and the ability to move with confidence (Chin, 1988). There are several benefits they can get

from improved mobility. Mobility means movement within and between environments. Mobility within environments refers to a person moving about in one environment, such as a school, workplace, home, store, or other public area. Mobility between environment s refers to a person moving from one environment to another, such as from home to school, work, or a shopping center. Increasing a student's mobility within the environment increases the likelihood that he or she will achieve successful educational outcomes. The student's ability to maneuver about and locate specific areas within an environment increases the student's competencies and independence in that particular setting, improving the chances that the student will be successful there (McGregor, 1995).

Attention to student mobility is an important educational goal for a second reason. Increasing mobility between environments has a positive effect on student self-determination. The ability to make choices that are meaningful is self-determination. Research over the past two decades indicates that individuals, disabled or not, tend to participate more in and receive greater benefit from activities in which they exercise choice and control. Dattilo and Rusch (1985) found that students with disabilities engaged in a leisure activity more when given the choice of participation than when the choice was eliminated.

Then, how does mobility increase self-determination? In a study of self-determined adults with disabilities conducted by West, et al. (1995), availability of transportation and independent mobility in the community were major factors in promoting self-determination. Having a means of accessing different environments increased individuals' range of options for work, socialization, recreation, and housing.

As they approach the transition to adult life, students who are dependent on family or social service agencies for transportation will be functionally limited in the jobs and housing options that are available to them, as well as the friends with whom they can socialize and the types of social, community, and recreational outlets they can enjoy as adults.

In a conclusion, as children who are blind begin to master the environment and adequately move within it, they often grow cognitively and physically. Their motivation to move and explore further increases; their greater motivation, in turn, ensures the continued expansion of their learning, control, and independence (Galloway, 1981). Therefore, they must be free to explore and experiment within the environment.

CHAPTER 3
MATERIALS AND METHODS

3.1 Participant

The participant of the study is a male who is 50 years old. He has total blindness, which means an inability to recognize a strong light shown directly into the eye. Interview participant also consented to reading their transcribed interviews for accuracy. Though not required for participation, he was asked if he would participate in the review of data analysis drafts to strengthen the credibility of the research findings.These observations served as a means to triangulate data and increase the credibility of the research findings. A University of Florida Institutional Review Board (IRB) approved consent form was signed by the participant to obtain permission for observation.

3.2 Materials

An interview guide of questions was used by the researcher (Appendix A). Because a semi-structured interview format was used, this interview guide serves as a basic checklist during the interview to make sure that all relevant topics are covered. By nature of the qualitative interview process, participant responses lead to further, spontaneous questions of inquiry or clarification that were not specified on the guide. A tape recorder was used to record the entire interview process.

3.3 Procedure

3.3.1 Wayfinding Skill Task

the way finding was designed based on a previous study titled, “The effect of spatial tasks on visually impaired peoples’ wayfinding abilities.” This instrument was

administered before and after the aquatic program to determine if there were any changes in the spatial awareness of the participant. The route was designed through the campus of the University of Florida, and it followed a path between several buildings.

The participant was guided along the route solely by verbal instructions, then he is guided back to the start of the route and asked to retrace the route by himself. The researcher would follow him to maintain his safety.

While walking the route the experimenter made notes about the location and the type of the errors made by the participants for each segments of the route (i.e., from Weimer Hall to the Infirmary building, from the Infirmary building to the Tower, from the Tower to the Weimer Hall). To code the errors, the experimenters identified 30 choice points along the route where the participants had to decide whether to go straight, to turn, or to stop. At each choice point, the participants' actions were classified in one of the four categories: Successful navigation (scored 1); a hesitation or deviation from the route that was self-corrected and followed by successful navigation (scored 2); a deviation from the route that needed guidance or reminder for successful navigation (scored 3); or being lost, when the participants said they were lost or failed to find their way after repeated guidance (scored 4). Thus, a higher score represented more errors and poorer performance.

3.3.2 Aquatic Program

The aquatic program was conducted twice per week, for eight weeks at the researcher's apartment pool. The time selected was decided based on a similarly titled "The effects of instruction in dance and movement on the spatial awareness." However, it was reduced since the participant in this study is an adult compared to children in dance movement study and it is expected that he can follow and learn the instruction during the

aquatic program more easily than children. The researcher was certified as an “Instructor of Adapted Aquatics,” as a “Teacher of Adapted Aquatics,” and as a “Water Safety Instructor.” A certified lifeguard accompanied every lesson for safety. The daily lesson plan was completed prior to beginning of the study by the investigator, each lesson lasts 50 minutes. Explicit verbal directions and physical assistance are accompanied all movements until the participant can totally understood them.

The aquatic program consisted of two parts. Several physical activities, which can help develop body image and spatial awareness, were administered to participant in the first part of the program. Basically, these activities were taken from the book, which is “Adapted Physical Activity, Recreation and Sport”(Claudine Sherrill, 1997) and “The Hill Performance Test of Selected Positional Concepts; since both were originally designed to test the spatial awareness of children with visual impairments, appropriate adaptations were made to account for the participant’s age. The second part of program consisted of teaching the actual swimming skills, i.e., “the modified free crawl”, and “the modified back crawl.”

Each skill was evaluated according to the performance standards, as described in the “Water Safety Instructor’s manual (WSI).”

There are two reasons why the researcher chose the aquatic program to improve spatial awareness. First of all, water allows for more freedom to perform the first part of the program, as the environments is safe and confined. Second, swimming can help increase body awareness and understanding of how body parts function. It is helpful in increasing awareness of both sides of the body and how they work together (laterality) and directionality (awareness of the body in relation to objects), and in increasing the

ability to cross the midline by making 90 degree turns while swimming prone, as described in *Adapted Aquatics Programming* by Lepore, Gayle, and Stevens (1998).

The researcher took the notes about the performance of the participant during the aquatic program and after the each session. In addition, semi-structured interviews were conducted with the participant after finishing all of the programs, which were the "Aquatic program" and "Wayfinding Skill Task". The quality of the data is rooted in the interviewer's accurate interpretation and understanding of the interviewee's words. It was necessary for the interviewer to frequently ask for clarification or expansion of the interviewee's responses in order to gain an accurate understanding.

3.4 Design

The research design of this study will be a holistic, single-case design (Patton, 1980) since this study represents a unique case, which is about the person who is blind and focuses on the global effect of the aquatic program.

3.5 Data Analysis

The results from the pre and post "Wayfinding Skill Task" tests were compared to each other, in the number of errors made while walking the route. Tape-recorded interviews were transcribed by the researcher and the participant was given a copy of his interview to review for accuracy. Hand written observational notes were rewritten more clearly for precision. Interview and observation data were analyzed using the constant comparative method of qualitative analysis (Glaser & Strauss, 1967). This method is determined "generate and plausibly suggest many categories, properties, and hypotheses about general problems" (Glaser & Strauss, 1967, p 104)

Using this constant comparative method, data were continually analyzed and reanalyzed for emerging conceptual categories, sub-components of categories, and

interrelationships of categories and concepts. A brief outline is provided below, but a description of this method is more fully detailed in Glaser and Strauss (1967) and Straus and Corbin (1998).

The first step of the constant comparative method is the breakdown of text into discrete areas of similar data concepts. These similar content areas are then grouped into categories. With each interview analysis, data is analyzed as to its fit into existing categories and also for the existence of new categories. If new categories are formed, previous interviews are reanalyzed for data fitting the new conceptual category. Second, categories are analyzed for various properties that are comprised within them. Data were reanalyzed for comparison of the incident to the properties within the category. This allows for the deeper inspection of motives or perspectives that give rise to the general categories.

In the analysis of data for this study, each interview was read line-by-line and tentative nodes (discrete categories) of data content were developed. Observational data transcripts were analyzed in the same manner as interview transcripts. As each interview was read, data was assessed and placed into existing categories, if appropriate, or new nodes were developed for data that did not fit existing nodes. The process of establishing data under existing nodes, establishing new nodes and reviewing previously coded interviews for newly developed nodes continued until all interviews had been coded. Once this phase had been completed, the nodes were analyzed and grouped together for similar content.

Once information was grouped under similar content categories, it was re-examined for broader thematic content. The similar content groups were then re-grouped together

under the appropriate thematic area. The data within each similar content area was then reanalyzed for fit within the theme.

Throughout the analysis process, each piece of supporting data within the nodes was constantly reexamined for fit and appropriateness within the node and similar content area where it is placed. Even in the last thematic stages of analysis, new concepts emerged from the data, requiring the researcher to start back at the beginning process of line-by-line inspection of each interview and working through the entire analysis process again.

As prescribed by Glaser and Strauss (1967) for this method of analysis, data were analyzed until saturation was reached. Saturation is the point at which data properties and categories have become rich with description and depth, and the addition of further data only serves to further illustrate what is already well established.

Final results of this research are presented within the framework of the four themes that emerged from the interview and observational data, which are body image, the hearing and tactual awareness, self-confidence, and spatial awareness.

Trustworthiness and Credibility: Two constructs of great importance in qualitative study are trustworthiness and credibility.

Trustworthiness: The first construct, trustworthiness, is the extent to which the researcher's interpretations correctly reflect the phenomenon being studied. Glesne and Peshkin (1992) point out that time is an essential factor in developing trustworthy research results. The more time a researcher spends in the environment being studied, the more opportunities there are to observe a wide range of interactions and events. It gives a broader view of the participant's world and the events that shape his or her perceptions and feelings.

Time spent with interview participants building relationships lends to more honest and comprehensive dialogue once the interview process has begun. Creating an interview atmosphere that is unrushed and relaxed allows participants to feel comfortable expanding on thoughts or ideas and fosters confidence that the interviewer is interested in what they have to share. Likewise, investment of time in the interview process helps to ensure that the interviewer is not ignoring possible topics for exploration or clarification for the sake of time constraints. In this study, participant was given copies of the interview format at least one week prior to his scheduled interview. This allowed him to think about the topics and formulate some of his thoughts prior to the interview.

The use of multiple data sources is another method of increasing the trustworthiness of research results. The utilization of more than one type of data collection is called "triangulation" (Glesne & Peshkin, 1992, p. 24). Triangulation methods were implemented in this research project by two ways. One is by the collection of data through interview as well as observations of participant and another one is by the collecting the data through some kind of qualitative methods with quantitative methods.

Credibility: The second construct of importance, credibility, is essentially the degree to which your research findings can be verified by some other means (Glesne & Peshkin, 1992). Steps to enhance credibility allows the researcher to avoid misconstrued research findings due to personal bias, assumptions, or simply misinterpreting data. To ensure credibility of this research project, the researcher employed the following methods suggested by Lincoln and Guba (1985):

Interview participant shared in the interpretive process on two levels. First, he reviewed his own interview transcripts for accuracy of content. Second, he was asked to review the final working draft of the research. As outlined by Glesne and Peshkin (1992),

the review of the drafts provides an opportunity for participants to "(1) verify that you have reflected the insider's perspectives; (2) inform you of sections that, if published, could be problematic for either personal or political reasons, and (3) help you to develop new ideas and interpretations." (p. 147)

CHAPTER 4
RESULTS AND DISCUSSION

The improvements in spatial awareness of people who are blind can not be easily isolated and addressed with only one point of view because spatial awareness of those persons seems to be a function of a interacting factors. Thus, multiple factors, which measure increased spatial awareness, such as the improvement of the cognitive mapping skill or the perception of the direction or the distance, are developed not only instinct, but by various kinds of physical and mental awareness. The factors contributing to the enhancement of spatial awareness appeared to develop out of primarily three realms: body image, the various kinds of awareness and the psychological aspect. Before we examine each category, it has to be acknowledged that the participant in this study already had a well-developed body image and spatial awareness, more than the researcher has expected.

4.1. Body Image

As it is defined before, the term body image is used in three ways. Therefore, the improvement of the body image has to be demonstrated according to each level.

4.1.1 First Meaning of the "Body Image"

First, Hapeman (1967) used the term to refer to a child's knowledge of his body parts and of the relationships among those parts (for example, the fingers are connected to the hand). Wherefore, in this study, the first part of the beginning sessions 1, 2 and 3 is designed to reinforce this level of body image by asking the participant to move various body parts in relationship to each other. It appeared that the participant already knew

where his body parts are placed and how they are related to each other from the very first lesson.

Lesson 1 (Appendix C).

- The participant responded perfectly to the instructions given for the first part of the session. It was apparent that he understood the relationship between the body parts and he was able to display good coordination.

- After performing the jelly fish float several times, he progressed to the next task, which was the "tuck float." Even though he seemed to understand how to do this task, it seemed a little clumsy because he could not hold the mid-shin tightly enough towards the chest. As he repeated doing the "tuck float," his body grew more adjusted and finally he accomplished doing the "tuck float" correctly.

Lesson 2. (Appendix C).

- First, he went through the first part of the session and he responds to all questions almost perfectly. What I want to see by doing this part today is whether he has an ability to move various body parts in relationship to each other to demonstrate positional concepts.

Lesson 3. (Appendix C).

- First, he went through the first part of the session and this part assesses the participant's ability to demonstrate the positional relationship between selected body parts and their movements. He also answered to all questions almost perfectly this time.

From these sessions, it became evident that the participant already has a well-developed perception of the first level body image, so he was next asked to complete the question, in various ways to train him in order to develop a more defined body image. This gave him more time to think about a different way to respond to the question, if there is more than one way, then he is to explain to me the different ways. As expected, he was also able to perform the required task in several ways.

Lesson 2. (Appendix C).

- The only question that he took his time answering was "Can you put your feet above your head?." First, he responded to my question by asking for physical assistance to support him for balance. Then, for his next attempts, he kicked his

foot forward high enough to be at head level. He was then asked to do this task in another way in the water and he responded quickly, apparently what he was being asked to do. He submerged his body, so he didn't have to kick his leg upward.

Lesson 3. (Appendix C).

- The only question he was asked him to try in another way was "Can you put your hands underneath your abdomen?" He responded to this question by placing his hands facing upward below the hip underneath the abdomen, in standing position. When he was asked him to accomplish this task in another way in the water, he floated on his chest and placed his hands underneath his abdomen.

As a result, the first level of body image training in the aquatic program was only able to reinforce this concept, but was not able to improve this ability significantly in this study. However, it is assumed that it is because of the maturity of the participant rather than the accountability of the program. This will be discussed later.

4.1.2 Second and Third Meanings of the "Body Image"

A second use of the term is as represented by Siegel and Murphy (1970), who defined body image as the mental "picture" one has of one's body in space. In addition, a third level of meaning is that Mills (1970) defined body image as a knowledge of body parts, how the parts relate to each other, how the parts may be utilized both individually and collectively for purposeful activity, and how the parts relate to the child's spatial environment." When the body image is used at these two levels, there is an improvement of this concept throughout the aquatic program. Originally, there was only one task the participant needed to accomplish, which was the "back crawl." However, the program had to be modified because of two reasons. First, it seemed too difficult to teach him how to float on his back in the first few sessions. Therefore, the researcher decided to have the participant to learn the "free crawl" (also referred to as the "free style" or "crawl stroke") in order to see if it is easier to teach him to float on his stomach rather than his back. Secondly, it became impossible for the participant to master the "free crawl" because he

was not able to use his arms freely due to an injury to his left shoulder. Finally, the researcher decided to teach the participant how to do the "free crawl" without the arm stroke and the "back crawl" without the arm stroke. Therefore, the progress will be shown according to each task.

4.1.2.1 "Free Crawl" without the arm stroke

It is required for the participant to master the "flutter kick," the "free crawl arm stroke," and the "breathing" skills in turn to perform the "free crawl" properly. It became clear that there was a gradual progression in mastering it. The participant was not only getting coordinated and adjusted to perform the task, he was also able to picture in his mind how to do it successfully. As a result, the following is a summary of the progress of the participant doing the "flutter kick," the "free crawl arm stroke," and the "breathing" skills he accomplished throughout the aquatic program.

"Flutter Kick": To begin, the participant's ability to do the "flutter kick" at the start of the program was that he had a tendency to move his lower body and also moving his legs in a bicycling motion, which are the skills expected to level 3 (Ref, WSI) in accomplishing the "free crawl kick." Next, after showing him how to use his legs, by demonstrating with the researcher's body as an example, he sill had a tendency to bend his legs too much, but no longer used his lower body. In analysis, his legs were working independently instead of together in a synchronized motion. After repeating this exercise several sessions, the participant gradually mastered the process.

Lesson 3. (Appendix C).

- Then, he was asked to learn how to do the "flutter kick." After it was explained to him, he was asked to try to do it on his own. He had a tendency to be moving his whole lower body while kicking. Therefore, his body was swaying side to side (laterally) and he was barely able to proceed swimming forward.

- After practicing the "flutter kick" several times, he no longer swayed side to side (laterally), but still, his legs were moved in a bicycling motion rather than up and down (vertically).

Lesson 4. (Appendix C).

- Next, he was asked to try to master the "flutter kick" by being explained of the problems that prevented him from doing it well. Then he began to practice the new instruction. As a result, he was using his legs wrong, whereby he was using his hips rather than his legs in a cycling motion. He explained he felt stiff and uncomfortable. Therefore, he was asked to feel the researcher's legs and notice how they moved when the skills were performed. After he examined these movements, he said that the kick seemed similar to a frog or a fish. It was probably helpful for him to picture how to kick more clearly because he could perform better after examining the motion of my feet. When he did the kick properly I had him remember what he did with his body, so he could repeat it again. He said that he was able to feel his body floating while he was kicking with slightly straightened legs in a mildly rapid motion, so he said he was not feeling tense anymore.

Lesson 5. (Appendix C).

- The session began by practicing the "flutter kick," but his performance showed that he was hot doing as well as he did previously. He bent the legs too much and moved them too slowly, which appeared that they were working independently instead of working together. Therefore, the kicking motion did not give him the necessary force to move forward.

- After correcting his mistake and practicing his kicks several times, it seemed that his body was appearing to adjust to the "flutter kick" properly whereby he was able to go forward efficiently and in a straight line without any supports.

Lesson 8-9. (Appendix C).

- When he appeared to accomplish kicking well holding onto the pool, he was then asked to hold onto the researcher's hands while trying to do the same the "flutter kick." In the process, he proceeded to move in a straight line. Next, he was asked to do the "flutter kick" with the kickboards. He had a tendency to move slightly diagonally approximately 60 degrees either to the right or left on different attempts doing the "flutter kick" with the kickboards. He was asked, "Why is it that you are going in a straight line when I am holding onto your hands and you appeared to go diagonally when you are holding onto the kickboards." He said, "When I am holding onto your hands and I am not concentrating on what I am feeling and I am focused on my leg movement whereby I am able to go forward. When I am holding onto the kickboards, I am preoccupied trying to feel and hold onto the kickboard rather than concentrating on my proper kick movement."

Lesson 10-11. (Appendix C).

- First, he was asked to use the kickboard to do the "flutter kick" by himself. His performance was good because his legs were working rhythmically along with proper speed and movement. Next, he was asked to repeat this exercise several times and he appeared like he was figuring out how to move his legs.

Lesson 12-13. (Appendix C).

- Afterwards, he was asked to do the "flutter kick" on his stomach in seeing how well he performs it. His body appeared to perform it rhythmically after practicing it twice. This was a great improvement in comparison with the past performances, thus revealing the difficulty of learning this in a very short period of time.

Lesson 14-16. (Appendix C).

- Next, he was asked how he feels now doing the "flutter kick." He explained that he now can feel the difference of the body and he can sense himself moving faster when using his legs correctly in deeper water.

As it shown, he was also able to move his legs continuously in a synchronized motion. These performances are required to level 6 (Ref. WSI), which is the final step to accomplish the "free crawl kick."

In a summary, the participant's performance in doing the "flutter kick" was progressed from level 3 to level 6.

"Free Crawl Arm Stroke" and "Breathing": In the beginning session, before learning about the participant's injured arm, his arm stroke was bending too much and having a tendency to drag on the surface when pulling back. Also, he had a tendency to move his upper body too much to the right or left when extending forward with the arm. These performances are expected to level 3 (Ref. WSI) in accomplishing the "free crawl arm stroke." After learning about his arm impairment, future session which used the arm were canceled and the lessons focused on how he could accomplish a modified sort of "free crawl," that is, performing the stroke with only the use of his legs.

For the breathing skill, the participant began the program with his tendency of moving his head side to side instead of rhythmically moving it to the right and then to the neutral position then to the left and then back to the neutral position. Next, after teaching the participant to use his head properly corresponding with his breathing, he improved using his head as directed, but still had a tendency to lift his head looking up facing forward when breathing. These performances are expected to level 3 (Ref. WSI) in accomplishing the "free crawl breathing skill." In the final sessions of aquatic program, he was no longer lift his head to breath and he was able to moving it rhythmically relating to kick, which is the required skill to level 6 (Ref. WSI).

Lesson 6. (Appendix C).

- First, he was asked to use only one arm stroking the water several times, then alternate the other arm repeating the motion in a "pitcher like" fashion. In the process of doing this motion, he had a tendency to bend his arm too much and drag it on the surface of the water when he brought it back to the original position.
- After practicing the strokes with the corrections added to them, he was able to use his arm almost successfully to achieve the stroke, but he still had a tendency to bring his arm back in the bent position.
- Afterwards, he was asked to perform the arm stroke without kicking. It became apparent that he had a tendency still to kick, which was what was expected. He said he just automatically did it because he tried to balance his body.

Lesson 7. (Appendix C).

- In analysis, he showed that he was able to picture the arm stroke and head motion to the one coordinated movement, he illustrated good improvement in comparison the way he had performed before by using his head and arms randomly and uncoordinated.

Lesson 8-9. (Appendix C).

- On further analysis, it was clear that he had a tendency to move his head side to side, omitting his head from being in the neutral position. Therefore, the practices began to emphasize the arm stroke and rhythmical breathing, with appropriately coordinated head movement.

- First, he was asked to hold the researcher's hands while his rhythmical breathing was carefully observed (by the researcher). He had a tendency to raise his head a little too high looking forward while he is moving his head side to side. Then he was asked to do the breathing technique with the kickboard. He moved in a straight line only when he moved his head side to side, but when he raised his head looking forward while he is moving his head side to side, he had a tendency move forward diagonally. Therefore, he was asked to concentrate on keeping his head close to the water moving his head side to side, not looking forward so that he may feel confident that he is swimming in a straight line not fearing any longer that he is moving diagonally. This seemed to help him improve his performance.

4.1.2.2 "Back Crawl" without the arm stroke

There is a significant progression in doing the "back crawl" because the participant was not able to float on his back at the start of the program. The most challenging task for the researcher was to teach the participant to float on his back, which was the required skill to level 1 (Ref. WSI), which is the first step to accomplish the "back crawl." In addition, the main problem in performing this task was the participant's psychological fear of drowning, which will be discussed later. The participant in the early session was not able to accomplish the performance of the "supine-float" properly because of the fear of drowning. Later in the session, after he had mastered the "flutter kick," he was asked once again do the "supine-float." He learned how to regulate his breathing while on his back and was able to position and control his body well enough to stay afloat, while breathing in proper rhythm. As the sessions progressed, he learned how to master his ability to float according to his breathing and his ability to kick on his back.

In other words, he was able to master the skill expected to level 6 (Ref. WSI), which is the final step to accomplish the "back crawl."

Lesson 2. (Appendix C).

- At this time, he was not able to perform the "supine float" without kicking, which meant he could not position his body to stay afloat independently (without kicking).

Lesson 4. (Appendix C).

- Still, whenever he turned on his back, his body appeared to sink just as it did before.

Lesson 8-9. (Appendix C).

- But with practice, he could now successfully accomplish the "supine float," without any physical support, or kicking. He was then asked to demonstrate the "supine float" several times for practice. In analysis, he appeared to float better when he was holding his breath, but when he tried to breathe he had a tendency to sink. Thus, he was next asked to try to learn how to do shallow breathing to better control his body to stay afloat.

Lesson 10-11. (Appendix C).

- When he tried the "supine float" again, and to breathe normally, he was getting better in regulating his breathing and staying afloat on his back. Finally, with more practice, he succeeded in mastering the "supine float." When he tried the "supine float" again, and to breathe normally, he was getting better in regulating his body to stay afloat according to the breathe.

- Thus, it was determined that he was ready to learn the next stage of the " supine float." So, he was then asked to do the supine float again, but this time by using his legs just as in the flutter kick, and try to move in a straight line. While in the process of performing this, it became clear that he had a tendency to bend his legs too much in a bicycling motion causing him to move in a circular direction.

- As he was doing the supine float, he gradually was regulating his breathing and trying to kick just as in the flutter kick, but his legs were still moving in a bicycling motion and his body moving in a circular direction.

Lesson 12-13. (Appendix C).

- He practiced the "supine float" again, and this time with kicking. Before beginning, he was instructed on how to kick properly. When he was doing the "supine float" with the kick, he was able to keep his body afloat with the force of kicking. He appeared to figure out on his own how to use his legs while on his back, whereby he not only kept his body afloat, but he was able to move in a straight line. This was a great improvement compared to the last session because he no longer has a tendency to move in a diagonal direction.

Lesson 14-16. (Appendix C).

- Moreover, it seemed that not only was he able to control his breathing, but also, his kicking motion was becoming more rhythmical and coordinated. In addition, his improvement was evidenced by the fact that he no longer took time preparing to float on his back before kicking; now he was able to instantly go on his back begin kicking and proceed forward in a straight line. He said that he found out that he can breathe somewhat normally because he could keep his body afloat on his back when he was kicking.

In conclusion, the body image of a person who is blind was strengthened after the aquatic program by achieving all the tasks required (which were the modified "free crawl" and the modified "back crawl") successfully.

4.2 Hearing Awareness and Tactual Awareness

The hearing awareness and the tactual awareness for the blind person to be aware of the world while moving around in it are just as important as vision is to the sighted person.

4.2.1 Importance of the Hearing Awareness

In this study, the participant spoke often throughout the aquatic program about the importance of the hearing awareness in order for him to move around in the pool using some medium, such as the instructor's voice as a reference.

Lesson 12 -13. (Appendix C).

- The participant said he needed my voice as a point of reference in order for him to proceed in the desired direction perfectly. For example, he asked the researcher to speak while he was in the process of turning so he could gauge his direction according to the position of my voice.

- At the end of the session, the participant mentioned that his sense of direction was impaired by the use of using ear plugs because of his ear infection. He said that he could have made his degree movements better and paid more attention to what is around him if he did not have to use ear-plugs. The reason for this is that he said he uses as point of reference the nature around him, and the air pressure, to inform him of objects near to him. However, the only point of reference he could use at this time was my voice.

Lesson 14 -16. (Appendix C).

- In the last aquatic session with the participant, he began by repeating navigation directions just as in the last session. Indeed, in comparison to the previous session, he responded to all questions more accurately, and evidently he was able to use his senses more efficiently because there were no other people in the pool creating distractions.

4.2.2 Change in Hearing Awareness

In addition, he also emphasized changes in his hearing awareness throughout the aquatic program. For instance, he had to go into a meditated state to tune himself to being aware of his surroundings, such as listening to the birds, wind blowing the trees, and the people nearby. As the session progressed, the participant stated that the water allowed him to be in a more calm state and gradually he was more a tuned to the sounds of movements of his body in the water and the ability to be aware of the direction while navigating in the water.

Lesson 1. (Appendix C).

- He performed the "jellyfish float" exactly the way it was directed and he did it in a relaxed manner. He also held his breath for about a minute, he said that he was meditating and listening the surroundings and in the process doing this, his awareness became more open.

  Question: "Has any type of awareness improved through the aquatic program? If so,how?"

  Answer: "I had noticed only the hearing awareness improved. The awareness that I felt is like a comfortable, relaxing feeling. If you are floating in the water, you have nothing holding you down, so what happened is that you allowed all your senses to function. I mean, you got used to paying more attention to the sounds around you, such as the distant sounds, nearby sounds, and the things that normally you may not pay attention to before the aquatic program."

To summarize, it appeared that only hearing awareness improved through the aquatic program, in comparison with tactual ability.

4.3 Self-Confidence

Generally speaking, it is believed that the persons who are blind have a difficulty moving around in their surrounding because of their lack of self-confidence in their physical abilities. Apparently, the reason why the blind person does not have the self-confidence in moving around in their surroundings is that they have limited opportunity to move around while growing up because of the overprotection of their parents or the fear of being physically injured.

In this study, the difference in this ability can be seen by observing the progress in doing the "back crawl." As was mentioned before, the participant had a hard time floating on his back in the early sessions because of the fear of drowning. However, as a result of the progress achieved during all of the sessions in learning and practicing the "back crawl," the participant's self-confidence improved each time to the point that he was not only able to perform the skill, but he was also able go into the back crawl instinctively, no longer fearing that he will sink and drown.

Lesson 2. (Appendix C).

- At first, the participant could not perform the task, thus, his body could not stay up, rather it was sinking. Even though his back was supported, his body still felt very tense. So, he was asked to try to relax his body and he replied he was relaxed. After repeating the "supine float" several times, he said he has a difficulty relaxing his muscles even though he believed he was relaxed. He stated that it may be because of his insecurity of not being able to see himself floating on his back. What was interesting about this session was that he felt insecure only when he was doing this new skill, the "supine float."

Lesson 3. (Appendix C).

- Despite his back being supported, his body was still very tense.
- After repeating the supine float several times, he said he had difficulty relaxing his muscles even though he believed he was relaxed. He stated, as before, that it may be because of his insecurity of not be able to see himself floating on his back.

Lesson 8-9. (Appendix C).

- He was next asked how he was able to successfully to float on his back while holding his breath, yet not be able to do so when was breathing. He answered, "When I am holding my breath I am not fearful of having water get into my nose and I can concentrate better on feeling my body float, but when I am breathing I can feel my body sinking and I am in fear of the water getting into my nose and mouth and possibly feeling like I am going to drown."

Lesson 10-11. (Appendix C).

- Afterward, I asked him to do the "supine float." It was evident that he was no longer reluctant to do the "supine float," despite the fact that in the recent past, he was hesitant of doing it because of his fear of the drowning. When he tried the "supine float" again, and breathe normally, he was getting better in regulating his breathing while staying afloat on his back. Finally, he had succeeded in mastering the "supine float."

- Afterwards, he proceed to do the supine float again, this time he asked me not to support his back because he can not concentrate on balancing his body with self-confidence for the reason he is focused on the reliance of my hands. Therefore, he said he would rather do it on his own by disciplining his body in obeying his will.

Lesson14 -16. (Appendix C).

- At this point, after explaining to the participant how he improved going in a straight line straightening the directions of his body, he stated that he felt more confident in regulating the different position of the body in the water.

- He also said that it is not like in the earlier session, which was that he was more focused on survival because he may end up drowning.

  Question: "How is your self-confidence improved not only in the water, but also in daily life after the aquatic program?"

  Answer: "My self-confidence has really only improved in the water rather than outside of it. I mean, that I had to be consistently aware of my body and how it reacted in the water until it became instinctive. After the aquatic program my self-confidence improved dramatically because now, I know what's happening with my body and how I can use it in the water."

However, there was no distinct difference in self-confidence to move around on land because the participant was already accustomed to move around on land near his house or campus.

> Question: "How is your self-confidence improved not only in the water but also in daily life after the aquatic program?"
>
> Answer: "It doesn't make any difference on the ground because I already have several years of survival ability. In other words, I already have enough experience in going to different places around here."

In conclusion, there has been a significant improvement in the participant's self-confidence to move around in the water environment after completing the aquatic program.

4.4 Spatial Awareness

As was defined before, spatial awareness is the internalization of our own location in space as well as object localization (Martin, 2000). If we see this term more in detail, the spatial awareness refers to the ability to work within one's own space and the ability to organize people and objects in relation to one's own body.

4.4.1 First Part of Session from Lesson 4-16

In this study, the first part of the sessions from Lessons 4 to 16 were designed to reinforce this concept (i.e., spatial awareness) by asking the participant to move his body in relationship to the objects or to move each object in relationship to each other. It appears that the participant could demonstrate proper positional concepts of his body and the relationship to the objects in the space from the beginning of the program. In the beginning of the program, the participant stated that he had to visualize what he was asked to do with positioning the objects. Later, he said he no longer needed to visualize it because he knew what was expected of him, therefore he was positioning the objects instinctively without taking any time to think or visualize.

Lesson 4. (Appendix C).

- In the first part of the session, he was asked to change his position in relationship to mine to see whether he has an ability to move the body in relationship to the objects. He also responded perfectly to all the questions that were posed to him.

Lesson 5. (Appendix C).

- The first part of the session started with him using the rubber tube. Basically, he was asked him to position the rubber tube in particular direction in order to see whether he could demonstrate positional concepts by moving the body in relationship to the objects. He accomplished all the tasks perfectly, so he moved onto the second part of the session.

Lesson 6. (Appendix C).

- In the first part of the session, he was given a rubber tube and he was asked him to move himself in relation with the tubes. He moved around the tubes freely without being confused moving to either the right or the left side of the tube and placing it in position properly as requested.

Lesson 7. (Appendix C).

- Next, he was asked to take two tubes, one large and one small, and place each of them on the one side of him and the other tube on the other side. This was done in order to evaluate how he coordinate and determine two different sizes of tubes and having them being positioned in certain ways to see if he distinguish which tube is furthest from him or closest to him. He responded to all of these instructions perfectly.

Lesson 8-9. (Appendix C).

- The session began by analyzing his coordination with three objects, the ball, the rubber tube, and the rubber kickboards. He was asked to examine and compare the objects with each other by having him place them in different orders of position. Upon analysis he was well coordinated and recognized and placed the objects as he was asked to do.

Lesson 12-13. (Appendix C).

- This session began by testing the participant's awareness and coordination of moving his body in the directions that were specified in terms of the degrees rather than turn in the direction of left or right. He was tested on turning left or right 90 degrees, 180 degrees, 270 degrees, 360 degrees. He responded to all the questions perfectly. It was assumed that he had no confusion about the direction and has pretty good instincts about the turning a certain degree specified.

4.4.2 Second Part of the Session from 8-16

In addition, the second part of the sessions from lessons 8 to 16 were also designed to enhance the spatial awareness by asking the participant to proceed a certain distance and to change the direction. First, the participant had a tendency to proceed in a diagonal direction rather than in a straight line at the beginning, but it was gradually getting better each consecutive session, and at the end of the program he had successfully proceeded in a straight line. Secondly, the participant was able to measure the distance fairly accurately, but he had a difficulty to change the direction in a certain degree because he has a tendency to go either below or above the degree that I had requested.

Lesson 8-9. (Appendix C).

- Next, the participant was asked to do the flutter kick on his own and stop when he thought he had traveled 3meters. When he was done, he was asked how far does he think he went. He said he was not sure, but he thought he might have gone about 2meters. He as told he was correct. This exercise was repeated several times having him swim at different distances. Each time he evaluated the distances that he swam fairly accurately. He was then asked how it was that he knew so well how far he had swam. He answered, "I only use my instincts on how far I believe that I have gone, otherwise, I really do not know." He also explained that he used his own idea of 'clocking' clock how rapidly and how many times, he was using his legs, so this way, he could use his instincts and judgments simultaneously.

Lesson 12-13. (Appendix C).

- He as asked to do the "flutter kick" on his stomach, testing him on distances and directions. For example, my direction was going 2meters one way, and doing a 90degree right turn, and then proceed another 2meters. ON each test, the distance, degrees and direction were modified in order to evaluate his instinctive awareness. Also, this was done to see if this would help to improve his supine float performance.

- Upon evaluation, he was pretty accurate at measuring the distance, but did not do very well in gauging the degrees.

Lesson 14-16. (Appendix C).

- Next, he was asked to do the "flutter kick" but without the kickboard, practicing doing the distances, degrees, and the directions. Upon evaluation, he went either

beyond, or below, the degrees that he was requested to make. For example, when he was asked to turn 90 degrees, he turned 70, 80 or 100 degrees.

- Afterward, he tried the direction and the distance exercise while performing the "flutter kick" on his back. He accomplished this task pretty well even though it was the first time that he tried it.

4.4.3 Wayfinding Skill Task

The purpose of the way finding was to compare the participant's performance in completing this task pre and post to the aquatic program, in order to see if there was a difference measuring the distance and changing the direction. (Tables 1-2)

Table 4-1: Number of errors made in completing the way finding before the aquatic program

	The first segment	The second segment	The third segment
Score 1	7	9	7
Score 2		2	4
Score 3			1
Score 4			
Total Score	7	13	18
Total Choices	7	11	12
Mean Score	1	1.18	1.5

The mean error score for each segment was calculated. As is shown, there was no significant difference in the mean error scores between two trials. However, the participant became more accurate in carrying out the task after the aquatic program because the mean error score was close to 1 (reflecting accurate performance at most

Table 4-2: Number of errors made in completing the way finding after the aquatic program

	The first segment	The second segment	The third segment
Score 1	7	13	12
Score 2			
Score 3			
Score 4			
Total Score	7	13	12
Total Choices	7	13	12
Mean Score	1	1	1

choice points). In addition, it appears that when the participant attempted to fulfill the task for the first time, he had to rely upon prior knowledge to complete the task, but when

he fulfilled the task second time, he was more dependent upon instinct; this seemingly allowed the participant to enhance his physical awareness.

> Question: "Before the aquatic program, what was your sense of direction or distance like when you were doing the "Wayfinding Skill Task?"
>
> •Was it improved after the aquatic program? If so, how?
>
> Answer: "When I was given the direction at that time, I already had prior knowledge about the distance of city block. So, I used that prior knowledge as a reference to fulfill my task. Now, doing that task again, I did not have to depend upon that knowledge, instead I had to use my instincts. Therefore, I am creating new landmarks indicating where I am at, and I am traveling out of pleasure rather than for searching where I have to go to fulfill my task."

CHAPTER 5
CONCLUSION, APPLICATIONS, AND FUTURE DIRECTIONS

5.1 Conclusion

This study reveals that the spatial awareness of a person who is blind will improve after the aquatic program. As stated before, the improvements of the spatial awareness of people with blindness can not be easily isolated and addressed with only one point of view because the spatial awareness of those persons seem to be functioning by the result of the several factors interacting, such as the improvement of the body image and the various kinds of physical, mental awareness. Therefore, according to this study, the spatial awareness of a person who is blind is improved because there is an enhancement of the body image, the hearing awareness, and the self-confidence. Furthermore, the aquatic program help make the person who is blind more instinctive when he either moving on land, or in the water.

5.2 Applications and Future Directions

There is a general lack of information available on the spatial awareness of people who are blind. This seems surprising considering that this ability is an important factor to provide more freedom to move within, and experience, the environment. In addition, there were relatively few studies, which try to strengthen the spatial awareness of people who are blind using a physical activity program. This, too, is surprising considering that according to Krebs (1979), concepts of spatial movement are most meaningful when experienced through physical and tactile activity. Indeed, the present study seems to

indicate that there are benefits from physical activity programs to strengthen the spatial awareness of the people who are blind.

Moreover, another value of this study is the ability of people with blindness to achieve a physical activity successfully. This is meaningful because to learn how to do a new physical activity is not only good for their health by doing the activity, but also giving them more opportunity to socialize in order to elevate their quality of life.

Before launching into the possibilities for future studies, a limitation of this study has to be addressed. The limitation of this study may be the selection of the participant. As it was mentioned before, the participant of this study already possessed a hightened spatial-awareness, more than the researcher had expected because, of the participant's maturity and his previous visual memories when sighted. As a result, the effect of the aquatic program upon the participant must be appreciated in this light.

Therefore, it is not a sufficient basis upon which to make generalized assumptions about all the people who are blind, despite the belief that this study achieved the goal of showing the effectiveness of the aquatic program on the spatial awareness of the participant. As it will be outlined below, there is a great deal of further research needed to more clearly show the effects of the aquatic program on the spatial awareness upon this population.

The following passages suggest an implication for future research generated by this study, which are: (1) To measure the primary differences of an aquatic program upon children who are blind, versus adults who are blind; (2) To compare the various differences of the effects of an aquatic program upon people who were born blind, versus those who became blind later in life.

> Question: "Do you think the first part of the session, which required for you to touch or move your body parts, was helpful for you to improve the knowledge about your body parts and their relationship?"
>
> Answer: "No, not so much because I was mature enough to know where each body parts are placed and how they are related to each other. I mean that I am fully educated and I am so dependent upon my memory or mental ability rather than my instinctive ability. However, if there were blind children, then they would depend more upon their senses trying to understand and analyze their own body. Therefore, you can teach them when you feel your arm is moving this direction, when you feel your leg is moving this direction, when your body turns this direction, that means going right or left...etc. But for me, I was able to recall all the memories in my mind as I remember from my years being sighted."

The effect of the aquatic program appears to have its greatest effect upon children rather than adults. The reason for that is, the more mature the person is, the more familiar they are about their own body and surroundings. This means that the person attained knowledge through learning and experience. Therefore, the older the person is, the less they become dependent upon their spatial awareness. In addition, the aquatic program similarly appears to have greater impact upon the people who were born blind versus the people who became blind sometime in their life. The reason is that the people who were born blind depend solely upon their four senses, whereby are unable to be influenced by the visual memory because lack of sight. Therefore, it is expected that the spatial awareness of people who were born blind learn more rapidly to develop their instincts of awareness rather than knowledge of awareness. Whereby, the people who were not born blind but became blind later in life learn from visual awareness by creating the visual picture when being given the direction or the description from the sighted person. Therefore, that people depend upon their visual memory not allowing their other four senses to enhance the spatial awareness.

To summarize, the following suggestions for future research are, first, to measure the primary differences of an aquatic program upon children who are blind, versus adults

who are blind; and second, to compare the various differences of the effects of an aquatic program upon people who were born blind, versus those who became blind later in life.

APPENDIX A
INTERVIEW GUIDE

1. "Before the aquatic program, how was your awareness of the body?"
   "Was it changed after the aquatic program? If so, how?"

2. "Before the aquatic program, what type of awareness (such as, hearing awareness, tactual awareness) did you use when you were doing the *Wayfinding Skill Task*?"

3. "Before the aquatic program, what was your sense of direction or distance like when you were doing the *Wayfinding Skill Task*?"
   "Was it improved after the aquatic program? If so, how?"

4. "How is your cognitive mapping skill improved by the aquatic program?"

5. "How is your self-confidence improved not only in doing the *Wayfinding Skill Task* but also in daily life after the aquatic program?"

APPENDIX B
WAYFINDING SKILL TASK ROUTE

There was 30 choice points along the route where the participant had to decide whether to go straight, to cross the road, to turn, or to stop. The route is as follows:

1. The First segment (7choices)
   The Weimer Hall → Road crossing → Stop → Turn right →Go straight → Stop → Turn left→ Stop→ The Infirmary Building

2. The Second segment (11choices)
   The Infirmary Building →Turn right →Go straight →Stop→ Road crossing→ Go straight→ Stop→ Road crossing→ Stop→ Turn right →Go straight →Stop→ The Century Tower

3. The Third segment (12 choices)
   The Century Tower→ Turn right→ Go straight→ Stop→ Turn left→ Go straight→ Stop →Turn right →Go straight→ Stop →Turn right→ Go straight→ Stop→ The Weimer Hall

APPENDIX C
AQUATIC PROGRAM

Lesson 1-3

	Part 1 **1. Instructor stands in water in front of the participant** **2. Instructor asks the participant touch participant's body parts.** ⇒Can you raise your right hand? ⇒Can you touch the head with right hand? ⇒Can you touch the top of your head with right hand? ⇒Can you touch the right shoulder with right hand? ⇒Can you touch the center of your face with right hand? ⇒Can you touch your left eye with right hand? ⇒Can you touch the back of your neck with right hand? ⇒Can you touch the left side of your body with right hand? ⇒Can you touch the front of your right leg with right hand? ⇒Can you touch your right knee with right hand? ⇒Can you touch a part of your body that is above your neck with right hand? ⇒Can you touch the toes (either right or left feet) with right hand? ⇒Can you touch the part of your body that is farthest away from your toes?

	⇒Can you touch the part of your body that is between your elbow and shoulder with right hand? ⇒Can you touch the upper part of your back with right hand? ⇒Can you touch a part of your body that is below your knee with right hand? ⇒Can you raise your left hand? ⇒Can you raise your right leg and make it 90 degree? ⇒Can you raise your left leg and make it 90 degree? **Part 2** **1. Student holds instructor's hands.** **2. Instructor exerts a light pressure touch to encourage the up and down bobbing motion.** ⇒Can you go down to the chest depth? ⇒Can you go down to the shoulder depth? ⇒Can you go down to the head depth? **3. Instructor explains how to do Jellyfish Float and Tuck Float** **Jellyfish Float** ⇒Submerge to the neck, take a deep breath of air. ⇒Bend forward at the waist, put your head in the water. ⇒Flex your knees slightly to raise your feet off the bottom. ⇒Your arms and legs hang from your body. ⇒Hold your breath and relax as much as you can.

	Tuck Float ⇒Submerge to the neck, take a deep breath of air. ⇒Bend forward at the waist, put your head in the water. ⇒Flex your knees slightly to raise your feet off the bottom. ⇒Flex your hips and knees and hold onto your legs at mid-calf.

Lesson 4-6

	Part 1 **1. Instructor stands in water in front of student.** **2. Instructor asks the student move his body part.** ⇒Can you put your right hand in front of your face? ⇒Can you make your left hand higher than your head? ⇒Can you make both of your heels higher than your toes? ⇒Can you move your left hand to the right side of your body? ⇒Can you put your right hand behind your back? ⇒Can you put your left hand behind your left leg? ⇒Can you put your right foot above your head? ⇒Can you put your left hand between your legs? ⇒Can you move your head closer to your right leg? ⇒Can you move your left hand away from the right side of your body? ⇒Can you move your right leg away from the left side of your body? ⇒Can you put your right foot in back of your left foot?

	⇒Can you move both of your hands toward the middle of your body? ⇒Can you move both of your knees toward the middle of your body? ⇒Can you move your right ear closer to your right shoulder? ⇒Can you move both of your hands so you are facing them? ⇒Can you put both of your hands under your head? ⇒Can you put both of your hands underneath your abdomen? **Part 2** **1. Instructor explains how to do the "Supine Float" and the "Prone Float".** **Supine Float** **Instructor asks the questions.** ⇒Can you get off the bottom and still keep your face dry? ⇒How would you do this? ⇒Use a different body position. **After talking about this, the instructor explains how their body is supposed to move to float in back.** ⇒Take a deep breath, lay your head back. ⇒Arch your body gently and relax. ⇒Hold your arms out from the shoulders, palms up. ⇒Lie all the way back. ⇒As you float, breathe in and out through your mouth every few seconds. **Prone Float** **Instructor asks the questions** ⇒Can you get your feet off the bottom?

	⇒How many different ways can you get your feet off the bottom? ⇒In order to do that, how do your body parts move? **After talking about this, the instructor explains how their body supposed to move to float in front.** ⇒Flex your knees until your shoulders are submerged. ⇒Extend your arms on the surface, take a deep breath, place your face in the water. ⇒Lean forward, and gently push your toes up off the bottom. ⇒To keep your nose from filling with water, lift your chin slightly and blow some air out through your nose. **2.Instructor explains how to do the "flutter kick" in doing the "front crawl"** **Flutter kick** ⇒The motion starts at the hip, with your thigh starting downward even while your calf and foot are still moving upward. For most of the downbeat, keep your knee slightly flexed. The propulsion occurs when you straighten your leg. This motion continues through the whole leg, and the feet follow through. The feet are turned slightly inward. Your foot snaps downward, completing the motion, as though you were kicking a ball. ⇒ In the upbeat(recovery), raise your leg straight toward the surface with little or no flexion in your knee, until your heel just breaks the surface. A common error is to bend the knee and thus pull the heel toward the buttocks. Your leg must stay straight in the recovery. Your knee is flexed for most of the power phase, and extends forcefully at the end of the kick.

	Participant holds onto pool edge in a front position and practices the flutter kick. **Once the participant gets used to doing the flutter kick, let him do it on his own while he holds the kickboard.** **Once the participant is used to the flutter kick, let him perform it on his own without support.**

Lesson 7-9

	Part 1 **1. Instructor asks the questions.** ⇒Can you move so I am facing you? ⇒Can you move so I am in back of you? ⇒Can you move so I am on your right? **2. Instructor gives a tube, which is suitable for the participant.** ⇒Can you put yourself in front of the tube? ⇒Can you put the tube over your head? ⇒Can you put the tube so it is on your left? ⇒Can you put the tube behind you? ⇒Can you move yourself so the tube is over your head? ⇒Can you move yourself so you are inside of the tube? ⇒Can you get out of from the tube to the right side of it? ⇒Can you get into the tube from the left side of the tube? **3. Instructor also gives a smaller tube.** ⇒Can you put yourself between two tubes?

	⇒Can you hold the small tube with right hand and the big one with left hand? ⇒Can you move the small tube so the big tube is nearer to you? **Part 2** **1. Instructor gives a ball, which is fitted for the participant and light enough to float.** **2. Let the participant try to throw the ball.** **3. Instructor explains how to throw the ball** ⇒Grab the ball with your throwing hand ⇒You need to be in a side-on position, with your weight on your back foot. ⇒Use your non-throwing arm to point in the direction of your target and bring your throwing arm through in an arc over the top of your shoulder. **4. The instructor explains how the participant can do the arm stroke in doing the "front crawl" in detail and practice a lot out of the water.** **5. Instructor emphasizes the way his hand goes, in other words, which body parts the hand passes.** ⇒From the initial position, the arm sinks slightly lower and the palm of the hand turns 45 degree with the thumb side of the palm towards the bottom. This is called catching the water and is in preparation for the pull ⇒The pull movement follows a semicircle with the elbow higher than the hand and the hand pointing towards the body center and downward. The semicircle ends in front of the chest at the beginning of the ribcage. ⇒The push pushes the palm backward through the water underneath the body at the beginning and at the side of the body at the end of the push. The

	movement increases speed throughout the pull push phase until the hand is the fastest shortly before the end of the push. ⇒Some time after the beginning of the recovery of the one arm the other arm begins its pull. The recovery moves the elbow in a semicircle in a vertical plane in the swimming direction. The lower arm and the hand is completely relaxed and hangs down from the elbow close to the water surface and close to the swimmers body. ⇒The hand enters the water thumb first almost as far forward as possible.

Lesson 10-12

	Part 1 **1. Instructor stands in water in front of student.** **2. Instructor gives a tube, a kickboard and a ball to the participant.** **3. Instructor asks the participant to move tube or kickboard.** ⇒Can you put the kickboard in front of the tube? ⇒Can you put the ball in back of the kickboard? ⇒Can you put the ball behind the tube? ⇒Can you put the ball to the left of the kickboard? ⇒Can you put the kickboard to the right of the tube? ⇒Can you put the tube on top of the kickboard? ⇒Can you put the ball above the kickboard? ⇒Can you put the tube between the kickboard and the ball?

	⇒Can you put the tube to the right of the ball and kickboard? ⇒Can you put the ball in the center of the tube? ⇒Can you put the ball close to the tube and the kickboard far away from the tube? ⇒Can you make the tube lower than the ball? ⇒Can you put the kickboard to the left of the ball and tube? ⇒Can you put the ball in the middle of the tube and the kickboard? ⇒Can you put the kickboard far away from the ball and the tube next to the ball? **4. Instructor asks the participant to do the flutter kick on his own and stop when he thinks he proceeds certain distance, which is required.**
	Part 2 **1. The instructor explains how to breathe in doing the "front crawl".** ⇒Start turning your head to the side as that arm starts its pull. ⇒Your mouth clears the water at the end of the pull, and you inhale just as the recovery starts. ⇒Body roll makes it easier to turn your head to the side. ⇒Look to the side and slightly back, keeping your forehead slightly higher than your chin. ⇒The opposite ear stays in the water. ⇒After inhaling, return your face to the water as you move your arm forward. ⇒Exhale slowly through your mouth and nose between breaths. Exhale completely underwater so you are ready to inhale at the next breath.

	2. Practice the breathing in correspondence with the arm stroke movement out side of the pool and then in the water. **3. Once the participant gets used to doing the flutter kick on his back, let him do it on his own while he holds the kickboard.**

Lesson 13-16

	Part 1 **1. Instructor asks the student changing the direction.** ⇒Can you make a 90 degree right turn? ⇒Can you make a 180 degree right turn? ⇒Can you make a 270 degree right turn? ⇒Can you make a full right turn? ⇒Switch the direction. **2. Instructor asks the participant to change the direction when he thinks he proceeds the certain distance, which is required.** **Participant stands at the start line.** **Participant proceeds forward by doing the "flutter kick" and whenever he thinks he reaches each spot, he needs to stop and to change the direction.** **Practice this task changing the degree, the direction and the distance between the each spot for each trial.** ⇒Make a 90 degree right turn when you reach the first spot. ⇒Make a 90 degree left turn when you reach the second spot. ⇒Make a 270 degree left turn when you reach the third spot. ⇒Make a 180 degree right turn when you reach the fourth spot. ⇒Make a 270 degree right turn when you reach the fifth spot.

	⇒Make a 90 degree right turn when you reach the sixth spot. ⇒Make a 90 degree left turn when you reach the eighth spot. ⇒Go straight until when you reach the ninth spot.
	Part 2 **1.Instructor explains how to kick in doing the "Back crawl".** ⇒The kick is like the flutter kick used in the front crawl but is a little deeper in the water. It is a continuous, alternating, up-and-down movement that starts from your hips. Keep the ankles loose and floppy, your feet slightly pigeon-toes, and your legs, separated slightly so that your big toes just miss each other. Most of the propulsive force comes from the upward kick, which is like punting a football with the tip of your foot. The downward movement of the sole of your foot against the water also helps propel you. ⇒At the start of the upward kick, flex your knee to gain the most propulsion from the upper surface of your lower leg and foot. Bring your thigh and knee near the surface, but keep whipping your foot upward until your leg is straight and your toes reach the surface. Keep your leg nearly straight in the downward kick. At the end of the downward movement, bend your knee and start your upward kick. Your thighs should pass each other and your knees should stay relaxed. **2. Let the participant hold the kickboard lying on his back and practice the "flutter kick" with the instructor's assists.** **3. Once the participant gets used to doing the flutter kick on his back, let him do it on his own while he holds the kickboard.** **4. Once the participant is used to the flutter kick, let him perform it on his own without support**.

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BIOGRAPHICAL SKETCH

Hee Sun Jun was born in Seoul, South Korea, on July 7, 1978. After graduating with a B.A. in physical education from Korea University, she relocated to the University of Florida (U.F) in Gainesville, Florida to pursue a Master of Science degree in exercise and sport sciences, with a concentration in special physical education. Her accomplishments during her master's program include the co-direction of multiple research, teaching and service programs including a fitness and sport program for adolescents with mental retardation; a low-intensity, pain-free walking program for individuals with peripheral vascular disease; serving as an academic secretary and daily assistant for an individual who is blind; implementing adapted aquatics instruction for children and youth with physical disabilities in programs held at UF; and teaching jogging as a graduate assistant in the college of Health and Human Performance. Ms. Jun hopes to dedicate her life to working people with disabilities and hopes to improve the quality of their lives.