

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

**A STUDY INVESTIGATING THE EFFECTS OF
TAI CHI CHUAN IN INDIVIDUALS WITH
TRAUMATIC BRAIN INJURY.**

A thesis presented in partial fulfilment of
the requirements for the degree of Master
of Arts in Psychology
at Massey University, Palmerston North, New Zealand.

CHRISTINE SINA GEMMELL

2002

Abstract

Tai Chi Chuan (or Tai Chi) is a Chinese Martial Art that has been shown to improve mood, balance, coordination, cardiovascular and respiratory functions, fatigue, general wellbeing, motor skills, and to reduce stress. Research on Tai Chi has mainly been conducted with older adults with little emphasis in other populations. This study explored whether Tai Chi had similar effects on individuals with traumatic brain injury (TBI). Eighteen participants with TBI, (nine females and nine males) either undertook a course in Tai Chi (N=9) or were on a waiting list (Control group, N=9). The Tai Chi group attended twice weekly, for 45 minutes over a 6-week period. Before and after each Tai Chi class the Visual Analogue Mood Scale (VAMS) was completed to determine whether there were any immediate effects on mood. Both groups also completed the Medical Outcome Scale Short Form 36 (SF-36) and the Rosenberg Self-Esteem Scale (RSES) (3 weekly) before, during, at the completion of the Tai Chi course, and 3 weeks after the experiment finished. Responses of the Tai Chi group were compared with the control group, to determine whether there were any group differences in physical and emotional functions, self-esteem, social functioning, and general perceptions of health. The results of this study confirm that Tai Chi improves mood in individuals with TBI. Individuals were less tense, afraid, confused, angry and sad, and felt more energetic and happy immediately after Tai Chi practice. No significant differences between groups were found for physical and emotional functioning.

Acknowledgements

I would like to thank Professor Janet Leathem for her energy, encouragement and valuable support in assisting me to complete this thesis.

I would also like to thank my teacher and father Robert Gemmell for his expertise and guidance in the area of Tai Chi Chuan, and my mother who has supported me throughout this study.

A special thanks to the individuals that participated in this study and for their valuable feedback.

Table of Contents

	Page
Title	i
Abstract	ii
Acknowledgements	iii
Table of Contents	iv
List of Tables	vii
List of Figures	viii
CHAPTER 1: INTRODUCTION	1
CHAPTER 2: TAI CHI CHUAN: THE ART OF MOVEMENT	3
Origins of Tai Chi Chuan	3
General principles of Tai Chi Chuan	4
Chi: Energy, Life Force, Breath	4
Sung: Relax, Let Go	5
Yin and Yang: Harmony	5
Yi: Intent	5
Fajing: Release Energy	5
Research on Tai Chi Chuan	6
Chinese Studies on Tai Chi Chuan	6
Cardio Respiratory Responses to Tai Chi Chuan	7
Studies on Tai Chi Chuan, Motor Control, and Balance	7
Studies on the Cognitive Component of Tai Chi Chuan	8
Psychological Studies on Tai Chi Chuan	8
Benefits of Tai Chi Chuan with Older Adults	10
CHAPTER 3: TRAUMATIC BRAIN INJURY	13
Prevalence of Traumatic Brain Injury	13
Demographics	14
Financial Costs	14
Factors Governing the Outcome of Traumatic Brain Injury	14

Mild Traumatic Brain Injury	15
Moderate Traumatic Brain Injury	16
Severe Traumatic Brain Injury	16
Cognitive Outcomes of Traumatic Brain Injury	17
Attention	17
Memory	18
Executive Functioning	19
Emotional Outcomes of Traumatic Brain Injury	19
Social Outcomes of Traumatic Brain Injury	20
Coping with Daily Living	22
Rehabilitation for Individuals with Traumatic Brain Injury	23
CHAPTER 4: THE PRESENT STUDY	25
Aims of this Study	26
Hypotheses	26
CHAPTER 5: METHOD	27
Experiment Design	27
Participants	27
Procedure	29
Measures	31
CHAPTER 6: RESULTS	33
Hypothesis 1	33
Hypothesis 2	34
Hypothesis 3	36
Post Hoc Qualitative Evaluation	40
CHAPTER 7: DISCUSSION	41
Mood	41
Social Interaction, Physical and Mental Health	43
Limitations of the Study	44
Future Research	45
Summary	46

REFERENCES	48
APPENDICES	58
Appendix 1 : Information Sheet	58
Appendix 2 : Consent Form	60
Appendix 3 : Tai Chi Pamphlet	61
Appendix 4 : Tai Chi Class Handout	64
Appendix 5 : Visual Analogue Mood Scale.....	65
Appendix 6 : Rosenberg Self-Esteem Scale.....	70

List of Tables

TABLE	Page
6.1 Comparison of the SF-36 and RSES Results for Tai Chi & Control Groups Before Commencement of Tai Chi sessions	33
6.2 Summary Data for the Visual Analogue Scale (VAMS)	34
6.3 Comparison of the SF-36 and RSES Results at Completion of the Tai Chi Course for the Tai Chi & Control Groups	36
6.4 The Results of a Repeated Measures ANOVA for the SF-36 and RSES Comparing the Tai Chi and Control groups individually across time	38

List of Figures

FIGURE	Page
1. Flow chart of procedure for experimental and control group	30
2. Comparisons between the mean scores before and after Tai Chi classes for the VAMS Scales	35
3. Comparisons between the Tai Chi and control group before and at completion of the Tai Chi course for the SF-36	37
4. Comparisons between the Tai Chi and control group before, during, after and at the follow up period for the RSES	39

Chapter 1

Introduction

Tai Chi Chuan, also known as Taiji Quan, or Tai Chi, is a Martial Art that literally translated means “Grand Ultimate Fist”. “Taiji” means grand, supremacy, ultimate and uniqueness. “Chuan” means hand, fist or “boxing”. “Chi” (also called ji or qi) means energy, life force and breath. All Martial Arts are characterised by their degree of hardness or softness. In this sense, Tai Chi is soft. The energy and power used to perform the techniques also falls into two main types, internal and external. Tai Chi utilizes internal energy (Gemmell, 1992).

Tai Chi has become increasingly popular for its health benefits (Wan, 1989). Originated in China, Tai Chi has been used to lower blood pressure (Wolf, Barnhart, Kutner, McNeely, Coogler, & Xu, 1996), improve cardiovascular and respiratory functions (Lai, Lan, Teng, & Wong, 1995), improve balance and coordination (Wolf et al., 1996), relieve arthritic symptoms (Yocum, Castro, Cornett, & 2000), improve mood, and reduce stress (Jin, 1992). Tai Chi has also been shown to lead to improvements in motor skills (Yan, 1999; Yan & Downing, 1998), coping skills, self-esteem, motivation, confusion (Kutner, Barnhart, Wolf, McNeely, & Xu, 1997), anger, fatigue, tension, anxiety and depression (Jin, 1989). While a large body of this research has focused on the elderly population, only a small amount of research has been conducted with other populations. Tai Chi is relevant in the present study because aging is often associated with reduced neurological function. This study sets out to explore whether Tai Chi has any benefits for individuals with traumatic brain injury (TBI).

One rationale for exploring Tai Chi and TBI is that Tai Chi is a gentle non-stressful art form characterised by soft flowing movements that can be practised regardless of age, sex, and fitness level. Tai Chi combines both physical and cognitive techniques in a simple and easy to learn sequence that could assist with individuals with TBI.

Traumatic brain injury is associated with cognitive, emotional, interpersonal difficulties, and is associated with difficulties in attention, and memory.

Traumatic brain injury is costly not only to the individual, but also to family members and society as a whole. The consequences are far reaching, often resulting in years of rehabilitation, loss of income, isolation, and disrupted relationships. Recovery may take years, and is usually not complete. Tai Chi is a cost effective and easily incorporated training regime that has been shown to improve both the physical and emotional well being of participants, and may be beneficial for individuals with TBI.

The proposed study will add to the body of research already established in the separate areas of Tai Chi and TBI and will be unique in that it will, for the first time, test directly for an effect of Tai Chi on TBI. If shown to be beneficial, it could effectively reduce the cost of rehabilitating individuals with TBI by providing a low cost adjunct to physical and cognitive rehabilitation as well providing a forum for social interaction and peer support after TBI. The researcher, who is a qualified teacher in Tai Chi and has considerable experience of Martial Arts, will also contribute her knowledge to this study.

Chapter 2

Tai Chi Chuan: The Art of Movement

To understand Tai Chi, first one must have an understanding of the origins of the art form. To observe Tai Chi on merely a physically level is to misunderstand its concepts. Tai Chi draws upon Chinese philosophy, custom, tradition, belief and healing systems, and the Chinese mind, which has shaped and molded Tai Chi into what it is today (Khor, 1994).

Origins of Tai Chi Chuan

The word Taiji (or Tai Chi) first appeared in the *Book of Changes of the Zhou Dynasty* (Bin, Gongbao, & Xingdong, 1992). The essay says: “where there is Taiji, there is peace and harmony between the positive and the negative” (as cited in Bin et al., 1992 p.40). Tai Chi got its name when Shanxi (province) secular Wushu (kung-fu or martial arts) master Wang Zongyue used the philosophy of the positive and negative from the book of changes to explain the principles of the boxing (Wilhelm, 1968).

There are different opinions as to the origin of Tai Chi (Williams, 1999). According to Bin et al.(1992), some believe Tai Chi was created by Zhang Sanfeng of the Song Dynasty (961-1279), others, that it was created by Han Gongyue and Cheng Lingxi in the Liang Dynasty (502-577), and still others that it was either created by Xu Xuanping or Li Daozi of the Tang Dynasty (618-907). Thus far it has not been possible to authenticate these dates from historical records (Jacobson, Ho-Cheng, Cashel & Guerrero, 1997; Yang, 1989).

Despite differing opinions on the founding of Tai Chi, it is generally acknowledged that the art was exercised and practised among the Chen family members at the Chenjia Valley, which is located in Wenxian County in Henan Province cc.1374 (Chung, 1974; Lim, 2000). The earliest recognized choreographer of Tai Chi Chuan boxing was General Chen Wangting of Henan Province in the early seventeenth century, who was both a scholar and a martial artist (Bin et al., 1992). Chen combined his knowledge of ancient psychological exercises; the positive and negative philosophy described in the *Book of Changes* (1968), and Chinese medical theory of passages and channels of

blood, airflow, and energy inside the human body with the exercises and practices of Wushu (Gemmell, 1992).

Chen absorbed the strong points from various schools and styles of martial arts of the Ming Dynasty, especially the 32-move Qi Jiguang style of boxing (long style boxing), to form the school Tai Chi Chuan. After years of dissemination, many styles of Tai Chi Chuan were created. The most popular and widespread are: Chen style, Taiji chuan, Yang-Style, Wu-style, Wu Yuxiang Style of Tai Chi, and Sun Style (Bin et al., 1992; Chung, 1974; Gemmell, 1992; Williams, 1999).

Chen style is considered the oldest form and the most advanced system of Martial Arts (Bin et al., 1992; Chung, 1974). All the other styles of Tai Chi Chuan were derived from it either directly or indirectly. The Chen-style Taijiquan of thirty-eight forms was created and compiled by Chen Xiaowang from the base of the Chen-style “Lao Jia” (old frame) of seventy-four forms and “Xin Jia” (new frame) of eighty-three forms. Chen style is characterised by its hard and soft movements, and as with all Tai Chi styles uses circular motion of movements. Beginners usually begin learning the simplified (38-step) form.

General Principles of Tai Chi Chuan

Tai Chi experts claim that one should practice Tai Chi in a mindful manner and learn the philosophy and principles behind the movements (Cheng Man Ch’ing, 1985; Gemmell, 1992; Khor, 1994). Below is a general summary of each.

Chi: Energy, life force, breath.

According to Chinese philosophy, everyone has a given amount of Chi, which permeates through the body as a life force. Sometimes, due to stress and other factors, the pathways (Meridians), become blocked, leading to illness. Through the practice of Tai Chi, these blockages are cleared, in a similar way to acupuncture, except that the blockages are cleared by the cultivation of the energy flow into the vital organs of the body (Chi-Gung). The cultivation of Chi is drawn from the *Dan Tien*, known as the *reservoir of Chi*, located approximately 33 millimeters below the navel. Through

movement and slow diaphragmatic breathing, the Chi is circulated from the Dan Tien to the rest of the body (Gemmell, 1992).

Sung: Relax, let go.

One of the most important principles in Tai Chi is the concept of *Sung* or *relax, let go*. By relaxing the body the meridians (channels) open up, and the Chi begins to flow correctly. In order to *let go*, one must allow the mind to empty all thoughts, and relax the body completely. The student is encouraged to extend the *Sung* principle beyond the movement, and use it in their everyday life, i.e., allowing the stress run off them like water. It is only when a student lets go, and begin to relax, can they progress to the next stage of Tai Chi (Gemmell, 1992).

Yin and Yang: Harmony.

Yin and Yang is also related to Tai Chi philosophy and training. The Yin Yang symbol portrays opposite forces of nature, yet each force, be it Yin or Yang, contains and reflects its opposite. In Chinese philosophy these opposites blend into one another to produce the universe. Male (Yang) and Female (Yin) are opposites yet create completeness when in harmony. Each contains a small amount of the other (Gemmell, 1992). Each movement in Tai Chi contains *Yin Yang*, or hard and soft movements, each correlating to a particular organ on the body. A balance between the mind and body must occur in order to move the Chi flow correctly. The mind leads the body and each move is harmonized as well as relaxed.

Yi: Intent.

To work with the internal energy, it is necessary to work with the *yi*, or *intent to move the Chi*, or energy, which in turn moves the body. Tai Chi works from the inside to the outside, every part of the body moves and is coordinated together i.e., the blood vessels, the nerves, the meridians, and the internal organs (Yang, 1989).

Fa Jing: Release energy.

Fa Jing refers to releasing energy, or the production of *Jing Chi*. Energy or Chi can build up which can cause an over flow of energy and thus block or cause stress or illness in the body (Gemmell, 1992). To bottle up the physical or mental energy

produced, will lead to de-harmonizing (“dis-ease”) one self. When practising Tai Chi, it is important to convert built up energy to outside the body. The energy is converted outwards through the hand or *Chuan*. The principle of Fa Jing allows balance between relaxation and releasing energy.

In summary Tai Chi is based upon collective philosophies of the ancient Chinese, Shaolin Martial Art and Nature. There are 5 styles of Tai Chi thought to have originated from the Chen style. Chen style is claimed to be the original style of Tai Chi Chuan. Both mind and body are emphasized throughout the practice of Tai Chi. The hand “Chuan” plays a significant role in governing the Chi throughout the body, as does the circulation of Chi from the Dan Tien (reservoir of Chi).

Research on Tai Chi Chuan

Despite the many articles and books published on the benefits of Tai Chi, scientific research is relatively new in the west. However, in China, Tai Chi and the cultivation of ones ‘Chi’ (Chi Gong), is a way of life (Yang, 1990; Zhou, 1994). The purpose of Tai Chi has gradually shifted from self-defense to health improvement over the years (i.e., stress management).

Chinese studies on Tai Chi Chuan.

Studies on Tai Chi in China such as reported in the People’s Sports and Exercise Publication (1983) (as cited in Wolf, Coogler, Tingsen & Xu, 1997), report that grip strength in Tai Chi practitioners (people who have practised for at least 12 months), aged 70 to 79, was a third greater than measures taken from a non Tai Chi group aged 50 to 59 years. Further after one year of Tai Chi training 83.2% of these elderly Tai Chi practitioners could undertake “house chores” that they were previously unable to complete. Another study evaluated behavioural changes among Tai Chi practitioners older than 70 years and found substantial improvement on measures of friendliness, pleasantness, and socialization in the Tai Chi group when compared to a sedentary age matched group (as cited in Wolf et al., 1997).

Cardio respiratory responses to Tai Chi Chuan.

Researchers such as Gong et al. (1981) found no change in heart rate with Tai Chi practice and concluded that Tai Chi exercise does not provide cardiovascular conditioning. However, in the West, several studies have examined the cardio-respiratory responses to Tai Chi practice (e.g., Lai et al., 1995; Lai, Wong, Lan, Chong, & Lien, 1993; Lan, Lai, Wong, & Yu, 1996). Brown, Muccie, Hetzler, & Knowlton (1989), found that during Tai Chi practice, practitioners had more efficient use of ventilatory volume on a cycle ergometer. The slow, deep diaphragmatic breathing required during Tai Chi practice apparently enhancing ventilatory execution and promoting relaxation of mind and body. Other studies have shown; increased alpha waves in the occipital hemispheres (Lee, Bae, Ryu, Sohn, Kim & Chung, 1997), increased maximum volume of oxygen intake (VO₂ max), improved flexibility, and enhanced body composition (body fat/muscle ratio) in the elderly (Lan et al., 1996), and decreased blood pressure in persons with acute myocardial infarction (Channer, Barrow, Barrow, Osbourne & Ives, 1996).

Studies on Tai Chi Chuan, motor control, and balance.

Yan and Downing (1998) investigated whether Tai Chi practice or selected locomotor activities, such as walking and jogging was more effective in improving older adults dynamic balance control and ballistic aiming arm movements. Thirty-eight nursing home residents (29 females and 9 males, 76-89 years of age), with a history of minimal to no exercise participation, voluntarily participated in one of two types of exercise programmes: Tai Chi or walking/jogging activity. Results showed that participants in the Tai Chi exercise group demonstrated an overall increased time on tasks involving maintaining balance and improvements in smoothness and speed of arm movements than did the locomotor activity group. The authors suggest that older adults may gain greater benefits in the areas of gross and fine motor control by engaging in Tai Chi exercise as opposed to walking or jogging, further that it enhances the ability of senior adult's to utilize sensory feedback in balance control by allowing them to train slowly and deliberately, focus on movement sensations that internally integrate body coordination and dynamic balance.

Jacobson et al. (1997) also suggested that “an improvement in the maintenance for balance may improve the precision during performance of specific motor skills” (p28). A similar study by Yan (1999) confirmed that Tai Chi could improve the inconsistency of arm movement force output in older adults and the author concluded that Tai Chi was a real world exercise that improved older adult’s manual performance.

Studies on the cognitive component of Tai Chi Chuan.

Brown et al. (1995) conducted a study that emphasized the cognitive component of exercise, specifically to determine whether exercise that involved cognition led to greater psychological benefits than non-cognitive exercise. Participants were healthy, sedentary adults, 69 women and 66 men, aged 40 – 69 years. Participants were randomly assigned to a control group (C), moderate intensity walking group (MW), low intensity walking group (LW), low intensity walking plus relaxation response group (LWR), or mindful exercise (ME) group, undertaking a Tai Chi type programme. Results indicated that women in the ME group showed reduction in mood disturbance (tension, depression, anger, and confusion) and an improvement in general mood compared to other groups. For the male participants, the MW group improved on mood measures more than the other groups, although all four groups showed more positive effects after testing than before on the life satisfaction, self esteem (physical ability), and personality inventories. This study demonstrates that gender is an important factor in exercise, since men reacted positively to the MW training whereas women seemed to benefit more from the Tai Chi programme with regards to mood improvement. The hypothesis that exercise modes that containing a cognitive component would result in more beneficial psychological outcomes was partially rejected, since the LWR condition did not lead to changes in mood and self esteem. The researchers concluded that ‘mindful exercise programmes’ such as Tai Chi will benefit those individuals who feel comfortable with that kind of activity, or those who, due to illness or various physiological limitations, are not suited for vigorous exercise.

Psychological studies on Tai Chi Chuan.

Jin (1989), compared 33 Tai Chi practitioners (12 months or more Tai Chi experience) with 33 beginners (less than 8 months Tai Chi practice) (total group age range, 16 – 75), and found that Tai Chi in general increased heart rate, increased noradrenaline exertion

in urine, and decreased salivary cortisol concentration. Increased noradrenaline and low cortisol levels are associated with reduced levels of stress. Mood also improved significantly during Tai Chi, and participants remained positive one hour after practice. Participants reported less tension, anger, fatigue, depression, confusion, and state anxiety, however it is unclear whether this effect was due to Tai Chi as such, or that Tai Chi worked as a distraction from problems and anxiety.

In another study, Jin (1992) examined Tai Chi for its efficacy in post-stressor recovery. The participants were 48 male and 48 female Tai Chi students recruited from different Tai Chi schools in Australia and were randomly assigned to four treatment groups: Tai Chi, brisk walking, meditation and neutral reading. Mental arithmetic and other difficult tests were chosen as mental challenges, and a stressful film was used to produce emotional disturbance. Tai Chi and the other treatments were applied after these stressors. The results showed that Tai Chi and brisk walking are moderate intensity exercises, and they result in a release of noradrenaline, which may be beneficial to health. The four conditions appeared to be effective in reducing mood disturbance, and the Tai Chi group showed a significantly greater reduction in state anxiety compared to the reading group, a result that might have been influenced by high expectations in the Tai Chi condition. An ethical consideration in this study is the evoking of stress for a participant.

Slater and Hunt (1997) showed that even a brief period of practising Tai Chi could result in reduced nightmares among 11 undergraduate women as compared to a control group. The Tai Chi group performed Tai Chi movements 5 minutes before bed for 20 days, and kept a dream diary, while the control group practised stretching exercises. The findings showed that brief training in Tai Chi was associated with reports of reduced nightmares in the group practising Tai Chi, but not for the control group doing stretching exercises. The study was small scale (N=11), and primarily investigated the effect of post vestibular stimulation on dreaming, however its results are interesting in terms of general well being produced by Tai Chi. The use of stress reducing techniques like Tai Chi has also been effective in the treatment of posttraumatic stress disorder (Gruetzner, 1994).

Hernandez-Reif, Field & Thimas (2001) examined the effects of Tai Chi on anxiety, mood, hyperactivity and conduct in adolescents with Attention Deficit Hyperactivity Disorder (ADHD). The study was an ABA design consisting of a baseline phase (without Tai Chi) (A₁), a 5 week Tai Chi phase (B), and a 2 week follow-up phase without Tai Chi (A₂). Thirteen adolescents (11 males and 2 females) aged between 14 and 16 years, diagnosed with ADHD participated in Tai Chi classes twice a week for 5 weeks. Each class was 30 minutes long and the adolescents were taken through various Tai Chi movements and forms. Teachers then rated the adolescent's behaviour on the Conners Rating Scale. The teachers were aware of the Tai Chi study being conducted in the school, however, they were not aware of the hypothesis of the study, nor when the adolescents were receiving the Tai Chi since the Tai Chi occurred mid-afternoon and the teachers were not involved. The teachers completed the Connors at three different time periods (baseline before Tai Chi, on the last day of Tai Chi and 2-weeks later). After the ten Tai Chi sessions the adolescents displayed less anxiety, improved conduct, less daydreaming behaviours, less inappropriate emotions and less hyperactivity. These improvements continued over the 2-week follow up (no Tai Chi period). The results of this study are encouraging in that Tai Chi could serve as an alternative therapy for treating adolescents with ADHD and other psychiatric disorders. In addition the lack of discernible side effects when compared with mainstream drug therapy is an appealing aspect of the effects that Tai Chi has had on reducing anxiety and hyperactivity, major and difficult symptoms to manage in children with ADHD.

Benefits of Tai Chi Chuan with older adults.

There have been a number of studies focusing on the effects of Tai Chi in the elderly. Most of these studies have emphasized the physical benefits of Tai Chi. As cited in Sandlund & Norlander (2000); an important finding is that all studies on the benefits of Tai Chi for older adults during 1996 to 1999 have reported positive results. For example in 1990 the FICSIT studies (Frailty and Injuries: Cooperative studies on Intervention Techniques) in Atlanta, Georgia, investigated the feasibility and efficacy of several intervention strategies (e.g., balance training and Tai Chi) in reducing falls and related injuries in the elderly (Province et al., 1995). One study compared two exercise programmes, Tai Chi and computerized balance training, on specific primary outcomes (biomedical, functional, and psychosocial indicators of frailty) and secondary outcomes

(occurrence of falls) (Wolf et al., 1996). Two hundred healthy participants (162 women and 38 men), aged 70 years or older, and living without supervision, were randomly assigned to one of three groups (Tai Chi, balance training, or education). The results indicated that the Tai Chi intervention had a greater impact on biological and psychosocial aspects of frailty than the other groups. In addition, practising Tai Chi reduced the risk of multiple falls by 47.5% (Wolf et al., 1996)

In a post intervention follow up, Kutner et al. (1997) found that Tai Chi exercise in the elderly could reduce potential psychological morbidities. The Tai Chi group when compared to other balance training groups demonstrated higher positive psychosocial well being, reduced stress, more focus or concentration, increased alertness, and relaxation benefits. The Tai Chi group also reported that their daily activities and their overall life had been affected; many of these participants changed their normal physical activity to incorporate ongoing Tai Chi practice. The data suggest that when mental as well as physical control is perceived to be enhanced, especially if accompanied by a generalized sense of improvement in overall well being, the motivation of older adults to continue exercising also increases.

Kirsteins, Dietz & Hwang (1991) evaluated the safety and potential use of Tai Chi as a weight-bearing exercise for patients with rheumatoid arthritis. The study showed that after practising Tai Chi for 10 consecutive weeks participants were found to have no deterioration in joint tenderness or joint swelling. Yocum et al. (2000) also showed that Tai Chi in conjunction with medication, appears to improve stress and pain mechanisms in arthritis sufferers who appear as a result to live better lives and have better long-term outcomes. The authors suggest that Tai Chi appears to be safe for patients with rheumatoid arthritis and could serve as an alternative form of exercise therapy in rehabilitation programmes.

Lan, Lai, Chen & Wong (2000) showed that Tai Chi enhanced muscular strength and endurance of knee extensors in 41 community dwelling participants aged between 61 and 69 years. The results of this and other research (e.g., Lan, Lai, Chen & Wong, 1998), suggest that Tai Chi could be an effective approach to increased strength (Wolfson et al., 1996), motor skills and stability (Jacobson et al., 1997), in older adults.

Because Tai Chi is slow, graceful, and low impact, and the orthopedic complication is minimal, Tai Chi is a low technology approach that can be implemented in the community with very low cost (Lan et al., 2000).

Many of the above studies have demonstrated that Tai Chi is beneficial in a number of areas including alleviation of mood (i.e., depression, anger, anxiety), enhancing coping skills, reducing stress, increasing physical fitness and enhancing motor coordination. In particular, Tai Chi in a number of ways is beneficial for the elderly, and may serve as a cost effective rehabilitative aid. An important finding is that exercise when accompanied by cognitive strategy training programmes (i.e., Tai Chi) is more effective than exercise programmes alone (Brown et al., 1995).

Further the gender differences reported by Brown et al. (1995) where men reacted better to a physical workout, and women improved in mood may point to a gender difference (Sandlund & Norlander, 2000), although more studies on gender differences are necessary to support this notion. Some researchers claim that longitudinal studies are needed and that methods must be improved so that effects of expectancy and demand characteristics are minimized (Chen & Snyder, 1999; Jin, 1989; Sandlund & Norlander, 2000). Due to the complexity of Tai Chi, researchers themselves should have a good understanding of the elements of a particular technique before implementing it in a study. It is also necessary that when observing the effects of Tai Chi on a beginner, the beginner should be periodically evaluated on their progress and programme adherence (Snyder, 1988).

In summary, most of the studies conducted have been on elderly populations where research has shown positive results. The effects of Tai Chi on younger and middle-aged people have yet to be investigated further (Sandlund & Norlander, 2000). Because aging is associated with neurological disorders, Tai Chi is promising in terms of its psychological advantage with potential to neurological deficits such as traumatic brain injury, which is discussed in detail in the following chapter.

Chapter 3

Traumatic Brain Injury

Traumatic brain injury (TBI) affects people of all ages and is the leading cause of death and long-term disability among children and young adults in America (National Institute of Health [NIH] panel, 1999). TBI implies trauma to the brain caused by an external force impinging upon the head and brain. Most brain injuries except wounds from missiles and other penetrating objects are *closed* in that the skull remains intact and the brain is not exposed. *Open head* injuries include all injuries from any source in which the skull is penetrated, and account for less than 10% of all documented head traumas in the population (Richardson, 1990).

Prevalence of Traumatic Brain Injury

Traumatic brain injury is the most common form of brain damage (Kurtzke 1984). According to the Head Injury Society of New Zealand there are approximately 100,000 head injuries per year (Codd, 2000). Fifty percent of the injured are between 15 and 34 years old, most admitted following road accidents (Head Injury Society of NZ Inc, 2001). In the United States it is estimated that between 1.5 million to 2 million people sustain TBI each year, which results in long-lasting and often permanent alterations in their cognitive, emotional and behavioural functioning (NIH, 1999). Twenty-five percent of these cases require hospitalization, with 70,000-90,000 of the survivors demonstrating many of the chronic sequelae of TBI (Lewine et al., 1996).

Motor vehicle accidents and falls are the leading causes of head trauma in the elderly (Lezak, 1995). Falls tend to be the most common cause of TBI accounting for more than half the injuries incurred by infants and young children and by persons in the 64 and older age range (Goldstein & Levin, 1990). Accidents involving moving vehicles account for approximately half of all TBI in the other age groups (Spivack & Balicki, 1990). Assaults, whether by blows to the head or a penetrating weapon, sports and recreational activities, and the workplace, together account for from about 25%-40% of reported injuries (Lezak, 1995).

Demographics

The peak ages for TBI are in the 15-24 year range (Lezak, 1995). Males sustain injuries twice or more as frequently as females, with this sex differential greatest in the peak trauma years (Naugle, 1990). Lower socio-economic status, unemployment and lower educational levels are also risk factors for TBI, especially those due to falls or assaults (Naugle, 1990).

Financial Costs

The costs of care and rehabilitation after TBI are very high, however these costs are considerably less than the costs to the government, the family and the individual if these services are not provided. The cost to care for individuals with TBI in long-term facilities such as nursing homes, psychiatric hospitals and prisons outweighs the costs of community rehabilitation services. The cost estimate of public hospital care in New Zealand is estimated at \$25 million per annum (Head Injury Society, 1993). Taking into account loss of productivity, rehabilitation programmes, and other medical and social costs, TBI could be costing as much as \$680 million dollars per year in New Zealand (Codd, 2000). In the United States the annual costs for TBI victims exceed \$25 billion, yet relatively little funding is available for the development of better diagnostic tools and efficient rehabilitation programmes (Lewine et al., 1996). With this cost taken in to conjunction with associated health, welfare and social costs to the individuals and families, the annual bill for TBI care and rehabilitation is considerable (Head Injury Society, 1993).

Factors Governing the Outcome of Traumatic Brain Injury

One of the most important factors governing the outcome in a patient with a TBI is the nature and extent of the damage sustained by the brain. It has been suggested (Graham, 1995) that there are two main stages in the development of brain damage following injury to the head. Primary damage occurs at the moment of injury and can include lacerations of the scalp, fracture of the skull, contusions and lacerations, diffuse axonal injury, and intracranial haemorrhage. Complicating processes that are initiated at the moment of injury but may not present clinically for a period of time after the injury produces secondary damage. This includes hypoxia/ishemia, swelling, infection, and brain damage due to elevated intracranial pressure (Graham, 1995).

Another important factor governing outcome is the length of coma. According to Lezak (1995) the duration of loss of consciousness (LOC) or length of coma can serve as a measure of the severity of damage, because it correlates directly with mortality, intellectual impairment, and deficits in social skills. The longer the coma, the greater the possibility of serious impairment and death. The Glasgow Coma Scale (GCS) has been generally accepted as the standard measure for determining severity of injury in individuals whose consciousness is compromised (Kolb & Whishaw, 1996). In evaluating injury severity, a GCS range of 3 to 8 is considered severe, 9 to 12 is moderate, 13 to 15 is mild (Lezak, 1995).

Posttraumatic amnesia (PTA) has been used as another indicator of TBI and provides another index as to the severity of brain injury. The longer the duration of PTA (i.e., over 1 week), the greater likelihood of residual memory deficit (Bond, 1975). PTA > 1 hour = mild trauma; PTA 1-24 hours = moderate injury; PTA 1-7 days = severe injury; Beyond a week of amnesia, the injury is considered very severe (Kolb & Whishaw, 1996).

The level of disability following TBI is generally classified into three major categories - mild, moderate, and severe. These categories are briefly described as follows.

Mild Traumatic Brain Injury

Most cases of head trauma result in mild brain injury (between 75%-90%). Mild traumatic brain injury generally means that LOC if any, and PTA is less than 20-30 minutes (Lezak, 1995). Neuropsychological dysfunctions include attention deficits, impaired verbal retrieval, and emotional distress that usually appear within the first few days after injury (Alves & Jane, 1985). Perplexity, distractibility, and fatigue are also common in individuals with mild brain injuries (Lezak, 1989).

The consequences of minor brain injury, which are difficult to recognise and even more difficult to comprehend, can engender secondary feelings of confusion, anxiety, anger, and depression in both the TBI individual and members of the family (Pollack, 1994).

As a result of these emotions, the person with a mild TBI may overestimate the degree of cognitive and physical impairments.

A person that has suffered a mild TBI may receive no medical care or at the most brief hospitalization for routine tests and observation. Many people with mild head injuries return home and resume their normal activities within a few days. However some 5-10 percent are unable to maintain their pre-injury performance level. When it is considered that the majority of head injuries fall in this category, these cases present a significant problem (Head Injury Society, 1993).

Moderate Traumatic Brain Injury

Moderate TBI is usually characterised by a period of unconsciousness ranging from one to twenty four hours. It is estimated that up to 10% of TBI results in moderate TBI (Berrol, 1989). The nature and duration of symptoms varies widely. After recovery individuals usually can, and for the most part do, function independently. Many return to work and to their usual responsibilities, yet many are different in that they exhibit behavioural traces of localized frontal and/or temporal bruising.

Frontal damage has been observed in individuals with TBI who have lost some ability to take the initiative or be spontaneous; have greater impulsivity or subject to temper outbursts than before; or whose affective or empathic capacity is muted (Lezak, 1995). Some individuals with diminished initiative and spontaneity may no longer plan for routine activities, including most leisure time activities. Muted emotions (or affect) often show up in diminished drives: foods are no longer relished and sexual activity while still pleasurable loses both urgency and importance (Lezak, 1995).

Severe Traumatic Brain Injury

Although fewer than 10% of head trauma victims are classified as severe TBI, they present a major and growing social problem because their rehabilitation needs are so great and costly. Few return to full independent living, and their disabilities create severe financial and emotional burdens for their families. Cognitive, emotional and executive functions are affected with associated personality problems (Lezak, 1995).

Most individuals that are conscious but disabled are usually dependent for daily support because of mental and/or physical disability (usually both). This may range from continuous total dependency (for feeding and washing) to need for assistance in only one activity (i.e., dressing). People, who have cognitive disabilities such as loss of memory, poor concentration and are unable to organize their day-to-day lives, are also classified as severely disabled (Head Injury Society, 1993). Persons in whom these capacities are compromised cease to be in adequate control of themselves or their destinies: the greater the defect, the more socially dependent and socially dysfunctional they become. This accounts for the poor outcomes of so many with severe TBI (Lezak, 1995).

Cognitive Outcomes of Traumatic Brain Injury

Cognitive impairment can seriously affect one or many areas of function depending on the severity of the damage. Cognitive areas affected include attention, memory, and executive function and these are persistent in the long term (Lovell & Franzen, 1994).

Attention.

Attention deficits are one of the most persistent and common problems following TBI, and may in turn also mimic impairment in other areas of cognitive functioning, particularly so in memory (Lovell & Franzen, 1994). As attention difficulties are not localized to one specific area, but multiple areas; therefore, lesions in different areas of the brain will result in impaired attention.

Individuals with TBI frequently have difficulties with sustaining attention over long periods of time, (e.g., watching a movie, or holding a conversation). Impairments in selective attention are also common, where individuals find it difficult to concentrate on one task, while ignoring things going on around them. For example an individual may find it difficult to follow a conversation when surrounded by a chattering crowd. Divided attention is also sensitive to TBI in that there is difficulty in attending to more than one stimulus at the same time. This can show up in day-to-day living such as an inability to concentrate on several elements of a problem simultaneously.

Slowed mental processing in general, including poor concentration, heightened distractibility, and impaired “short term memory” are prevalent in individuals with TBI. Individuals with severe attention deficits may complain of confusion, inability to think clearly, and disorientation (Lezak, 1995).

Memory.

Memory deficits are among the more lasting and pervasive of neuropsychological sequelae of head injuries in adults (Grimm & Bleiberg, 1986). The majority of individuals with TBI will experience memory deficits within the year following the brain injury, over a third will suffer them a year after, with the duration depending on the time they had remained in coma, its severity, and the period of time they suffered post traumatic amnesia. (Leon-Carrion, 1997). Memory impairment can range from global amnesia, varying degrees of posttraumatic amnesia to anterograde memory difficulty, and effect the processing of verbal and/or nonverbal material (Cullum, Kluck, & Ruff, 1990).

Memory impairments after TBI are usually classified as either retrograde or anterograde amnesia. Retrograde amnesia is defined as the partial or complete loss of memory for a period of time before the traumatic event (Lovell & Franzen, 1994). This type of memory loss usually diminishes within the first few days after the injury with chronologically more distant memories returning first and with orientation returning usually in the sequence of person, place, and time (Levin, 1989). Anterograde amnesia refers to the loss of memory for events occurring after a TBI. This can occur within the context of PTA or can be more permanent.

TBI may lead to impairment in the acquisition, retention, and retrieval of newly learned information. Although the acquisition of new information may be reserved, delayed recall of this information is likely to be impaired in individuals with TBI (Brooks, 1975). Individuals with TBI, particularly those, whose damage is diffusely distributed, have reduced ability to process information as rapidly as it is presented to them. They fail to recall elements of a conversation of the evening news because they have not been able to assimilate the information as it was presented.

As with attention, memory is not a single process but instead involves multiple cognitive processes and underlying brain structures. It is often difficult to distinguish between a primary memory disorder and a more general impairment in attention or concentration secondarily disrupting memory. Often patients perform poorly on both attentional and memory tasks (Lovell & Franzen, 1994).

Executive functioning.

Executive functions refer to those abilities necessary to formulate goals and carry them out effectively (Lezak, 1982). Individuals with TBI can have deficits in executive functioning such as planning and problem solving abilities, organization and performance of tasks (Lovell & Franzen, 1994). Individuals with impaired executive functioning often do not plan or recognize and choose alternatives that are necessary for daily living.

A key factor in executive functioning involves an individual's ability to benefit from mistakes, to learn and not make the same mistake again, or to work out different approaches to overcoming an obstacle. For example, a person who takes the same route by car to work everyday hears there is an accident that has caused a traffic jam. A person with intact executive function would probably work out a different road to take to work, but a person without the necessary functioning skills might not be able to decide how to react, take the same route as always and get in trouble for being late to work.

Emotional Outcomes of Traumatic Brain Injury

The emotional state of a TBI individual has a significant effect on their recovery of function (Prigatano, 1986). As emotional disturbances associated with TBI often increase rather than decline with time (Pollack, 1994), the emotional impact of TBI may persist or worsen for as long as 10-15 years post trauma (Fordyce, Roueche & Prigatano, 1983). Further, emotional problems are not only limited to moderately and severely impaired individuals but effect those that have good cognitive recovery. Often emotional impairments develop into significant psychiatric disorders such as depression, bipolar disorder, and secondary mania (Ross, 1992).

A regular problem in individuals with TBI is agitation, characterised by cognitive disorganization, interpersonal isolation, combativeness, and affective disturbance (Jackson, Corrigan & Arnett, 1985). Agitation, hyper-arousal and aggression usually characterize disruptive behaviour. This can result in paranoia or blaming of others for negative events, which is a natural tendency when individuals do not reason effectively (Ross, 1992). Rage and violent behaviour are one of the primary problems in post TBI, often requiring pharmacologic management (Cope, 1987).

It is common for a person who survives TBI to experience distressing feelings of guilt and shame. The occurrence of these feeling would be quite understandable if that person was the drinking and driving. However when an injury is caused by unavoidable events, intense feelings of guilt and shame add their weight to the patient's already heavy burden (Pollack, 1994).

Depression is a common problem for individuals after TBI, although it is not fully understood as to whether the depression is related to TBI itself, or whether the person is reactive to the situation. Depression has serious consequences for individuals with TBI as it can compound the problems that already exist by decreasing activity levels and undermining the expression of skills possessed by the injured person (Levin, Grossman, Rose & Teasdale, 1979). An inability to comprehend a situation or anticipate what is going to happen can also lead to anxiety. Coping strategies characterised by worry, wishful thinking, and self-blame are often associated with higher levels of depression and anxiety in individuals with TBI (Curran, Ponsford & Crowe, 2000).

Diminished self-awareness is common in TBI, particularly in severe head injuries. Self-awareness is important because when compromised, so are insight and empathy which greatly impacts on cooperation for rehabilitation (Lezak, 1995). Often a person with severe TBI does not have a very good understanding of their deficits or the impact of those deficits on daily life.

Social Outcomes of Traumatic Brain Injury

In our society, TBI is a condition that is deeply discrediting and stigmatizing and survivors of TBI may be treated as incompetent, inadequate, or crazy. Frequently they

are held responsible for their situations, for example “he drove too fast” or “she wasn’t paying attention to the road conditions”. This discrimination effectively reduces the patient’s life choices, possibly limiting rehabilitation (Murphy, 1987).

Social consequences of mild, moderate, and severe TBI have serious and far-reaching implications not only for individuals with TBI, but also their families, social service agencies, law enforcement, and the courts. The consequences of TBI increase the risk of suicide, divorce, chronic unemployment, economic strain, and substance abuse (NIH, 1999).

Adverse effects occur not only in individuals with TBI but also in the lives of their family members. Long-term studies have demonstrated that the strain felt by many relatives is still high 10 years after the injury (Koskinen, 1998). Other investigators have shown that high levels of emotional distress, leading to clinical depression have been noted in the family members of individuals who remain in a vegetative state, have marked personality changes, or require constant supervision at home (Bontke, Zasler & Boake, 1995).

Failure to return to work is one of the most devastating consequences of TBI. The social and personal consequences of such failure contribute directly to deterioration in the quality of life (McMordie & Barker, 1988). Return to work is crucial to the autonomy of the individual and hence merits special attention. It has also been shown that more women than men return to work and that socio-economic status is highly predictive of a return to work (Crepeau & Scherzer, 1993).

There is the financial burden as well. For severe TBI the lifetime cost (US dollars) is over \$3 million; for moderate injury, \$941,000; and for mild trauma \$85,000 (NIH, 1999). It has been suggested that these figures may grossly underestimate the economic burden of TBI to family and society because they do not include lost earnings, costs to social services systems, and the value of the time and foregone earnings of family members who care for persons with TBI (NIH, 1999).

Coping with Daily Living

Discharge and returning home can be an extremely stressful and difficult time for both the individuals with TBI and their families. Both their life and the families have changed dramatically. As individuals with TBI attempt to resume their usual daily activities, the environment places increasing demands on them, uncovering additional psychosocial consequences. For example, executive dysfunction may become obvious only in the workplace; behavioural changes affecting interpersonal relationships may appear after leaving inpatient care (NIH, 1999).

In a report on research undertaken by the Head Injury Society of New Zealand Inc (1993), individuals with TBI reported that the most significant areas of difficulty for them were in the cognitive and psychosocial areas. Other common difficulties reported were fatigue, epilepsy, and constant headaches. They also reported that the most significant areas of difficulty in daily living activities were employment, leisure, recreation and social activities. Loss of ability and confidence in social skills was commonly commented upon (Head Injury Society, 1993).

In addition, an individual's participation in sports and outdoor activities had decreased since the injury by 72%. There were a wide range of reasons for this, the most common being poor co-ordination, decreased concentration, poor memory and fatigue. More than a third (38%) of those with TBI found it difficult to make friends after their TBI. The most common reasons given by the individuals for their difficulties were lack of confidence, decreased self-esteem and lack of motivation (Head Injury Society, 1993).

Loneliness is both the most common and the most distressing of the long-term effects of TBI (Fordyce et al., 1983), and can affect the recovery process. According to Pollack (1994), every mild TBI causes some disturbance of the individual's sense of self. This can range from feelings of different-ness or estrangement to a total disconnection from the person's past identity. Although individuals with TBI may be unaware of the reasons for these changes, they are usually aware that something disturbing has occurred. This can result in the world being experienced in a different way after TBI leading often to withdrawal from interpersonal relationships (Pollack, 1994).

To summarize, physical, mental, emotional, and psychosocial factors are among the most common residuals secondary to TBI. Traumatic brain injury has long lasting effects, and as such the consequences can be devastating to not only the TBI sufferer, but to their family, and society. The adjustment to these changes in every daily life can be difficult for the TBI survivor, particularly if they cannot comprehend the extent of their injuries. Further if they cannot comprehend the extent of damage, this may greatly affect the rehabilitation process.

Rehabilitation for Individuals with Traumatic Brain Injury

Cognitive and behavioural rehabilitation have been shown to be useful for individuals with TBI (NIH, 1999). Restorative training is used to improve a specific cognitive function, whereas compensatory training is used to teach an individual to adapt to the presence of a cognitive deficit. Cognitive exercises such as computer programmes have been used to improve specific neuropsychological processes such as attention, memory and executive skills (NIH, 1999). Compensatory training such as the use of memory books and paging systems are used to improve particular cognitive functions and to compensate for specific deficits.

Psychotherapy is used to treat emotional and personality problems in individuals with TBI such as depression and loss of self-esteem, which can be associated with cognitive dysfunction (Pollack, 1994). The involvement of family and significant others is equally important to psychotherapy as it is for the individual with TBI. Psychotherapy encourages emotional support, providing explanations of the injury and its effects, assisting an individual to achieve self-esteem in the context of realistic self-assessment, reducing denial and assisting an individual to relate to family and society.

Behavioural modification has been used to address the personality and behavioural effects of TBI (NIH, 1999). Retraining of social and independent skills is implemented so that individuals with TBI are able to cope with everyday interpersonal and functional needs. As an individual becomes competent in coping with life demands, frustrations and behavioural problems diminish in frequency. Pharmacological intervention has also been useful in behavioural and affective difficulties after TBI (Ross, 1992), however the effectiveness of pharmacological intervention needs further investigation (NIH, 1999).

As work is among the most significant outcomes of successful rehabilitation for individuals with TBI, vocational strategies such as supported employment and job coaching are commonly used after TBI (NIH, 1999). Comprehensive interdisciplinary rehabilitation involving individually tailored interventions, provided by experienced professionals is also used for individuals with TBI. Alternative approaches such as nutritional support, music, art therapy, education, and acupuncture which are also commonly used to treat individuals with TBI, however the efficacy of these approaches have not been widely studied (NIH, 1999).

Many of the above interventions discussed have been used in the rehabilitation of individuals with TBI, however more research is required to validate their effectiveness and efficacy (NIH, 1999). An important aspect of rehabilitation in TBI is to consider the needs, strengths, and capacities of each individual and to modify those needs as they change over time. Furthermore the individual's home, social and work environment is of paramount importance to ensure fuller participation in all aspects of their lives. Based on chapter 2, it appears that Tai Chi may be a valuable intervention that could assist in some of these TBI difficulties.

Chapter 4

The Present Study

This review of the research on Tai Chi has revealed that it has mainly been conducted with older adults with little emphasis in other populations. Specifically none was located that examined the effects of Tai Chi on TBI. It would seem worthwhile then to explore whether the reported benefits of Tai Chi found in older adults (e.g., physical and mental functioning), also apply to individuals with similar neurological impairments to older adults. The proposed study sets out to explore whether Tai Chi has any self-reported psychological effects for individuals with TBI.

TBI can result in impairments in physical, cognitive, behavioural, emotion, and psychosocial domains, often resulting in years of rehabilitation, loss of income, isolation, and disrupted relationships. One reason for expecting that Tai Chi might be of assistance to those with TBI is that Tai Chi is a gentle non-stressful art form characterised by soft flowing movements that can be practised regardless of age, sex, and fitness level. Tai Chi also has a physical and psychological component. Tai Chi Chuan (or Tai Chi) is a Chinese Martial Art that has been shown to improve mood, balance, coordination, cardiovascular and respiratory functions, fatigue, general wellbeing, motor skills, and to reduce stress. Physical exercise and cognitive retraining have been shown to benefit individuals with TBI in their rehabilitation process. Tai Chi could provide an alternative to, or an adjunctive in both physical and cognitive retraining, as well as providing a useful forum for social interaction and peer support for individuals with TBI. The proposed study would examine whether there are any social, physical and cognitive benefits in practising Tai Chi after TBI.

As Tai Chi is also a Martial Art, it could appeal to younger males with TBI who sustain injuries twice or more as frequently as females. If shown to benefit individuals with TBI, Tai Chi could be implemented as a low cost programme to assist with rehabilitation. The proposed study will contribute to the growing body of psychological research in the areas of Tai Chi and TBI.

Aims of this study

The main aims of this study are:

To determine in a group with TBI whether Tai Chi will:

- (a) have an immediate effect on mood states.
- (b) improve both perceived physical and emotional functions.
- (c) improve self-esteem.
- (d) improve social functioning.
- (e) improve perceptions of health.

Hypotheses

1. That there will be no difference between the two groups on the Medical Outcome Scales Short-form 36 (SF-36) and the Rosenberg Self-Esteem scale (RSES) prior to commencement of Tai Chi training sessions.
2. That individuals with TBI will report improvements in their mood immediately after *each* Tai Chi session.
3. That *on completion* of a course in Tai Chi, individuals with TBI will report more improvements in their general physical, mental well-being and social interaction than a control group during the course of the study.

Chapter 5

Method

Experiment Design

This study utilized a within group design, testing the immediate effect of Tai Chi on individuals with TBI and a between groups design, testing the longer term effects that Tai Chi may have had on general well being compared to a control group.

Participants

Eighteen participants, nine females (mean age = 40.2, SD = 12.5 yrs) and nine males (mean age = 51.2, SD = 8.7 yrs), were recruited through the Head Injury Society of NZ Inc. All participants had suffered trauma to the brain (i.e., due to vehicle accidents, work-related accidents, cerebral bleeding, hemorrhage, fall, tumor, or meningitis) that had resulted in either a mild, moderate or severe brain injury. The average time since the injury for participants was 8.7 years. They came from different walks of life (professionals, self-employed, students, beneficiaries' etc) and various ethnic backgrounds (New Zealand non Maori, and Indian).

Participants had volunteered to take part in the study subsequent to a talk given by the researcher and her supervisor regarding the study at a meeting of the Head Injury Society of NZ Inc. Those individuals who were interested in participating in the study had added their names and contact details to a list circulated and were contacted by phone. Those meeting the inclusion criteria (listed below) and still interested in participating in the study were offered a free Tai Chi course as compensation for their time, and asked to attend an initial discussion and information session given by the researcher. The initial talk also provided an opportunity for the participants to ask questions about the study.

Those assigned to the control group did not attend the initial discussion but were contacted via the phone by the researcher where a discussion of the study took place. The control group were also offered a free Tai Chi course but at the completion of the study. It was made clear to all individuals that non-participation at any time during this

study would have no impact on their involvement with the Head Injury Society of NZ Inc.

The inclusion criteria were that individuals had sustained a mild, moderate, or severe TBI, according to the standard criteria:

- had some type of retrograde and/or anterograde amnesia
- and/or posttraumatic amnesia
- and/or loss of consciousness with associated outcomes (i.e., have some degree of brain injury or outcome).

During the initial discussion and information meeting held at Massey University participants were advised of the venue: Whanau room of the College of Humanities and Social Sciences, Massey University, Wellington. Participants were also advised that transport would be provided to and from the venue by the researcher at no extra cost. The expectations that participants may have had about Tai Chi were discussed at the outset of the study. The reason was that some participants might have had false hopes regarding the benefits of Tai Chi especially if the outcome was not as favorable as they were expecting.

Participants were also advised that Tai Chi training had not been trialed with people with TBI before. Participants in the Tai Chi group were given a folder each to bring to each class for keeping handouts and to offset memory difficulties. They were given a full briefing on the type of clothing to wear (e.g., loose clothing), the duration, days, times, and length of the course.

At the end of the initial meeting all individuals still interested in taking part in the study were provided with a questionnaire, along with a cover letter, information sheet (Appendix 1.), consent form (Appendix 2.), and a Tai Chi information pamphlet (Appendix 3.). The questionnaire included demographic questions as well as questions about individuals history of TBI. The researcher explained to the participants that any personal information obtained in the questionnaire would only be used to gain the data needed to describe the participant population in general terms. A Tai Chi pamphlet was included to give potential participants an overview of what Tai Chi entailed.

Participants were advised that if they have any further questions regarding the study, they could contact the researcher.

Informed consent was obtained in line with the Code of Ethical Conduct for Research and Teaching Involving Human Subjects. There was also implied consent by the completion of the questionnaire.

Procedure

This study was reviewed and approved by the Massey University Human Ethics Committee, WGTN Protocol 01/110.

Participants were randomly assigned to one of two groups, an experimental group and control group. Both groups initially completed the demographic questionnaire, the Medical Outcome Scale Short Form 36 (SF-36) and the Rosenberg Self-Esteem Scale (RSES) (3 weekly) before, during, at the completion of the Tai Chi course and 3 weeks after the experiment had finished. The control group completed the demographic form via the researcher who recorded their details over the phone and they also completed the two questionnaires that were mailed to them. The Tai Chi group completed the demographic form at the initial discussion and the other questionnaires before their Tai Chi training. It took 15 to 20 minutes each time the participants completed the two questionnaires.

The Tai Chi group participated in a 6-week Tai Chi course twice a week for 45 minutes and was asked to complete a Visual Analogue Mood Scale (VAMS) before and after each Tai Chi session, which took 5 minutes to complete each time. These measures were used to assess for any immediate affects after practising Tai Chi.

The Tai Chi taught in this study was based on a standard introductory course of Tai Chi that was modified for individuals with TBI by the Principal and Grandmaster of the Shaolin Chuan Fa School (SCF) in conjunction with the researcher (also a Tai Chi instructor). The standard and traditional Tai Chi course that is taught over 8-weeks, once a week by the SCF, was modified to twice weekly sessions over 6-weeks, so that the techniques learned were retained for those participants that had memory deficits. To

offset memory difficulties, a handout depicting pictures and names of the forms being taught (Appendix 4.) was given to each participant so that they could practice at home. These were kept in folders already supplied. Participants were also encouraged to mirror the instructor (when facing the class) to prevent confusion of techniques and to offset any visuo-spatial problems.

The instructor (also the researcher) and the assistant that taught the Tai Chi course were fully qualified instructors from the SCF School. Grandmaster Robert Gemmell's system of Tai Chi is based on the traditional Chen Style. The course consisted of various Tai Chi basics, breathing and stepping techniques, and 5 forms from the 38-step frame. Participants followed the principal instructor at the front with the aid of the assistant at the side of the class. In keeping with the traditional teachings of Tai Chi, at each lesson the instructor revised the previous lesson and participants were encouraged to rest when they needed to. Chairs were assembled at the side of the room for this purpose. A flowchart of the procedure as described in this chapter is shown in Figure 1, below.

Experimental Group (Tai Chi)		Control Group (Waiting list)
1.	Invited to take part in study	Invited to take part in study
2.	Initial discussion and meeting	Discussion by phone
3.	Tai Chi course commences	—
	Session 1. VAMS/ SF-36/ RSES	First post out – SF-36/ RSES
4.	Sessions 2-6. VAMS	—
5.	Session 6. VAMS/ SF-36/ RSES	Second post out - SF-36/ RSES
6.	Sessions 7-12. VAMS	—
7.	Sessions 12. VAMS/ SF-36/ RSES	Third post out - SF-36/ RSES
8.	Follow up (3 weeks post study) SF-36/ RSES	Follow up: post out - SF-36/ RSES
9.	—	Tai-Chi course offered

Figure 1. Flow chart of procedure for experimental and control group.

Measures

All psychometric measures were selected on the basis of their reliability, validity and their suitability for measuring neurologically impaired individuals, namely ease of use by participants, and their relatively short response time frame. One-week prior to the commencement of the Tai Chi course, all participants were asked to complete a number of self-rating scales. These scales consisted of the Rosenberg Self-Esteem scale (RSES) (Rosenberg, 1965), the Medical Outcomes Scales Short-form 36 version (SF-36) (Ware & Sherbourne, 1992), and the Visual Analogue Mood Scale (VAMS) (Stern, 1997).

An independent person experienced in administering neuropsychological and psychometric tests conducted the evaluation so that the researcher/instructor was blind to the evaluations until the completion of the course. This minimized the influence that the researcher may have had on any evaluation by participants.

SF-36

The SF-36 is a self-rating multi-item short form health survey with 36 questions on physical and mental health. It is a generic measure, as opposed to one that targets a specific age, disease, or treatment group. The SF-36 is well validated and has high reliability (0.93) with test-retest correlations of 0.9 (Ware, 2000).

The SF-36 assesses eight health concepts: 1) limitations in physical activities because of health problems; 2) limitations in social activities because of physical or emotional problems; 3) limitations in usual role activities because of physical health problems; 4) bodily pain; 5) general mental health (psychological distress and wellbeing); 6) limitations in usual role activities because of emotional problems; 7) vitality (energy and fatigue); and 8) general health perceptions. It also has two summary scales summarizing a person's general physical and mental health.

For this study the Australia/New Zealand 1.0 version of the SF-36 Health Survey was used. There are several versions for differing populations including four-week, two-week, and immediate time periods. The standard four-week version of the form was used. As shown on Figure 1, this form was administered four (4) times in the

experiment; prior the first lesson, in the middle of the course (after the 6th lesson), at the completion of the course (12 lessons), and at the 3-week follow-up period.

RSES

The RSES was administered at the same time as the SF-36 form and was used to monitor the self-esteem of the individuals during the experiment. The RSES is a self-rating ten-item scale that measures global self-esteem. The scales deal with general feelings about ones self (e.g., On the whole, I am satisfied with myself). Individuals rate themselves on each statement ranging from strongly agree to disagree on a 4 point scale. The RSES is highly reliable (0.92) and has test-retest correlations of 0.85 and 0.88 (Rosenberg, 1965).

VAMS

The VAMS are reliable (test-retest coefficients of 0.69-0.84) and valid measures of 8 specific mood states: Afraid, Confused, Sad, Angry, Energetic, Tired, Happy, and Tense (Stern, 1997; Arruda, Stern, Somerville & Bishop, 1997). These scales place minimal cognitive or linguistic demands on the respondent and are appropriate for neurologically impaired individuals or those who are unable to complete more verbally or cognitively demanding instruments. The scales have a "Neutral" schematic face (and accompanying word) at the top of a 100 mm vertical line and a specific "mood" face (and word) at the bottom of the line. Participants placed a mark across the line at the point that best described how they were feeling on the day of their participation. The VAMS was used because they are brief, easily administered, and valid measures of mood states (Appendix 5).

Chapter 6

Results

Hypothesis 1

That there will be no difference between the two groups on the Medical Outcome Scales Short-form 36 (SF-36) and the Rosenberg Self-Esteem scale (RSES) prior to commencement of Tai Chi training sessions.

As predicted, and as is shown on Table 1, there was no difference between the two groups on the SF-36 and RSES before commencing Tai Chi, confirming that the two groups were equal on these dimensions prior to the experimental procedure.

Table 1

Comparison of the SF-36 and RSES Results for Tai Chi & Control Groups Before Commencement of Tai Chi sessions

	Tai Chi		Control		<i>T</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
<i>SF-36</i>					
<i>Summary Scales</i>					
Physical Health	236.36	94.59	191.53	73.93	1.030
Mental Health	206.78	61.81	314.77	63.70	-0.246
<i>Independent Scales</i>					
Physical Functioning	71.43	28.68	74.38	21.62	-0.227
Role Physical	35.71	35.36	15.63	35.20	0.938
Bodily Pain	69.93	23.80	51.90	27.30	1.353
General Health	59.29	33.35	49.63	16.38	0.728
Vitality	40.71	22.25	38.75	4.43	0.245
Social Functioning	51.79	18.30	48.44	18.22	0.354
Role Emotional	57.14	46.00	58.33	50.00	-0.048
Mental Health	57.14	16.61	69.25	15.53	-1.459
<i>RSES</i>	56.66	22.20	58.25	18.88	-0.149

Hypothesis 2

That individuals with TBI will report improvements in their mood immediately after each Tai Chi session.

The means and standard deviations, and t scores for the Visual Analogue Scale (VAMS) before and after each Tai Chi session are shown on Table 2. As predicted, individuals reported statistically significant improvements on all dimensions of the VAMS after each Tai Chi session with the exception of tiredness.

Table 2

Summary Data for the Visual Analogue Scale (VAMS)

Scale	Before		After		<i>T</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Afraid	57.03	8.10	51.62	6.63	3.05*
Confused	60.86	10.81	53.78	7.66	3.88*
Sad	63.30	12.52	55.81	11.44	5.30*
Angry	59.55	11.41	54.74	10.83	4.44*
Tense	57.19	6.47	48.69	4.82	6.74*
Energetic	43.12	5.06	49.15	4.83	-7.20*
Happy	43.54	5.46	46.69	4.31	-3.90*
Tired	54.42	6.03	52.52	5.82	1.10

* Significant at .05 level

Comparisons between the results before and after Tai Chi practice for each dimension on the VAMS scales are shown in Figure 2.

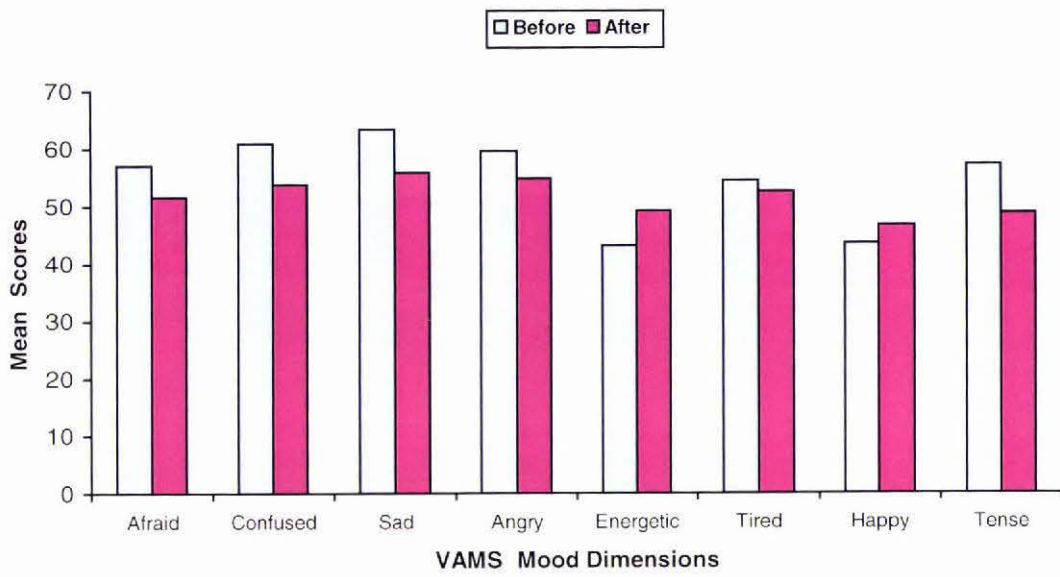


Figure 2. Comparisons between the mean scores before and after Tai Chi classes for the VAMS Scales.

Hypothesis 3

That on completion of a course in Tai Chi, individuals with TBI will report more improvements in their general physical, mental well being and social interaction than a control group during the course of the study.

None of the between group comparisons shown on Table 3, listing the results for the SF-36 and RSES was significantly different.

Table 3

Comparison of the SF-36 and RSES Results at Completion of the Tai Chi Course for the Tai Chi & Control Groups

	Tai Chi		Control		<i>T</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
<i>Summary Scales</i>					
Physical Health	220.30	98.27	207.44	83.47	0.274
Mental Health	182.78	70.16	209.00	88.11	-0.631
<i>Independent Scales</i>					
Physical functioning	72.79	22.84	75.63	21.95	-0.245
Role Physical	25.00	23.80	25.00	46.30	.000
Bodily Pain	64.64	25.45	54.69	29.42	0.696
General Health	57.86	35.10	52.13	14.60	0.424
Vitality	47.14	18.22	47.50	20.18	-0.036
Social Functioning	48.21	15.19	52.50	30.12	-0.340
Role Emotional	28.57	35.63	50.00	43.64	-01.03
Mental Health	58.86	22.12	59.00	20.18	-0.013
<i>RSES</i>	61.90	22.68	65.00	25.45	-0.247

Comparisons between the Tai Chi and control group before and at completion of the Tai Chi course for the SF-36 dimensions are shown in Figure 3.

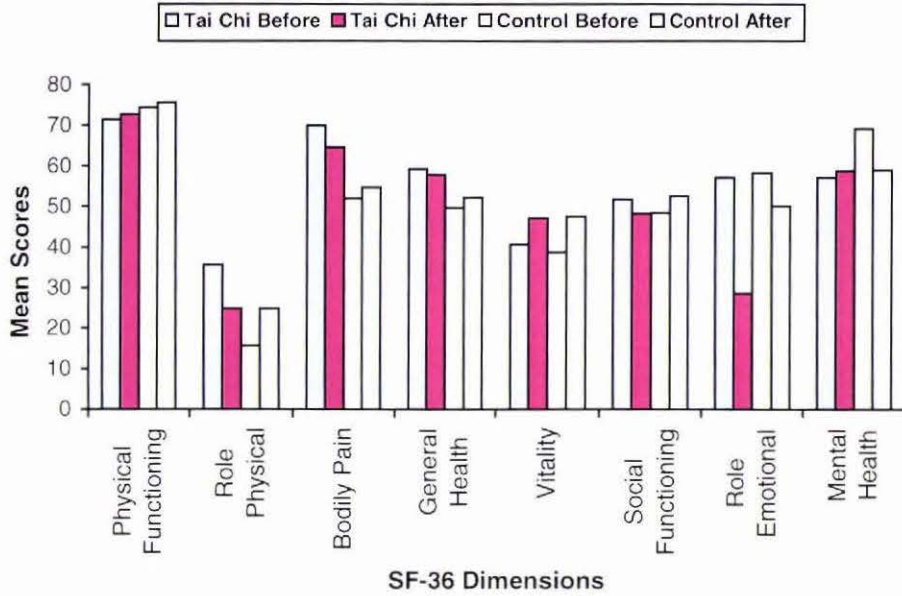


Figure 3. Comparisons between the Tai Chi and control group before and at completion of the Tai Chi course for the SF-36.

A one-way repeated measures ANOVA was conducted to compare scores for the individual dimensions of the SF-36 and the RSES to determine any differences over time. Within group scores across the four time periods (before, during, after, and follow up) for control and experimental groups separately were compared. As shown on Table 4, no significant differences were found over time for either group.

Table 4

The Results of a Repeated Measures ANOVA for the SF-36 and RSES comparing the Tai Chi and Control groups individually across time

	Group	Wilks' - Lambda	<i>F</i>	<i>P</i>	<i>Eta</i> <i>Squared</i>
<i>Summary Scales SF-36</i>					
Physical Health	Tai Chi	0.757	F (3,4) = 0.428	0.744	0.243
	Control	0.749	F (3,5) = 0.557	0.666	0.251
Mental Health	Tai Chi	0.643	F (3,4) = 0.741	0.581	0.357
	Control	0.473	F (3,5) = 1.859	0.254	0.527
<i>Independent Scales SF-36</i>					
Physical functioning	Tai Chi	0.406	F (3,4) = 1.952	0.263	0.594
	Control	0.841	F (3,5) = 0.315	0.815	0.159
Role Physical	Tai Chi	0.735	F (3,4) = 0.481	0.713	0.265
	Control	0.455	F (3,5) = 2.000	0.233	0.545
Bodily Pain	Tai Chi	0.853	F (3,4) = 0.229	0.872	0.147
	Control	0.605	F (3,5) = 1.088	0.435	0.395
General Health	Tai Chi	0.482	F (3,4) = 1.435	0.357	0.518
	Control	0.568	F (3,5) = 1.269	0.380	0.432
Vitality	Tai Chi	0.522	F (3,4) = 1.220	0.411	0.478
	Control	0.748	F (3,5) = 0.562	0.663	0.252
Social Functioning	Tai Chi	0.331	F (3,4) = 2.691	0.181	0.669
	Control	0.881	F (3,5) = 0.225	0.875	0.119
Role Emotional	Tai Chi	0.449	F (3,4) = 1.635	0.316	0.551
	Control	0.662	F (3,5) = 0.851	0.513	0.338
Mental Health	Tai Chi	0.395	F (3,4) = 2.042	0.251	0.605
	Control	0.478	F (3,5) = 2.226	0.203	0.575
<i>RSES</i>					
	Tai Chi	0.398	F (3,4) = 2.017	0.254	0.602
	Control	0.574	F (3,5) = 1.239	0.388	0.426

Although there were no significant between groups or within group differences over time, there was a general increase in the RSES. Figure 4 illustrates the comparisons between the Tai Chi and control groups over the four testing periods.

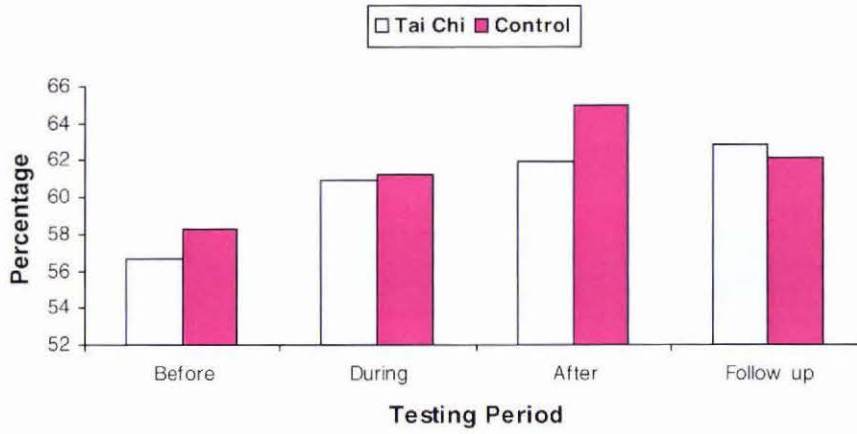


Figure 4. Comparisons between the Tai Chi and control group before, during, after and at the follow up period for the RSES.

Post Hoc Qualitative Evaluation

Subsequent to the above results the following unsolicited comments from one participant arose from this study.

A relaxed and calm mind is the most beneficial thing I can think of that really helps, with anything for that matter. Not that I have, and not that I didn't know that, just nobody; including various health professionals suggested how I might achieve it. It can be hard to slow down a racing and tired mind and drugs have never been my choice although at times I would have taken anything for relief. It's not always convenient to for a run or surf and it's a one-time hit! Sitting on a lawn counting daisies or whatever really doesn't do it.

Tai Chi has been a lifesaver in dealing with both the effects of a head injury, and for want of a better word, 'well-being'. While the head really physically feels it at the time it's the result later that's good. Nothing has ever produced that result, and a calmer mind helps the attitude, makes for a more peaceful environment, and the cognitive stuff becomes less of an issue and more do-able, and then becomes self-perpetuating. Sleep is now even longer than three hours at a time. That's very significant. I can picture some of the results from your thesis, but there's a whole lot more that would have been beyond the scope of the questionnaires. I have obviously not achieved perfection here, but it's progress that counts!

Chapter 7

Discussion

The present research set out to evaluate whether Tai Chi Chuan (Tai Chi) would have an immediate positive effect on mood in individuals with TBI. The research also set out to determine whether practising Tai Chi would have a positive effect on social interaction, physical and mental health over time, i.e., from outset, through to follow-up. The effects of Tai Chi for the difficulties reported by individuals with TBI had not been considered in previous Tai Chi research.

As predicted, there was no difference between the control and Tai Chi groups on the SF-36 and RSES before commencing Tai Chi, confirming that the two groups were equal on these dimensions prior to the experimental procedure.

Mood

Also as predicted, mood in general was improved immediately after each Tai Chi session with participants reporting significant improvements on all dimensions of the VAMS with the exception of tiredness. Specifically, immediately after participation in Tai Chi, individuals were less tense, afraid, confused, angry and sad, and felt more energetic and happy.

These results are consistent with other findings where mood improved significantly during and after Tai Chi practice (e.g., Brown et al, 1995; Hernandez-Reif et al, 2001 & Jin, 1989), however the difference in the current study compared to other findings, is that Tai Chi for the first time has been shown to improve mood in individuals with TBI. Although this was a pilot study, these findings have important significance for TBI and rehabilitation. Previous research (e.g., Prigatano, 1986) has shown that emotional states of an individual with TBI can have a significant effect on their recovery function, and that emotional disturbances often increase rather than decline with time (Pollack, 1994). Emotional problems can develop into significant psychiatric disorders such as depression (Ross, 1992). Depression has serious consequences for individuals with TBI as it can compound the problems that already exist by decreasing activity levels (Levin et al, 1979). This study has shown that Tai Chi improved mood in the TBI group and

therefore could assist in alleviating symptoms of depression such as fatigue and sadness, common problems after TBI. The results of this study also indicate that individuals with TBI felt more energetic and happier after practising Tai Chi. This is consistent with studies (e.g., Jin, 1989) that have shown reductions in depression, fatigue and anxiety.

Anger and aggression are also problems associated with TBI, often requiring pharmacological (Cope, 1987) and behavioural management (Corrigan & Jakus, 1994) in individuals with TBI. The results of this study show that short-term practice of Tai Chi has an immediate effect in reducing anger. These results support other studies that have also found Tai Chi to be effective in reducing anger (Brown et al, 1995; Jin, 1989). Tai Chi could assist in anger management programmes, or coping strategies for aggressive behaviour in individuals with TBI as well as serving as a complementary or alternative to drug therapy. Furthermore the breathing component of Tai Chi may also assist individuals in relaxation, relieving tension and increasing awareness of oneself and surroundings. This current research showed that individuals with TBI were less tense immediately after practising Tai Chi as had been reported for other groups (Jin, 1989; Brown et al, 1995).

Psychosocial difficulties are common after TBI and can lead to decreased confidence, self-esteem and lack of motivation in individuals with TBI (Head Injury Society, 1993). In this study participants reported feeling less afraid immediately after practising Tai Chi. If Tai Chi reduces fear in individuals with TBI, then it could improve their self-confidence and motivation, particularly in decision-making, thus increasing self-esteem and sense of control. These results lend support to other literature where Tai Chi reduced the fear of falling in older adults (Wolf et al., 1996). This point itself is worth further investigation as half of all TBI is caused by falls (Lezak, 1995).

Cognitive difficulties such as attention are one of the most persistent problems after TBI and can result in confusion, an inability to think clearly and disorientation (Lezak, 1995). This study showed that individuals with TBI were less confused after practising Tai Chi. The reduction of confusion could assist persons with TBI to concentrate more clearly on various tasks. Tai Chi has also been shown to improve concentration with

older adults (Kutner et al., 1997), and could be easily implemented as part of a rehabilitation plan to assist individuals with TBI in overcoming difficulties like attention or concentration.

Social Interaction, physical and mental health

The Tai Chi group *did not* however report significant improvements in their social interaction, physical and mental health when compared to a control group as measured by the SF-36, and RSES over the course of the study (i.e., four time periods - before, during, after, and follow up). Furthermore, there were no significant within group differences between the four time periods on the SF-36 and RSES.

The null hypotheses that physical, mental health and social interaction would improve was inconsistent with the Kutner et al. (1997) finding that Tai Chi exercise contributes to a higher positive psychosocial well being. However it is possible that participants in this study felt less tense and therefore may have felt more relaxed and less stressed after Tai Chi. Furthermore Kutner et al. advocated that many of the participants changed their normal physical activity to incorporate ongoing Tai Chi practice. Although not tested directly, similar observations were found at the completion of this study and at the follow-up session, where participants reported that they viewed the social interaction with others as an important factor in their Tai Chi training. In addition some participants joined other Tai Chi clubs including one individual who enrolled in an intensive 3-month full time Tai Chi course.

The feedback from participants was inconsistent with the non-significant results found in this study. One explanation could be that a majority of other studies were conducted on older adults therefore the measures employed were not specific to TBI. It is interesting to note that this study and that of Kutner et al's., who also used the same questionnaires (SF-36 & RSES) to measure self-esteem and general health showed non-significant results. However Kutner et al. used a range of other measures to test general health. The difficulty with using many scales versus few with TBI is that individuals could find this tiring, particularly if suffering from fatigue. It is recommended that future studies incorporate shorter measures that take into consideration TBI deficits such as fatigue.

Furthermore, the non-significant results on the mental health component of the SF-36 were also inconsistent with the significant improvements found on the VAMS mood scale after each Tai Chi session. One explanation could be that the SF-36 tested different constructs of mental health compared to the VAMS, which is a measure specifically targeted to a TBI population.

Limitations of the Study

One of the major issues limiting the internal and external validity of this research is the reliability and validity of the assessment instruments used. As mentioned above one explanation for the non-significant results found in physical and mental health could have been because the two measures (SF-36 and RSES) used were not specific enough for a population with neurological impairments. Feedback from both the control and Tai Chi group revealed that the SF-36 questionnaire was too general and did not seem to relate to their brain injury sufficiently enough.

Memory difficulties present in some participants with TBI could also have confounded the outcome of the results. The SF-36 questionnaire asks questions about an individual's view about their health, how they feel and how well they are able to do their usual activities. A majority of these questions are based on the individual's ability to recall what they felt in the past 4 weeks as they fill in the forms. Because most of the participants had some type of memory deficit (i.e., self report of "short-term memory difficulties") as a result of TBI, it is fair to assume that some of them could have answered the questions inaccurately and/or found it hard to remember any improvements in the past 4 weeks. Asking participants about their immediate reactions to the previous 4 weeks is not going to provide information of the same reliability and validity as asking them soon after the event if they have memory impairments.

Participants in both the Tai Chi and control groups commented on the length of time that it took to complete the questionnaires. In particular the Tai Chi group reported feelings of tiredness before beginning their Tai Chi lessons, especially when they had to fill in 3 questionnaires that took 20-30 minutes to complete. Some participants reported feeling confused and irritated over the questions and that they had difficulties in

understanding the instructions given, and often had to ask the administrator to repeat or read aloud the instructions. The administrators also reported that some participants became confused and forgot they had consented to fill in the forms prior to Tai Chi training. These difficulties encountered by participants might have contributed to them feeling more irritable and stressed than usual which may have had an effect on the outcome of the measures used. In addition participants may already have been irritable and stressed due to their TBI. In either case Tai Chi may have had a calming and balancing effect on their irritableness and stress levels.

The participant group reported positive experiences after practising Tai Chi, and although there was a slight improvement pre to post intervention, the results were non-significant for self-esteem. Statements like “I feel that I’m a person of worth, at least on an equal plane with others” (see Appendix 6.) on the RSES may not have adequately reflected how the person was improving in Tai Chi on other levels relating to their TBI. For example a qualitative comment reported by one participant who found the Tai Chi course to be beneficial said: “*there's a whole lot more that would have been beyond the scope of the questionnaires*” (p.58).

Future Research

Taking into consideration the participant’s feedback and the measures used in this study, it is recommended that in future studies involving Tai Chi and TBI, researchers consider the measures they intend to use very carefully. The measures employed need to be specific to TBI rather than general well-being and health. It is probable that the SF-36 and RSES failed to capture the constructs as they apply to TBI sufficiently well. Deficits such as memory and fatigue need to be taken into consideration for future studies, particularly the length and complexity of measures selected.

Long-term and larger scale studies are recommended, particularly in physical, cognitive, psychosocial and behavioural domains involving individuals with TBI and Tai Chi. Individual differences also need to be taken into account such as age, gender, and personalities when looking at future studies. The results of this study confirm that Tai Chi has an immediate effect on mood in individuals with traumatic brain injury, a result that could be further explored in other neurological domains. Furthermore individuals

with TBI could utilize the immediate effect of Tai Chi as part of an effective stress management plan.

Researchers need to consider the location of participants, the venue, and associated difficulties (e.g., fatigue) that individuals with TBI may encounter to get to Tai Chi. Easy access to the venue is suggested with brief shorter time periods (e.g., once a week).

As Tai Chi is a non-invasive art form it could be successfully adapted and applied to a variety of rehabilitation programmes offered to individuals with TBI. Tai Chi masters advocate that one should enjoy Tai Chi practice and incorporate it into their daily living, thus Tai Chi may be suited to those who enjoy the philosophical and mental aspect of this unique Martial Art. Even though Chinese Martial Arts are relatively new to Western science, there are several other internal styles such as Chi Gung (cultivating energy) that could be explored. Chi Gung utilizes similar techniques to Tai Chi, however there are no specific forms as taught in Tai Chi, which could be beneficial for individuals who are neurologically impaired or who have memory difficulties.

Researchers have advocated that studies on Oriental Martial Arts could be improved by understanding their cultural and psychic integrity (Columbus & Rice, 1991). Tai Chi is based on collective Chinese culture and philosophies; therefore researchers should have a basic understanding of the art. While researchers are skilled in their own fields, they should be aware of their limited knowledge in Tai Chi, thus regular communication between the teacher and researcher is emphasized. Fully qualified teachers are also recommended to ensure correct technique and philosophies are taught.

Summary

This research has aimed to explore whether there are any self-reported psychological benefits of Tai Chi for individuals with TBI. The results of this study confirm that mood is improved through Tai Chi practice. Non-significant improvements were found for self-reported physical, mental and social functioning. It is suggested that further studies using measures that are more pertinent to the constructs in question, are required. This study has demonstrated the importance of Tai Chi on mood in

individuals with TBI and contributes to the growing body of psychological research in the areas of Tai Chi and TBI.

References

- Alves, W.M. & Jane, J.A. (1985). Mild brain injury: Damage and outcome. In D.P. Beck & J.T. Povlishock (Eds.), *Central nervous system trauma status report-1985*. Washington, D.C.: National Institutes of Health.
- Arruda, J.E., Stern, R.A., Somerville, J.A., & Bishop, D.S. (1997). Description and initial validity evidence for the Visual Analog Mood Scales in a neurologically impaired population (Abstract). *Journal of Neuropsychiatry and Clinical Neurosciences*, 9, 152.
- Berrol, S. (1989). Moderate head injury. In P. Bachy Rita (Ed.). *Traumatic brain injury*. New York: Demos.
- Bin, W., Gongbao, Y., & Xingdong, L. (1992). *Chinese Wushu series: Essentials of Chinese Wushu*. Foreign Languages Press, Beijing.
- Bond, M.R. (1975). Assessment of the psychosocial outcome after severe head injury. *Foundation Symposium*, 34, 141-157.
- Bontke, C.F., Zasler, N.D., & Boake, C. (1995). Rehabilitation of the head-injured patient. In R.K. Narayan, J.D. Wilberger, J.D. and J.T. Povlishock (Eds.), *Neurotrauma* (pp. 841-858). New York: McGraw-Hill.
- Brooks, D.N. (1975). Long and short-term memory in head injured patients. *Cortex*, 11, 329-340.
- Brown, D.D., Muccie, W.G., Hetzler, R.K., & Knowlton, R.G. (1989). Cardiovascular and ventilatory responses during formalized Tai Chi Chuan exercise. *Research Quarterly for Exercise and Sport*, 60, 3, 246-250.

- Brown, D.R., Wang, Y.D., Ward, A., Ebbeling, C.B., Fortlage, L., Puleo, E., Benson, H., & Rippe, J.M. (1995). Chronic psychological effects of exercise and cognitive strategies. *Medicine and Science in Sports and Exercise*, 27, 5, 765-775.
- Channer, K.S., Barrow, D., Barrow, R., Osbourne, M., & Ives, G. (1996). Changes in hemodynamic parameters following Tai Chi Chuan and aerobic exercise in patients recovering from acute myocardial infarction. *Postgrad Medical Journal*, 72, 349-351.
- Chen, K.M., & Snyder, M. (1999). A research-based use of Tai Chi/movement therapy as a nursing intervention. *Journal of Holistic Nursing*, 17, 3, 267-279.
- Cheng Man Ch'ing. (Ed.). (1985). *Cheng Tzu's Thirteen Treatises on T'ai Chi Ch'uan*. (Benjamin Pang Jeng Lo & Martin Inn, Trans.). North Atlantic Books, California.
- Chung, T.R. (1974). *Tai Chi Chuan in theory and practice*. Taipei: Zhen Zhong Publishing House.
- Codd, L. (2000). Head injury: The silent epidemic. *Disability resource guide 2000*. DPL Publishing, Auckland, N.Z.
- Columbus, P.F., & Rice, D.L. (1991). Psychological research on the martial arts: An addendum to Fuller's review. *British Journal of Medical Psychology*, 64, 127-135.
- Cope, D.N. (1987). Psychopharmacologic considerations in the treatment of traumatic brain injury. *Journal of Head Trauma Rehabilitation*, 2, 1-5.
- Corrigan, P.W. & Jakus, M.R. (1994). Behavioral treatment. In J.M. Silver, S.C. Yudofsky and R.E. Hales (Eds.), *Neuropsychiatry of Traumatic Brain Injury* (pp. 733-769). Washington (DC): American Psychiatric Press.

- Crepeau, F., & Scherzer, P. (1993). Predictors and indicators of work status after traumatic brain injury: A meta-analysis. *Neuropsychological Rehabilitation*, 3, 1, 5-36.
- Cullum, C.M., Kuck, J., & Ruff, R.M. (1990). Neuropsychological assessment of traumatic brain injury in adults. In E.D. Bigler (Ed.), *Traumatic brain injury* (pp. 69-107). Austin, TX: Pro-ed.
- Curran, C.A., Ponsford, J.L., Crowe, S. (2000). Coping strategies and emotional outcome following traumatic brain injury: A comparison with orthopedic patients. *Journal of Head Trauma Rehabilitation*, 15, 6, 1256-1274.
- Fordyce, D.J., Roueche, J.R., & Prigatano, G.P. (1983). Enhanced emotional reactions in chronic head trauma patients. *Journal of Neurology, Neurosurgery & Psychiatry*, 46, 620-624.
- Gemmell, R. (1992). *Reeling Silk: A guide to tapping internal energy*. Picton, New Zealand: Reeling Silk Publications.
- Goldstein, F.C. & Levin, H.S. (1990). Epidemiology of traumatic brain injury: Incidence, clinical characteristics, and risk factors. In E.D. Bigler (Ed.), *Traumatic brain injury*. Austin, TX: Pro-ed.
- Gong, L., Qian, J., Zhang, J., Yang, Q., Jiang, J., Tao, Q., Zhang, X. (1981). Changes in heart rate and electrocardiogram during Taijiquan exercise. *Chinese Medical Journal*, 94, 589-592.
- Graham, D.I. (1995). Neuropathology of head injury. In R.K. Narayan, J.D. Wilberger, and J.I. Povlishock (Eds.), *Neurotrauma* (pp. 43-59). New York: McGraw-Hill.

- Grimm, B.H., & Bleiberg, J. (1986). Psychological rehabilitation in traumatic brain injury. In S.B. Filskov & T.J. Boll (Eds.), *Handbook of clinical neuropsychology* (Vol. 2, pp. 495-560). New York: Wiley.
- Gruetzner, C. (1994). Corporate reply to traumatic events soothes survivors' troubled minds. *Occupational Health and Safety*, 63,12, 38-40.
- Head Injury Society of New Zealand Inc. (1993, September). *Head injury: The silent epidemic: Research into the needs of New Zealand individuals and families affected by head injury*. Wellington, NZ: Author.
- Head Injury Society of New Zealand Inc. Homepage. [Http://www.head-injury.org.nz](http://www.head-injury.org.nz) [online]. Rene Turner (Ed.). (2001).
- Hernandez-Reif, M., Field, T.M., & Thimas, E. (2001). Attention deficit hyperactivity disorder: benefits from Tai Chi. *Journal of Bodywork and Movement Therapies*, 5, 2, 120 -123.
- Jackson, R. D., Corrigan, J.D., & Arnett, J.A. (1985). Amitriptyline for agitation in head injury. *Archives of Physical Medicine & Rehabilitation*, 68, 180-181.
- Jacobson, B.H., Ho-Cheng, C., Cashel, C., Guerrero, L. (1997). The effects of T'ai Chi Chuan training on balance, kinesthetic sense, and strength. *Perceptual and Motor Skills*, 84, 27-33.
- Jin, P. (1989). Changes in heart rate, noradrenaline, cortisol and mood during Tai Chi. *Journal of Psychosomatic Research*, 33, 2, 197-206.
- Jin, P. (1992). Efficacy of Tai Chi, brisk walking, meditation, and reading in reducing mental and emotional stress. *Journal of Psychosomatic Research*, 36, 4, 361-370.

- Khor, G. (1994). *Tai Chi for stress control and relaxation*. (2nd ed.). Simon and Schuster. Australia.
- Kirsteins, A.E., Dietz, F., & Hwang, S.M. (1991). Evaluating the safety and potential use of a weight-bearing exercise, Tai Chi Chuan, for rheumatoid arthritis patients. *American Journal of Physical Medicine & Rehabilitation*, 70,3,136-141.
- Kolb, B., & Whishaw, I. (1996). *Fundamentals of human neuropsychology*, (4th ed.). New York: Freeman.
- Koshinen, S. (1998). Quality of life 10 years after a very severe traumatic brain injury (TBI): The perspective of the injured and the closest relative. *Brain Injury*, 12, 8, 631-648.
- Kurtzke, J.F. (1984). Neuroepidemiology. *Annals of Neurology*, 16, 265-277.
- Kutner, N.G., Barnhart, H., Wolf, S.L., McNeely, E., & Xu, T. (1997). Self report benefits of Tai Chi practice by older adults. *Journal of Gerontology: Psychological Sciences and Social Sciences*, 52b, 5, 242-246.
- Lai, J.S., Lan, C., Teng, S.H., & Wong, M.K. (1995). Two-year trends in cardio respiratory function among older Tai Chi Chuan practitioners and sedentary subjects. *Journal of the American Geriatrics Society*, 43, 11, 1222-1227.
- Lai, J.S., Wong, M.K., Lan, C., Chong, C. K., & Lien, I.N. (1993). Cardio respiratory responses of Tai Chi Chuan practitioners and sedentary subjects during cycle ergometry. *Journal of the Formosan Medical Association*, 92, 1, 894-899.
- Lan, C., Lai, J.S., Chen, S.Y., & Wong, M.K. (1998). Twelve-month Tai Chi training in the elderly: Its effects on health fitness. *Medicine and Science in Sports and Exercise*, 30, 3, 345-351.

- Lan C., Lai, J.S., Chen S.Y., & Wong, M.K. (2000). Tai Chi Chuan to improve muscular strength and endurance in elderly individuals: a pilot study. *Archives of Physical Medicine and Rehabilitation*, 81 5, 604-607.
- Lan, C., Lai J-S, Wong M-K, Yu M-L. (1996). Cardio-respiratory function, flexibility, and body composition among geriatric Tai Chi Chuan practitioners. *Archives of Physical Medicine & Rehabilitation*, 77,6, 612-616.
- Lee, M.S., Bae, B.H., Ryu, H., Sohn, J.H., Kim, S.Y., & Chung, H.T. (1997). Changes in alpha wave and state anxiety during Chundosunbup Qi- training in trainees with open eyes. *American Journal of Chinese Medicine*, 25, 3-4, 289-299.
- Leon-Carrion, J. (1997). Rehabilitation of memory. In J. Leon-Carrion (Ed.), *Neuropsychological Rehabilitation* (pp. 371-398). Delray Beach (FI): GR/St. Lucie Press.
- Levin, H.S. (1989). Memory deficit after closed head injury. *Journal of Clinical Experimental Neuropsychology*, 12, 129-153.
- Levin, H.S., Grossman, R.G., Rose, J.E., & Teasdale, G. (1979). Long-term neuropsychological outcome of closed head injury. *Journal of Neurosurgery*, 50, 412-422.
- Lewine, J.D., Orrison, W.W., Davis, J.T., Hart, B., Spar, J., Kodituwakku, P.W., Hill, D., Chang, S., Woldord, V.A., Shaw, P., Edgar, C., & Sloan, J.H. (1996). Neuro magnetic evaluation of brain dysfunction in post-concussive syndromes associated with mild head trauma. In Uzzell, B.P., & Stonnington, H.H. (Eds.). *Recovery after traumatic brain injury*. (pp. 7-29). New Jersey, Lawrence Erlbaum Associates Inc., Publishes.

- Lezak, M.D. (1982). The problem of assessing executive functions. *International Journal of Psychology*, 17, 281-297.
- Lezak, M.D. (1989). The walking wounded of head injury: when subtle deficits can be disabling. *Trends in Rehabilitation*, 3, 4-9.
- Lezak, M.D. (1995). *Neuropsychological Assessment* (3rd ed.). Oxford University Press, New York.
- Lim, P. (2000, November/December). The roots of Taiji: The martial arts practiced in the Chen village: The Sung Tai Zhu Quan connection. *Insights into Martial Arts*, 8, 50-52.
- Lovell, M.R. & Franzen, M.D. (1994). Neuropsychological assessment. In J.M. Silver, S.C. Yudofsky and R.E. Hales (Eds.), *Neuropsychiatry of Traumatic Brain Injury* (pp. 3-160). Washington (DC): American Psychiatric Press.
- McMordie, W.R., & Barker, S.L. (1988). The financial trauma of head injury. *Brain Injury*, 2, 4, 357-364.
- Murphy, R.F. (1987). *The body silent*. Henry Holt, New York.
- National Institute of Health consensus development panel on rehabilitation of persons with traumatic brain injury. (1999). Rehabilitation of persons with traumatic brain injury [Consensus conference: From the national institute of health]. *The Journal of the American Medical Association*, 282, 10, 974-983.
- Naugle, R.I. (1990). Epidemiology of traumatic brain injury in adults. In E.D. Bigler (Ed.), *Traumatic brain injury* (pp. 69-107). Austin, TX: Pro-ed.
- Pollack, I.W. (1994). Individual psychotherapy. In J.M. Silver, S.C. Yudofsky and R.E. Hales (Eds.). *Neuropsychiatry of Traumatic Brain Injury* (pp. 671-702). Washington (DC): American Psychiatric Press.

- Prigatano, G.P. (1986). Personality and psychosocial consequences of brain injury. In G.P. Prigatano, D.J. Fordyce, H.K. Zeiner, J.R. Roueche, M. Pepping, & B.C. Wood (Eds.), *Neuropsychological rehabilitation after brain injury* (pp. 29-50). Baltimore: Johns Hopkins University Press.
- Province, M.A., Hadley, E.C., Hornbrook, M.C., Lipsitz, L.A., Miller, J.P., Mulrow, C.D., Ory, M. G., Sattin, R.W., Tinetti, M.E., Wolf, S.L., for the FICSIT group. (1995). The effects of exercise on falls in elderly patients: A preplanned meta-analysis of the FICSIT trials. *Journal of the American Medical Association*, 273, 1341-1347.
- Richardson. J. (1990). *Clinical and neuropsychological aspects of closed head injury*. Great Britain, Burgess Science Press.
- Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.
- Ross, L.K. (1992). The use of pharmacology in the treatment of head-injured patients. In C.J. Long and L.K. Ross (Eds.), *Handbook of Head Trauma* (pp. 137-164). New York: Plenum Press. 142-164.
- Sandlund, E.S., and Norlander, T. (2000). The effects of Tai Chi Chuan relaxation and exercise on stress responses and well being: An overview. *International Journal of Stress Management*, 7, 2, 139-149.
- Slater, J., & Hunt, H.T. (1997). Postural-Vestibular integration and forms of dreaming: A preliminary report on the effects of brief Tai Chi Chuan training. *Perceptual and Motor Skills*, 85, 1, 97-98.
- Snyder, M. (1988). Movement therapy. *Journal of Neuroscience Nursing*, 20, 6, 373-376.

- Spivack, M. & Balicki, M. (1990). Scope of the problem. In D. Corthell (Ed.), *Traumatic brain injury and vocational rehabilitation*. Menomonie, WI: Research and Training Center, University of Wisconsin-Stout.
- Stern, R.A. (1997). *Visual Analog Mood Scales*. Odessa, FL: Psychological Assessment Resources.
- Wan, Q. (1989). Rehabilitation effect of Tai Chi Chuan for inpatients with chronic diseases. *Tai Chi Chuan Journal*, 63, 33-34.
- Ware, J.E. (2000). SF-36 Health Survey Update. *Spine*, 25, 24, 3130-3139.
- Ware, J.E., & Sherbourne, C.D. (1992). The MOS 36-item Short Form Health Survey (SF-36). I. Conceptual framework and item selection. *Medical Care*, 30, 473-483.
- Wilhelm, R. (Ed.). (1968). *I Ching [The book of changes]*. (3rd ed.). (C. F. Baynes, Trans.). London, Routledge & K. Paul.
- Williams, T. (1999). *The Complete Illustrated guide to Chinese medicine: A comprehensive system for health and fitness*. Mustard, Parragon, Bath.
- Wolf, S.L., Barnhart H.X., Kutner, N.G., McNeely, E., Coogler, C., Xu, T. Atlanta FICSIT Group. (1996). Reducing frailty and falls in older persons: an investigation of Tai Chi and computerized balance training. *Journal of American Geriatric Society*, 44, 489-97.
- Wolf, S.L., Coogler, C., & Tingsen Xu, P.T. (1997). Exploring the basis for Tai Chi Chuan as a therapeutic exercise approach. *Archives of Physical Medicine and Rehabilitation*, 78, 8, 886-892.
- Wolfson, L., Whipple, R., Derby. C., Judge, J., King, M., Amerman, P., Schmidt, J., Smyers, D. (1996). Balance and strength training in older adults: intervention

- gains and Tai Chi maintenance. *Journal of the American Geriatrics Society*. 44,5, 498-506.
- Yan, J.H. (1999). Tai Chi practice reduces movement force variability for seniors. *The Journals of Gerontology*, 54A, 12, 1-8.
- Yan, J.H., & Downing, J.H. (1998). Tai Chi: An alternative exercise form for seniors. *Journal of Aging & Physical Activity*, 6,4, 350-362.
- Yang, J.-M. (1989). *The root of Chinese Chi Kung: The secrets of Chi Kung training* (3rd ed.). YMAA Publication Centre, Hong Kong.
- Yang, J.-M. (1990). *Chi Kung: Health & martial arts* (2nd ed.). YMAA Publication Centre, Hong Kong.
- Yocum, D.E., Castro, W.L., & Cornett, M. (2000). Exercise, education, and behavioral modification as alternative therapy for pain and stress in rheumatic disease. *Rheumatic Diseases Clinics of North America*. 26, 1, 145-159.
- Zhou, H. (1994, Spring). The magic of Qi Gong. *Shaolin Chuan Fa & Tai Chi Association: Spring Seminar*, 54, 6-9.

A Study Investigating the Effects of Tai Chi Chuan in Individuals with Traumatic Brain Injury

INFORMATION SHEET

My name is Chriztine Gemmell and I am completing a Master of Arts in psychology at Massey University, under the supervision of Professor Janet Leathem. You may recall writing your name on a list of people volunteering to take part in a study on Tai Chi which was discussed at the Head Injury Society annual meeting, Lower Hutt or you will have volunteered after discussing the study with Janet Leathem of the Psychology Clinic, Wellington.

The purpose of this study is to determine whether a Chinese Martial Arts known as Tai Chi will benefit people who have sustained traumatic brain injury in the same ways that it has proven beneficial with older adults.

What will be expected if I participate?

- A free 6-week Tai Chi course twice a week for 45 minutes.
- To be picked up to attend the course at Massey University, Wellington
- To fill in a questionnaire before and after each session.
- And to fill in a different questionnaire at four times – before, during, immediately after and some time after the course. It should take about 15 to 20 minutes each time the participants fill in the two questionnaires.
- Two courses will be held, the first beginning very soon, the second in two months time.

Summary of your rights

If you decide to take part in this study, you have the right to:

- Ask any questions about the study at any time during your participation.
- Refuse to answer any questions.
- Decline to take part or withdraw from the study at any time.
- Contact the researchers at any time during the study.
- Participate in the study anonymously and with confidence that your personal details are confidential.
- Receive information about the results at the end of the study.

If you have any questions about the study Chriztine Gemmell can be contacted at the Tai Chi Centre on (04) 2375255 and Janet Leathem can be contacted on (04) 8015799 extension 6768.

This project has been reviewed and approved by the Massey University Human Ethics Committee, WGTN Protocol 01/110.

Thank you for your consideration.

Christine Gemmell
Researcher

Janet Leathem
Clinic Director

A study investigating the effects of Tai Chi Chuan in individuals with traumatic brain injury

CONSENT FORM

I have read the Information Sheet and have had the details of the study explained to me. My questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I understand I have the right to withdraw from the study at any time and to decline to answer any particular questions.

I agree to provide information to the researcher on the understanding that my name will not be used without my permission. (*The information will be used only for this research and publications arising from this research project*).

I agree to participate in this study under the conditions set out in the Information Sheet.

Signed:

Name:

Date:

APPENDIX 3

Tai Chi Pamphlet

GETTING IN TOUCH WITH YOUR CHI

Normally we do not feel Chi. Like the air we breathe, Chi exists and is vitally important as our air supply. Chi is, in fact, the energy transformed from breathing. Correct or improved breathing fully utilises the cleansing or filtering capacity of the lungs, re-oxygenating the blood and removing harmful pollutants. Through Tai Chi Internal (Nei-Gung) training, we begin to feel the chi.



Focussing your mind, energy, and effort, is generally improved upon with Tai Chi practise. When your Chi permeates through the body unimpeded, even the slightest movement brings a feeling of harmony. The key is to "open the channels" to ensure that the flow of energy takes place. Once a person feels the enriched Chi, which may have lain dormant, lifestyle and harmony is greatly improved.

Days: Monday & Thursday

Time: 10:30am - 12:30

Where: Whanau room of the
College of Humanities &
Social Sciences

Massey University,
Wellington, Block 7.

Contact People:

Chriztine Gemmell (pictured)



Jade Centre: (04) 237 5255

or

Janet Leathem

Psychology Clinic: (04) 8015799

INNER CIRCLE

TAI

CHI

CHUAN
WITH



S.C.F
FOUNDER
AND GRAND MASTER

WHAT IS TAI CHI?

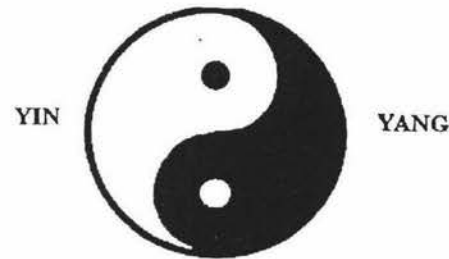
Firstly, Tai Chi Chuan literally translated means "Grand Ultimate Fist." Chuan refers to the Fist or "Boxing." Chi means Breath or Energy. Tai Chi (also known as Taiji) is a Martial Art. All Martial Arts are characterised by their degree of hardness or softness. In this sense, Tai Chi is soft. The energy and power used to perform the techniques also falls into two main types, Internal and External. Tai Chi utilises Internal Energy, as do the other Internal Systems, Pa Kua and Hsing-I.

When practising the Tai Chi forms, each position cultivates and flows energy into the vital organs of the body. The movements are often described as swimming on land.

There are five styles of Tai Chi, four of which originate from the Chen family system. The Art was developed 350 years ago, and is believed to have originated from the Shaolin Chuan Chang (Chinese Kempo). Mr Gemmell is a Grand Master in Kempo.

The head of the Chen System is Chen Xiao Wang. He is the 19th generation Grand Master of the system. Robert Gemmell has trained with Master Chen in mainland China. Recently, Master Chen toured the chain of schools founded by Mr Gemmell, instructing at live seminars throughout

Tai Chi brings into play the Chinese concept of Yin and Yang. This symbol represents the seemingly opposite forces of nature, yet each force or energy, be it Yin or Yang, contains and reflects its opposite. These opposites blend into one another to produce the Universe. Male (Yang) and Female (Yin) are opposite yet create completeness when in harmony. Each contains a small amount of the other.



INNER CIRCLE

Robert Gemmell has practised Martial Arts for fifty years and has 3000 students throughout Australasia, who include all ages and are from a good cross section of lifestyles and occupations. He also teaches Kempo, Shaolin Chuan Fa, Self Defence and Weaponry.

Some teachers teach only the Tai Chi Form. Robert Gemmell feels that without the Chi-Gung energy cultivation techniques, the form lacks full potential of your Chi. He refers to his teaching method as the "Inner Circle System."

BENEFITS OF TAI CHI

The Chinese believe that everyone has a given amount of Chi, which permeates through the body as a life force. Sometimes, due to stress and other factors, the pathways (Meridians), become blocked, and this leads to illness. Through the practise of Tai Chi, these blockages are cleared, in a similar way to acupuncture, except that the blockages are cleared by the cultivation of the energy flow, (Chi-Gung). The flow is correctly regulated to each organ by the Tai Chi movements.

In September 1992, the Wellington Rheumatology Unit at Hutt Hospital reported on a study they were conducting into the effects of Tai Chi on Rheumatoid Arthritis Sufferers. Preliminary data suggests that the low impact exercises of Tai Chi affect the aerobic efficiency in people with the disease, improving fitness, even when their disease is in remission. Many other forms of exercise are not possible if the bone joints are indoor condition.

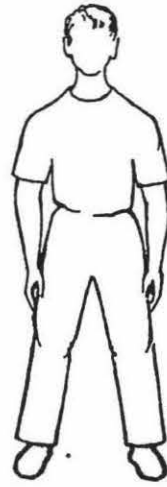
BENEFITS INCLUDE;

- *Stress reduction
- * Increased Energy
- *Personal Development
- *Inner and Outer Harmony
- *Improved Fitness

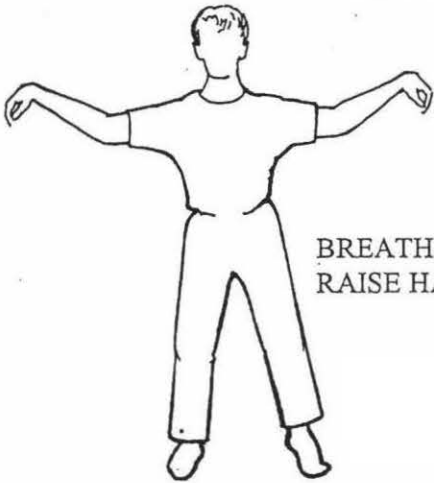
APPENDIX 4

Tai Chi class handout

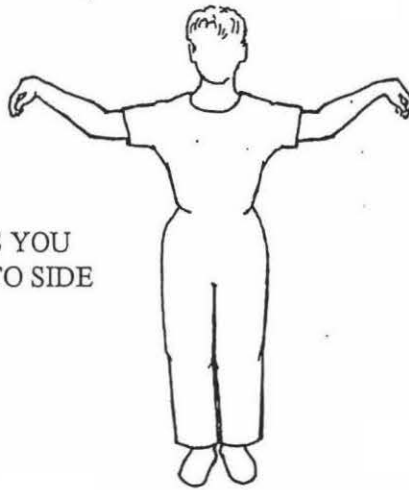
WSLD
GOOSE



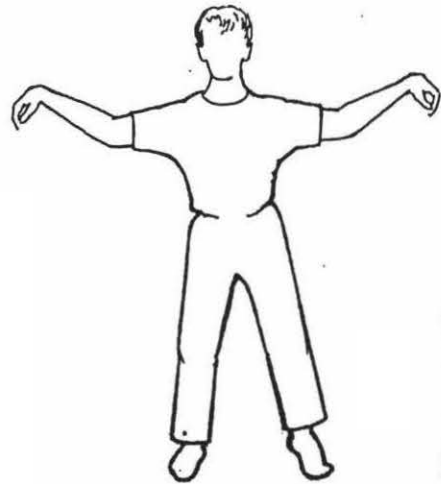
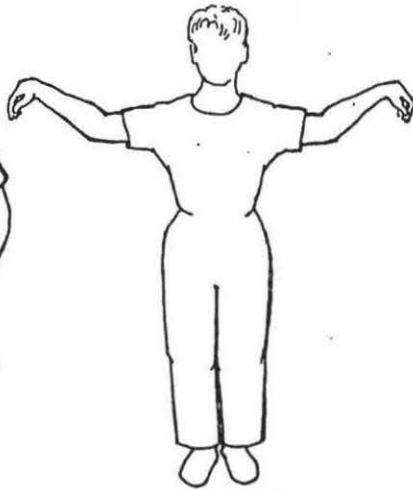
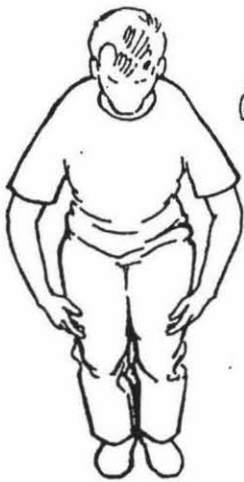
CHI
GUNG SWALLOW DIPS WINGS
INTO WATER



BREATHE IN AS YOU
RAISE HANDS TO SIDE



BREATHE OUT AS
YOU LOWER BODY



APPENDIX 5

Visual Analogue Mood Scale

Special Note

Due to copyright regulations, some pages of the Visual Analogue Mood Scale have been removed from Appendix 5 .



Response Booklet



by Robert A. Stern, PhD

Name _____ Test Date ____/____/____

ID # _____ Birthdate ____/____/____

Gender _____ Ethnicity _____ Handedness _____ Age _____

Education _____ Examiner _____



Directions

Print your name, today's date, your birthdate, gender, ethnic background (ethnicity), handedness, age, and years of education in the spaces provided above. If you have an identification number, please enter it in the space provided.

On the following pages, you will see eight sets of scales. On each of the scales, you will see drawings of two faces connected by a long line. A "Neutral" face will appear at the top of the line, and a face showing an emotion will appear at the bottom of the line. The name of the emotion the face represents will be printed beneath the face. For each scale, **place a mark across the line at the point which best describes HOW YOU ARE FEELING RIGHT NOW.** If you wish to change an answer, scratch out or erase the incorrect mark and make a new mark. Be sure to make a mark, and only one mark, for each scale. **Do not** leave any scale blank unless the examiner tells you to do so.

Example

On the first scale, the more **afraid** you are feeling today, the closer you would make your mark toward the bottom of the line, as shown in Figure 1 below. If you are not feeling afraid, you would make your mark toward the top of the line, as shown in Figure 2 below. If you are feeling somewhere in between, you would make your mark somewhere around the middle of the line, as shown in Figure 3 below. These three figures are meant only as samples of how to use the scales. Your actual responses should be marked on the scale in the place that best relates to how afraid you feel. Please respond to all of the scales in this manner.



Figure 1. "More afraid."



Figure 2. "Not afraid."

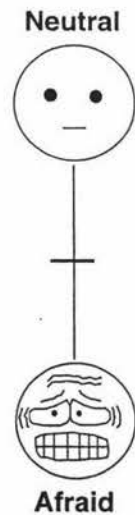
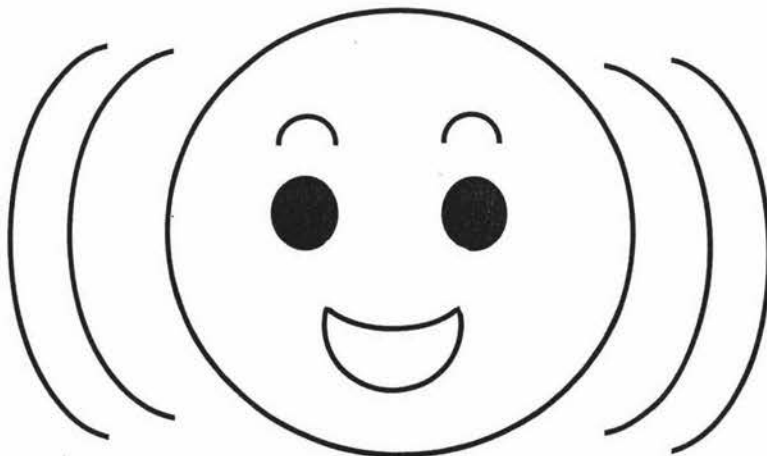
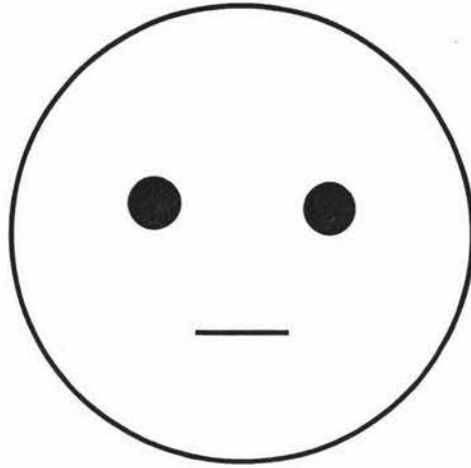


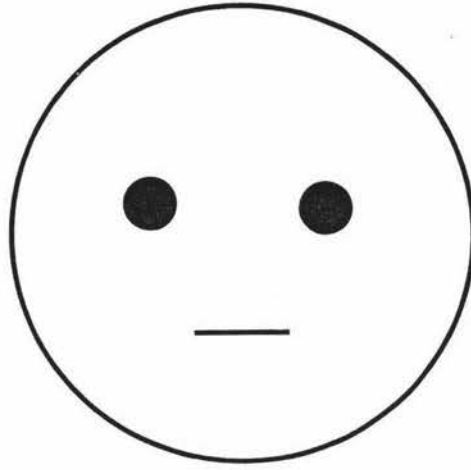
Figure 3. "Somewhere in between afraid and not afraid."

Neutral



Energetic

Neutral



Angry

APPENDIX 6

ROSENBERG SELF-ESTEEM SCALE

INSTRUCTIONS: BELOW IS A LIST OF STATEMENTS DEALING WITH YOUR GENERAL FEELINGS ABOUT YOURSELF. IF YOU STRONGLY AGREE, CIRCLE SA. IF YOU AGREE WITH THE STATEMENT, CIRCLE A. IF YOU DISAGREE, CIRCLE D. IF YOU STRONGLY DISAGREE, CIRCLE SD.

	strongly agree	agree	disagree	strongly disagree
1. On the whole, I am satisfied with myself.	SA	A	D	SD
2.* At times I think I am no good at all.	SA	A	D	SD
3. I feel that I have a number of good qualities.	SA	A	D	SD
4. I am able to do things as well as most other people.	SA	A	D	SD
5.* I feel I do not have much to be proud of.	SA	A	D	SD
6.* I certainly feel useless at times.	SA	A	D	SD
7. I feel that I'm a person of worth, at least on an equal plane with others.	SA	A	D	SD
8.* I wish I could have more respect for myself.	SA	A	D	SD
9.* All in all, I am inclined to feel that I am a failure	SA	A	D	SD
10. I take a positive attitude toward myself.	SA	A	D	SD