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Exploration of the footprint of a 10-week baseball training camp on visually enfeeble players

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This study investigated the impact of a 10-week baseball training camp on visually impaired players. Sixteen blind and visually impaired subjects were evenly divided into an experimental group and a control group. The experimental group participated in baseball training three times a week for 1 h 14 min, while the control group did not participate in training. Test data were analyzed through analysis of variance with a paired sample t-test. Following the course of baseball training, the experimental group achieved a statistically significant improvement in orientation and mobility including: 1) a 33 foot unassisted fitness walking test; 2) a 33 foot walking test while holding a cane; 3) a 45 foot road map test, in which participants follow a predetermined course involving turns and orientation according to a sound beacon; 4) a test measuring the success rate of hitting a pitched ball. Following training, the time the experimental group required to complete the walking tasks and the success rate in hitting the ball both showed a statistically significant improvement ($p<0.05$). These findings strongly indicate how such training has a direct beneficial outcome towards orientation and mobility development for the visually impaired, and recommend further research into the effects of blind baseball training.

Key words: Visually impaired, 10-week blind baseball training, orientation, mobility.

INTRODUCTION

According to World Health Organization (2010) report released, new global estimates of visual impairment using the most up to date studies, WHO estimates that the number of people with visual impairment (presenting vision) is 285 million (65% of whom are aged over 50 years). Of these, 246 million have low vision (63% over 50 years) and 39 million are estimated to be blind (82% over 50 years). With advances in technology, the quality of life for most people is improving; however, socially vulnerable groups such as the visually impaired are unable to enjoy these conveniences. Nonetheless, given the opportunity, the visually impaired are able to participate in various sporting activities. In 2007, the number of handicapped individuals reached 991,161, with this number increasing yearly (Monthly Bulletin of Statistics, 2007). At present, the visually impaired comprise approximately 5% of the total number of physically handicapped individuals. Through participation in leisure activities, the visually impaired are able to enhance their ability to adapt to their environment, and in many areas, technology is able to compensate for physical deficiencies. Such advances reduce barriers to participate in mainstream activities, and increase the likelihood of success in their educational endeavors (Yeh, 1999). Despite the loss of eye function, the visually impaired retain their hearing, touch, smell, and perception of motion and balance as well as their language skills, mobility and sensory apparatus (Lee, 2000). The International Blind Sports Federation (IBSF) (2007) promotes competitions for the visually impaired including alpine skiing, track and field, archery, soccer, croquet, judo, bowling, cross country skiing, power lifting, chess, cricket, equestrian sports, golf, sailing, boating, and water skiing.

In 1975, blind baseball originated from a U.S. company in Minneapolis called Telephone Pioneer, and a St. Paul blind baseball team owned by the Bray Exercise Foundation. The NBBA was established in Chicago in March 1976, to promote blind baseball, and has since extended to more than one hundred teams (Chen and Hsieh, 2003). The education department of the Taiwanese Government took notice of the development of this sport, for the great strides it has made in improving the mobility of the visually impaired and engendering the development social relationships. Sports and leisure development for the visually impaired include 3-wheel cycling, sports wheelchairs, among others (Chiou, 1990). The style, objectives, elements, and training involved in blind baseball are biased toward “performance-related” physical fitness. However, competitive sports or player-related fitness, such as agility, balance, coordination, speed, reaction time, muscle strength, anaerobic power, and other factors, are closely related to exercise capacity (Keh, 2003).

Physical activity for the visually impaired involves motor learning and movement related to environmental safety and convenience (Chen and Hsieh, 2003). Significant differences exist between the physical exercise regimes of the visually impaired and the normally sighted. Chang (1991) asserted that the blind suffer from a lack of exercise, and that walking alone imposes a psychological burden and variety of dangers. Social sports and other athletic activities for the visually impaired in Taiwan are still lacking, and recreational activities include mostly sedentary activities, such as playing chess, piano, and blind cards. Blind baseball not only provides an alternative outdoor recreational activity, but also builds confidence in the ability of the visually impaired to live more normal lives. The visually impaired typically engage in massage as their source of income, and this requires considerable physical effort. Most individuals involved in this work are employed during the evening, and the daytime is spent sleeping and relaxing. This results in fewer opportunities to participate in leisure activities, compared with the general population.

Visually impaired orientation and action theory

Except for the use of braille, general education and learning for the visually impaired is much the same as it is for the normally sighted. The loss of visual acuity has an impact on spatial cognitive ability, forcing the visually impaired to rely heavily on touch, smell, and hearing to act within complex environments. Understanding the means by which the remaining senses are used, and spatial cognition is developed is very important (Thoma and Chalip, 1996). Human hearing can be divided into hearing and sound localization. The ability of humans to hear changes in intensity produces the critical curve of hearing, or hearing threshold. The frequency of sound audible to human ranges from 20 to 20,000 Hz, and the intensity ranges from 0 to 130 decibels (Shiu et al., 1996).

The abilities of the visually impaired can be improved through education, but to achieve this goal, the government must seek the advice of experts to develop teaching aids to enable participation in team sports and other activities. Since childhood, most visually impaired individuals suffer from a lack of life experience; nonetheless, they are able to use tape recorders, Braille materials, tactile aids, blind computers, and visual aids to learn and reach their maximum potential. Regardless of the development in these areas, orientation remains the most important skill for the visually impaired (Liu, 1975).

Regardless of one’s visual acuity, the ability to walk confidently, safely, and purposefully is extremely important, but encountering an unfamiliar environment is especially challenging for the visually impaired. Previous researchers have identified an Inhibitory control deficit in children suffering from developmental coordination disorder (Mandich et al., 2003; Tsai et al., 2009; Wilson et al., 1997; Wilson and Maruff, 1999). Tsai (2009) showed significant improvements in motor and cognitive functions in such children following a ten-week group physical activity program conducted within a school setting.

With adequate orientation skills and mobility, the visually impaired are able to perform many living skills independently, such as using the toilet, walking to classrooms alone, and avoiding falling which are crucial to their self esteem and sense of independence. Many of these individuals are even capable of returning home without assistance, thereby reducing the psychological burden on teachers. Gaining experience and knowledge, expanding their living space, adapting to new social situations, improving relations with classmates, and receiving encouragement from teachers make life for the visually impaired far easier and more fulfilling. Several studies have made references to living environments, in which the visually impaired are able to use their residual vision or other sensory organs to identify their relative position within the environment (Mao, 1995; Cai, 1993; Fan, 1993). Research shows that individuals with intellectual disabilities tend to maintain a positive general self-concept, due to the compromising (and in this case also protective) role of their mental limitations, in regard to the perception of the full extent of their incapability (Cunningham and Glenn, 2004; Weiss et al., 2003). Several models have been proposed to direct general movement: “the use of vigorous physical exercise to improve fitness and behavior would not need to be rejected. However, attention should be paid to a number of points, for example: 1) the intensity of the exercise should be built gradually; 2) various reinforcing events should be employed to increase the persons’ motivation to exercise; and 3) the persons’ opinion about the exercise should eventually be assessed by allowing them to choose between various exercise options,” (Lancioni et al., 1996: 391–411).

Research has shown in reference to goal-orientation, that there is evidence that, following adequate support, and probably by employing downward comparisons, that is, comparisons with persons regarded as being worse off on the dimension of concern to the individual (Jahoda and Markova, 2004), individuals with mild intellectual disabilities may develop both ego and task orientation, which may be high enough to compare favorably with the goal-orientation of other individuals with disabilities, for example, individuals with specific learning disabilities (Milo et al., 2004). As far as self-regulation of individuals with intellectual disabilities is concerned, research has revealed their limited ability to achieve it (Eisenhower et al., 2007; Gilmore et al., 2003; McIntyre et al., 2006), especially in reference to effort maintenance and persistence in task completion (Kozub et al., 2000; Niccols et al., 2003).

The literature indicates that moderate exercise is beneficial; however, for the visually impaired to engage in outdoor sports requires the participation of family or friends to ensure safety. Blind baseball is a recreational sport, requiring the cooperation of the visually impaired and the sighted. This sport enables the visually impaired to venture outside and even participate in international competitions, thereby expanding their range of experience and interpersonal relationships.

The history of blind baseball as a recreational sport in Taiwan is very short. However, television broadcasts introducing the sport began attracting many participants to the sport. Blind baseball provides fun, outdoor leisure activity, and a sense of accomplishment (Chen and Hsieh, 2003). The rules of blind baseball include hitting the ball, base running, fielding, and other activities. A systematic process of incorporating blind people into baseball, and dealing with the associated problems are crucial topics related to the future development of recreational sports for the visually impaired.

Unfortunately, very little literature related to this topic is available. In undertaking this research, we hoped to compensate somewhat for this knowledge gap by focusing on the crucial factors influencing the capabilities of the visually impaired:

1) We established a 10 week training program in blind baseball to test whether orientation is significantly related to mobility, and the degree to which this could be influenced through such training.
2) We also tested whether the physical attributes of participants showed significant differences before and after basic physical fitness.

This research was conducted in the hope of providing visually impaired massage associations and future researchers in blind baseball with direction and suggestions for the on-going development of activities for the visually impaired.

METHODS

Study group

A total of 16 visually impaired students, with an age range of 44 to 45 years, were recruited from the Taiwan Blind Baseball Association. This study recruited 16 visually impaired subjects and divided them equally into an experimental and a control group.

Training items for the experimental group included the effect of treatment on the stimulation of basic skills, while the control group received no such stimulation. The experimental and control groups included totally blind and slightly visually impaired; therefore, all subjects were required to wear goggles to remove factors that might influence research objectives.

This study was developed according to the four test items of orientation and mobility training, set out by the Taiwan Blind Baseball Association. All walking tests were performed in open areas, in which a series of bricks were laid end to end to form a pathway. This pathway was 24 inches wide, raised 2.5 inches from the surrounding surface. Three walking tests were employed: a) a fitness walking test, in which participants follow the path elevated path for 33 feet, completely unaided; b) a walking test on the same elevated path while holding a cane; c) a 45 foot road map test, in which participants follow a predetermined course involving one left turn and one right turn as they make their way to a sound beacon;
d) a test measuring the success rate of hitting a pitched baseball. These tests were conducted before and after the 10 weeks of blind baseball training, and test data was analyzed using statistical difference analysis to compare the two groups.

Experimental methods and procedures

The experiment was conducted under controlled conditions to establish causal relationships within the findings. Experimentation is an inductive method, applying repeated observation or examination to determine causality.

The subjects were divided into two homogenous groups: the control group, and the experimental group. The experimental group was subjected to experimental conditions, and any observed changes were compared with those of the control group to identify causal processes. None of the participants had any experience with blind baseball training prior to the experiment, and instructions were delivered in Braille. Because most participants in this study have had little experience in outdoor sports, they were advised that the test methods might cause discomfort or bodily fatigue. In the experiment, a coach guided the subjects within the environment, whether within or outside the location of the study. Should any of the participants encounter danger, the coach would immediately halt the experiment, and all of the subjects would be required to stop their activities immediately. The researchers also provided the instruction required for participants to fully understand the blind baseball-training mode. The study was conducted between February 28th and May 20th, 2009. Every Wednesday and Tuesday, from 15:00 to 15:45; and on Friday, the session was from 14:00 to 14:45.

The orientation and mobility of all subjects were compared before and after 10 weeks of blind baseball training, and the differences were analyzed using purposive sampling. Prior to the study, a standardized visual acuity chart was used to select sixteen totally blind and slightly visually impaired individuals as the research study sample. Base barrier sound was controlled by two volunteers with more than six years of experience in blind baseball. Various activities were recommended by experts and scholars in the field, and further revised to ensure compliance with the training conducted in the experimental and control groups, without external interference. In this study, the pitching coach was responsible for the training of all activities in the experiment. Objectivity testing consisted of dividing the subjects into two groups (experimental and control). All subjects were required to participate in the training experiment, recording the before and after test results of each group for data analysis and conclusions.

Pretest and post-test packet sequence of experimental group and control group

Because the study sample was a special group, researchers assigned members of the experimental group signs with number 1

Table 1. The flow and objects for blind baseball training.

Assigned time (min)	Training object	Training flow
20	1. Before the experiment activities, the visually impaired are informed. 2. Every time the instructor meets with the team to warm up and stretch joints development activities.	Activity contentment ↓ Extension of activity ↓
50	1. The sighted pitcher and catcher are matched with the visually impaired hitter for coordination training. 2. The field coach and the visually impaired repeat rehabilitation exercises of the previous week.	Understanding training ↓ Basic action training ↓
45	12 times of basic hitting action.	
22	100 foot base running training.	Start formal training
12	Garrison 33 foot left and right run	

Total time is 1 h 14 min.

and members of the control group with number 2. Physical characteristics were determined according to the measurement of basic physical fitness, the ability to orient oneself, and exhibit mobility, including: a) a 33 foot unassisted walking test, b) a 33 foot walk test holding a cane, c) a 45 foot road map test, and d) a test measuring the success rate of hitting a baseball, conducted before and after the other tests.

Baseball training comprised basic skills and developmental training for 50 min, covering the three main components of listening to the base running sound, hitting action against voices, and listening to defensive action. Based on studies provided by the Society for Taiwan Blind Baseball (Table 1), the experimental group for the blind baseball-training course was prescribed.

Movement type

1. Subjects received training to hit a pitched baseball with four players per group, 12 hits per person, and 1 loop for each player. Each player took a turn at bat six times, for a total of 45 min.
2. When the subjects began running the 100 feet to the base sound, the base controller started the buzzer at the first base or third base to provide the runner directions. Warm-up exercises took 10 min, and each exercise was performed in six cycles, followed by 1 min of rest, for a total of 22 min.
3. The subjects were instructed regarding fielding position after receiving a password from the coach. They ran approximately 20 feet in the left direction, and then immediately ran another 20 feet to the right before falling to the ground to make a fielding position. Each exercise ran for six cycles, with each cycle lasting 1 min, followed by 1 min of rest, for a total of 12 min.

Exercise intensity

In 1962, the 15-point Borg rating of perception was established (Borg, 1962), with fairly light (11) to tiring/hard (15) levels. The experimental group was used to test intensity through six cycles of exercises where each cycle involved all training Movement project 1 min and resting 1 min. The subjects were asked about their perceived experience immediately after each cycle.

Exercise time and frequency

The experimental group received training with blind walking canes, three a week for 10 weeks. In each session, subjects performed 6 cycles of following a central auditory signal for 1 min, followed by 1 min of rest.

Research tools

This study included base buzzers, a blind base control box, home plate, blind baseball, bat, gloves, goggles, stopwatch, measuring tape, marking barrels, nylon rope, bell, experimental records, white cane, and bricks.

Data processing

1. Basic information of participants was described by analysis of statistical mean and standard deviation.
2. Homogeneity was tested using an independent sample t-test, for basic information (height, weight, BMI) of all participants, and test data.
3. Paired t-test was used to compare differences between those with and without blind baseball training.
4. One-way analysis of variance (ANOVA) was used to determine any significant differences.
5. The collected information in this study was analyzed by a version 11.0 SSPS software package for analysis and statistical test values to $\alpha = 0.05$ significance level.

RESULTS

Comparison of basic test data between pre- and post- training

Following statistical analysis, no significant difference was observed between the basic pre-test and post-test data, including age, height, weight, and body mass index (BMI), of sixteen visually impaired

Table 2. Basic information summary before and after the test.

Group	Items	N	Before test	After test
Experimental	Age	8	44.75	44.75
	Height (m)	8	170	170
	Weight (kg)	8	81.10	81.35
	BMI (kg/m²)	8	28.39	28.11
Control	Age	8	44.50	44.50
	Height (m)	8	169.25	169.25
	Weight (kg)	8	72.05	72.34
	BMI (kg/m²)	8	25.10	25.20

*p < 0.05.

Table 3. Summary table of descriptive statistics of the ability to detect orientation and mobility.

Test items	Group	N	Before test (N=8)		After test (N=8)	
			M	SD	M	SD
33 feet fitness walking test	Experimental	8	19.36	2.13	11.95	1.09*
	Control	8	18.88	1.60	19.82	3.05
33 feet walking cane holders test	Experimental	8	13.85	1.29	10.08	1.35*
	Control	8	13.93	1.42	13.96	0.91
100 feet road map test	Experimental	8	10.42	1.10	7.43	1.04*
	Control	8	10.87	1.54	11.44	1.84
12 times of hitting rate test	Experimental	8	1.50	1.51	3.50	1.51*
	Control	8	1.25	1.75	1.13	1.13

*p < 0.05.

participants (Table 2).

Test results of pre- and post- orientation and mobility training

Table 3 presents the statistical significant results of the four tests regarding directional mobility. The test results of the experimental group and control group are presented as mean and standard deviation. The results of the paired t-test, show that after the experimental group completed the training, the results of the walking test had significantly improved, reaching statistical significance, with a p value <0.05.

Effectiveness of blind baseball training intervention

Table 4 illustrates the analysis of variance in the four tests, comparing the experimental and control groups. Using single factor analysis, the experimental group in the unassisted walking test improved significantly, with a p value < 0.05. After 10 weeks of blind baseball training, orientation and mobility related to unassisted walking significantly improved.

DISCUSSION

In this study, 16 visually impaired subjects were tested for age, height, weight, and BMI, and the basic data were measured using pre-and post-tests, shown in Table 2. This study used the 33 foot unassisted walking test to determine the ability of participants to orient themselves and act on that orientation. After 10 weeks of blind baseball training, the experimental group walked 33 feet without the assistance of a guide or other device, and showed significant progress in completing the task, demonstrating that the training could be targeted to improve operational capacity of the visually impaired. Ten normal students of National Changhua University received two months of orientation and mobility training, showing a consistent improvement in balance (Chang, 1991). A 33 foot walking test along the road holding a

Table 4. Test results of directional mobility by analysis of single factor analysis of variance.

Parameters	Source of variation	Squares	Freedom degrees	Average sum of squares	F-test	P-value
33 foot fitness walking	BG	219.86	1	219.86	77.25	0.000*
	WG	39.85	14	2.85		
	Sum	259.70	15			
33 foot cane hold walking	BG	56.63	1	56.63	32.63	0.000*
	WG	24.30	14	1.74		
	Sum	80.92	15			
100 foot road map	BG	438.90	1	438.90	47.37	0.000*
	WG	129.71	14	9.27		
	Sum	568.61	15			
12 times of hitting rate	BG	16.00	1	16.00	7.00	0.019*
	WG	32.00	14	2.29		
	Sum	48.00	15			

*$p < 0.05$.

cane was used to test directional acuity, and the experimental group showed significant progress. This is consistent with the hypothesis of the Shannon and Elliott (1996) study in which subjects showed significant improvements in agility after undergoing a five-day balance beam training course. After 10 weeks of blind baseball training, the experimental group showed significant progress in the 45 foot road map test, in which participants follow a predetermined course, involving multiple 90° turns and cross a street by themselves.

Conclusions

The experimental group also improved significantly in their success rate in hitting a baseball after the 10 weeks of blind baseball training. The paired sample t-test showed that the experimental group made obvious progress in directional detection of mobility in four test items, achieving a statistically significant improvement. However, without training, the control group showed little significant progress and did not reach a statistically significant level. This study confirmed that 10 weeks of blind baseball training for the visually impaired showed significant improvement in orientation and mobility.

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