Effects of Tai Chi exercises on work engagement and mental and physical health: A pilot study

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Abstract

The past decades interest in alternative medicine in the Netherlands has grown. Tai Chi, a type of alternative medicine, is a combination of rhythmic movement and self-defense practice with relaxation trough deep breathing and self-awareness so a person can connect his mind and body. Several investigators demonstrated a positive effect of Tai Chi on physical and mental health. This pilot study addresses the effect of Tai Chi on work engagement. Work engagement - a concept of positive psychology - is a positive, work-related psychological state which is characterized by vigor, dedication and absorption. Work engagement is positively correlated to mental and physical health. Participants followed a ten week Tai Chi program, meaning they followed one Tai Chi session a week under supervision of a professional Tai Chi practitioner. By using questionnaires, during ten weeks, participants reported on their level of work engagement and mental and physical health. The expectation was that Tai Chi has a positive effect on work engagement and mental and physical health. Results showed that a Tai Chi session has a positive, short term effect on physical tension, balance and mental relaxation, but not on energy. No convincing evidence on the effects of a ten week Tai Chi program was found.

Samenvatting

De laatste jaren is de interesse voor alternatieve geneeswijzen in Nederland gegroeid. Tai Chi, een alternatieve geneeswijze, is een combinatie van ritmische bewegingen, zelfverdedigingtechnieken en ontspanning door ademhaling, waardoor lichaam en geest één geheel worden. Verschillende onderzoekers hebben aangetoond dat Tai Chi een positief effect heeft op lichamelijke en geestelijke gezondheid. In dit pilot-onderzoek is het effect van Tai Chi op werkbevlogenheid onderzocht. Werkbevlogenheid - een begrip uit de positieve psychologie - is een positieve werkgerelateerde psychologische staat en wordt gekenmerkt door vitaliteit, toewijding en absorptie. Werkbevlogenheid is positief gerelateerd aan lichamelijke en geestelijke gezondheid. De proefpersonen volgden een Tai Chi programma van tien weken, waarbij zij elke week een sessie volgden onder leiding van een professionele lerares. Met behulp van vragenlijsten hebben proefpersonen hun niveau van werkbevlogenheid en lichamelijke en geestelijke gezondheid gedurende tien weken beoordeeld. De verwachting was dat Tai Chi een positief effect op werkbevlogenheid en lichamelijke en geestelijke gezondheid zou hebben. Er is geconcludeerd dat een Tai Chi sessie op de korte termijn, direct na de sessie, een positief effect heeft op lichamelijke spanning, balans en mentale ontspanning, maar niet op energie. Er werd geen overtuigend bewijs gevonden voor een effect van het gehele Tai Chi programma op werkbevlogenheid of lichamelijke of geestelijke gezondheid.

Introduction

Interest in alternative medicine has grown during the past years. In 2006, 1 million people of the population in the Netherlands visited an alternative healer. In 2008 this number has grown to 1,2 million people (Central Bureau for Statistics (CBS), 2010). Alternative medicine partially finds its origin in China. One type of alternative medicine is Tai Chi: A traditional Chinese martial art. It combines rhythmic movement and self-defense practice with relaxation trough deep breathing, self-awareness so a person can connect its mind and body. Tai Chi is based on the Taoist philosophical principles of Yin and Yang (the opposite forces) and breathing techniques. It can be distinguished from other martial arts by its flowing, slow movements, which makes Tai Chi a low to middle impact exercise. Besides, Tai Chi is also type of meditation because of the slow movements and controlled breathing. Different aspects of Tai Chi can be accentuated, but the integration of mind and body in every motion through respiration, mental and visual concentration and dynamic relaxation is crucial in Tai Chi (Dunn, 1987). Tai Chi rests on five basic principles:

1) *Relaxation*: Attempts are made to apply just enough strength for every movement or task, thereby conserving energy and maintaining strength.
2) *Separating Yin and Yang*: This principle refers to the philosophy of opposites in nature, for example force versus relaxation, speed versus stillness, weight shifts, and so on.
3) *Turning the waist*: A strong and flexible waist is essential in connecting the upper and lower body. Ultimate power also originates from muscles connected to the waist which then transfers it to smaller muscles and extremities.
4) *Keeping the back erect*: Keeping the body perpendicular to the ground in order to achieve balance, comfort, relaxation and optimal energy is a principle used in Tai Chi and yoga as well as other martial arts.
5) *Total body involvement*: Synonymous with body synchronization—that the whole body moves together and not limb by limb—is said to be achieved through adherence to the other four principles. (Sandlund & Norlander, 2000)

Tai Chi practitioners claim that Tai Chi has beneficial effects on physical and mental health. Qu (cited by Yan, 1995) gives two reasons for these effects appear. First, participants have to be very concentrated, so they exclude possible negative distractions and experience inner

peace. Second, the smooth and rhythmic movements facilitate muscle relaxation and flexibility.

Multiple studies investigated the effects of Tai Chi on mental health. Taylor-Piliae (2006) investigated the effects of Tai Chi on psychosocial status using a 12-week Tai Chi exercise program. Significant improvements in mood state and reduction in perceived stress were found. Wang, Zhang, Rasmussen, Lin, Dunning, Kang, Park & Lo (2009) conducted a systematic review on the effect of Tai Chi on psychosocial well-being. Out of 15 studies, 13 studies were found to have a significant effect, especially in the management of depression and anxiety, but they conclude that it is still premature to make any conclusive remarks on the effect of Tai Chi on psychosocial well-being. The effects of Tai Chi on physical health have also been investigated. Lui (2008) revealed that, after following a 12 weeks Tai Chi exercise program, elderly were significantly more flexible, better able to balance and had less fear to fall. A systematic review on six studies, about the effectiveness of Tai Chi for chronic musculoskeletal pain conditions, was conducted by Hall, Maher, Latimer & Ferreira (2009). A small positive effect of Tai Chi on pain and disability in people with arthritis was found. In another study, conducted by Lee (2009), significant improvements were found on physical and mental health. Available evidence seems to confirm a positive effect of Tai Chi on physical and mental health. Unfortunately the available data are sparse and derived from low-quality studies, e.g. a small number of participants or the lack of a control group. Besides, because Tai Chi is a low to middle impact exercise, it is often subject of studies which involve elderly or people with a disease background. This makes it difficult to generalize the outcomes of studies on Tai Chi.

There are many things in the workplace that can cause stress for the employees. Heavy workloads, deadlines, conflicts with coworkers or clients can be the order of the day. In 2006, 40% of the Dutch working population works mostly under pressure and 29% is rushing most of the time. In 2008 42% of them does too much work and 27% works extra hard (CBS, 2010). A person exposed to stress at work shows a whole range of emotional, cognitive, behavioral and physiological reactions to various harmful effects of work, work organization and working environment. Psychological reactions to stress can include: growing anxiety,

difficulties with concentration, negative emotions, lack of attention, depression and fatigue (Knezevic, B., Milosevic, M., Golubic, R., Belosevic, L., Russo, A. & Mustajbegovic, J., 2009).

Currently it is a trend in psychology to focus on positive psychology. Instead of aiming on negative experiences and negative traits, positive psychology focuses on positive experiences and positive traits. For example, while traditional psychology merely investigated how to prevent a burn-out, positive psychology aims at increasing work engagement (the opposite of a burn-out). Work engagement as described by Schaufeli, Bakker & Salanova (2006) is a positive, work-related psychological state which is characterized by vigor, dedication and absorption. Vigor is characterized by high levels of energy, persistence and mental resilience while working and the willingness to invest effort in one's work. Dedication is characterized by being strongly involved in one's work and experiencing a sense of significance, enthusiasm, inspiration, pride and challenge. Absorption is characterized by being fully concentrated and happily preoccupied with one's work, whereby time passes quickly and one has difficulties with detaching oneself from work (Schaufeli, Bakker & Salanova, 2006). Based on the three aspects of work engagement (vigor, dedication and absorption) the Utrecht Work Engagement Scale (UWES) has been developed (Schaufeli, Salanova, González-Romá, & Bakker, 2002). Work engagement is positively correlated to mental and physical health (Schaufeli, Taris & Van Rhenen, 2008).

A study which combines work engagement and meditation is conducted by the Christian National Trade Union (CNV). In February 2009 the CNV published the results of the pilot 'Meditation in the workplace'. The aim of this pilot was investigate the effects of meditation on mental resistance, concentration and stress resistance. A number of 63 participants, working for a welfare organization, followed eight weekly meditation sessions with a professional practitioner. Employees who participated reported improvements in concentration, (self-)consciousness, mental and physical condition and job satisfaction (http://www.fcbwjk.nl/Content/Paginas/Themas/Meditatie/Ervaren%20effecten %20meditatie.aspx).

As mentioned previously scientific literature about the effects of Tai Chi is sparse and it is difficult to generalize the outcomes of studies on Tai Chi. In addition, as recommended by Bakker, Schaufeli, Leiter and Taris (2008), future research on work engagement should focus

on interventions that improve work engagement. Therefore the aim of the present study was to examine the effects of Tai Chi on work engagement and mental and physical health. To do so, two experiments were conducted. In the first experiment participants followed a ten week Tai Chi program. Before and after every Tai Chi session participants were asked to report on physical tension, balance, mental relaxation and energy. In this experiment the short-term effects of Tai Chi will be investigated. In the second experiment there were two groups of participants: A Tai Chi group and a control group. Participants in the Tai Chi group were the same participants as mentioned by experiment one. Participants were asked to fill in three different questionnaires (experiment 2a, 2b and 2c) two times, at the beginning and at the end of a ten week Tai Chi program. In this experiment the effects of a ten week Tai Chi program will be investigated.

Expected is that practicing Tai Chi has beneficial effects on work engagement and mental and physical health. This means that participants experience less physical tension and more balance, mental relaxation and energy after a Tai Chi session. Also participants experience more work engagement and better mental and physical health after following a ten week Tai Chi program. This follows the indications made in the literature. In addition, Tai Chi is also a type of meditation, which makes it reasonable that the effects of Tai Chi partially show similarities with the effects of meditation shown by the CNV.

Methods

Experiment 1

Participants Men and women, ranging from 20 to 60 years of age, volunteered in a ten-week Tai Chi program. The number of participants varied per session from 11 - 25 participants with an average of 18 participants. The group consisted of psychotherapists and clerical workers, working in one and the same health care institution.

Procedure For ten weeks, participants followed a weekly Tai Chi session. Every session took an hour and was planned in daytime during working hours, with approval from the direction. The sessions were leaded by a professional Tai Chi practitioner, who was also a psychotherapist.

Questionnaire Right before and after a one hour Tai Chi session, participants scored (ranging from 0 - 10) their level of mental relaxation, physical tension, balance and energy (Appendix I). This way the direct effects of a Tai Chi session were measured. The questionnaire was tailor-made and contained questions like 'How much physical tension do you experience?' and 'How much energy do you have?'. This questionnaire is called questionnaire one.

Data analysis Considering the small number of participants the non-parametric Wilcoxon Signed Rank Test was used.

Experiment 2a

Participants The Tai Chi group, which followed the Tai Chi program consisted of 12 participants, the control group consisted of 9 participants. Participants in the Tai Chi group were the same participants as mentioned by experiment one.

Procedure The procedure of this experiment is identical to the one followed in experiment one. The control group did not follow any Tai Chi session.

Questionnaire

Participants received the work related functioning questionnaire a few days before the first Tai Chi session (Appendix II). Through this questionnaire participants reported on their work related functioning. The questionnaire is tailor-made and identical to the one used in the meditation pilot described previously (Introduction). Before the first session participants scored (ranging from 0 (low) – 10 (high)) fifteen statements like 'Your level of focus during work', 'your ability to work relaxed', 'your balance between work and your personal life'. This questionnaire is called questionnaire two. After the tenth and last Tai Chi session

participants received the same questionnaire. This way the effects of a ten week Tai Chi program on work related functioning were measured.

Data analysis The data analysis used in this experiment is identical to the one used in experiment one.

Experiment 2b

Participants The experimental group, which followed the Tai Chi program consisted of 15 participants, the control group consisted of 8 participants. The composition of the groups is identical to the participants in experiment 2a.

Procedure The procedure of this experiment is identical to the one followed in experiment 2a.

Questionnaire Participants received the UWES-9 questionnaire a few days before the first Tai Chi session (Appendix III). The UWES-9 consists of nine items, addressing work engagement on three scales (vigor, dedication and absorption) of three items each. The validity of the UWES-9 was demonstrated by Schaufeli & Bakker (2006) using confirmatory factor analysis: the three scale scores have good internal consistency and test-retest reliability. Before the first session participants scored (ranging from 0 (never) – 6 (everyday)) items like 'I am enthusiastic about my job', 'I feel like working when I get up in the morning' and 'I am dedicated to my job'. This questionnaire is called questionnaire three. After the tenth and last Tai Chi session participants received the same questionnaire. This way the effects of a ten week Tai Chi program on work engagement were measured.

Data analysis The data analysis used in this experiment is identical to the one used in experiment one.

Experiment 2c

Participants The experimental group, which followed the Tai Chi program consisted of 14 participants, the control group consisted of 8 participants. The composition of the groups is identical to the participants in experiment 2a.

Procedure The procedure of this experiment is identical to the one followed in experiment one.

Questionnaire The Outcome Questionnaire (OQ; Lambert et al.,1996) is used often in clinical outcome research (de Jong, Nugter, Polak, Wagenborg, Spinhoven & Heiser, 2007). From this questionnaire eleven questions - addressing work related stress and physical complaints -

were used in this experiment. Before the first session participants scored (ranging from 0 (never) – 6 (everyday)) items like ‘I am under stress at work’, ‘I can concentrate very well’ ,‘I have back pain’ and ‘I feel stiff’. This questionnaire is called questionnaire four. After the tenth and last Tai Chi session participants received the same questionnaire. This way the effects of a ten week Tai Chi program on work related stress and physical health were measured.

Data analysis The data analysis used in this experiment is identical to the one used in experiment one.

Results

Experiment 1

Data from questionnaire one shows that in all ten sessions there is a significant effect of Tai Chi on physical tension (Table 1). This indicates that participants experienced a decrease on physical tension after all ten sessions. The variable balance shows a significant effect in all ten sessions, indicating that participants experienced an increase on balance after all ten sessions. Mental relaxation shows a significant effect in all ten sessions. This points out that participants experienced an increase in mental relaxation after all ten sessions. The variable energy shows significant effects in two sessions, indicating that participants experienced an increase in energy two out of the ten sessions.

Table 1 Differences between pretest- and posttest scores by Tai Chi session

	Pretest		Posttest			
Session and variable	**Mean**	**SD**	**Mean**	**SD**	**Z value**	**P value***
Session 1						
Physical tension (n=23)	5,978	1,898	4,261	2,158	-2.872	**0.002**
Balance (n=23)	5,891	1,758	6,543	1,852	2.178	**0.015**
Mental relaxation (n=11)	5,727	1,009	6,909	1,136	2.119	**0.017**
Energy	-**	-**	-**	-**	-**	-**
Session 2 (n=25)						
Physical tension	5,404	1,697	4.481	1.909	-3.043	**0.001**
Balance	6,019	1,526	6.611	1.728	2.682	**0.004**
Mental relaxation	5,596	1,400	6.759	1.382	3.955	**0.000**
Energy	5,920	1,256	6.200	1.090	1.155	0.124
Session 3 (n=25)						
Physical tension	5,720	1,487	4.960	1.720	-1.743	**0.041**
Balance	6,333	1,494	6.780	1.234	1.849	**0.033**
Mental relaxation	5,519	1,459	6.667	1.316	3.101	**0.001**
Energy	6,514	1,406	6.167	1.239	-0.265	0.396
Session 4 (n=24)						
Physical tension	5,250	1,800	4.333	1.341	-2.812	**0.003**
Balance	6,063	1,236	6.938	1.014	3.055	**0.001**
Mental relaxation	5,660	1,329	7.180	1.030	4.164	**0.000**
Energy	5,720	1,671	6.460	1.241	2.738	**0.003**
Session 5 (n=16)						
Physical tension	5,588	1,661	4.031	1.218	**-3.007**	**0.002**
Balance	5,529	1,772	6.938	1.482	2.463	**0.007**
Mental relaxation	5,313	1,580	7.133	1.060	3.088	**0.001**
Energy	5,938	1,237	6.200	1.146	1.265	0.103
Session 6 (n=18)						
Physical tension	5,667	2,142	4.605	1.875	-2.705	**0.004**
Balance	6,778	1,074	7.263	1.229	1.671	**0.048**
Mental relaxation	5,556	1,514	7.121	1.160	3.501	**0.000**
Energy	6,044	1,385	6.526	1.438	1.237	0.108
Session 7 (n=18)						
Physical tension	5,278	1,447	4.000	1.085	-2.725	**0.003**
Balance	6,278	1,179	7.389	0.979	3.133	**0.001**
Mental relaxation	6,000	1,283	7.667	0.664	3.542	**0.000**
Energy	6,611	1,149	6.861	0.682	0.900	0.368
Session 8 (n=17)						
Physical tension	5,000	2,151	3.941	1.952	-2.616	**0.005**
Balance	6,882	1,054	7.794	1.047	2.807	**0.003**
Mental relaxation	6,118	1,269	7.441	0.864	3.249	**0.001**
Energy	6,471	1,125	6.353	1.498	-0.369	0.356
Session 9 (n=13)						
Physical tension	5,115	2,238	4.192	1.407	-2.203	**0.014**
Balance	6,000	1,225	7.154	1.162	2.829	**0.003**
Mental relaxation	6,385	1,102	7.192	1.251	2.396	**0.009**
Energy	6,385	0,961	6.654	1.214	0.947	0.172
Session 10 (n=11)						
Physical tension	5,455	2,252	3.636	1.502	-2.831	**0.003**
Balance	5,818	1,601	6.727	1.954	1.653	**0.049**
Mental relaxation	6,455	0,820	7.727	0.905	2.889	**0.002**
Energy	6,455	0,934	7.091	0.861	2.010	**0.022**

Posttest score – pretest score

*= Significant values are in bold

** = No data available

Experiment 2a

Data from questionnaire two shows that a ten week Tai Chi program causes a small significant increase in work related functioning (Table 2). This is similar to what was expected. In addition the control group also shows a small significant increase in work related functioning. This was not expected.

Table 2 Pre- and posttest scores on a work related functioning questionnaire from the Tai Chi and control group

Group	**Pretest**		**Posttest**			
	Mean	**SD**	**Mean**	**SD**	**Z value**	**P value**
Tai Chi (n=12)	7.0889	0.997	7.2833	0.891	2.939	0.002
Control (n=9)	7.3444	0.984	7.496	0.963	2.052	0.020

Experiment 2b

On questionnaire three no significant effects of a ten week Tai Chi program on work engagement were found. The control group shows no significant change in work engagement after ten weeks. These results indicate that a ten week Tai Chi program has no significant effect on work engagement.

Table 3 Pre- and posttest scores on the abbreviated UWES-9 from the Tai Chi and control group

Group	**Pretest**		**Posttest**			
	Mean	**SD**	**Mean**	**SD**	**Z value**	**P value**
Tai Chi (n=15)	3.99	1.184	3.93	1.297	-0.648	0.259
Control (n=8)	4.65	1.160	4.68	1.059	0.263	0.396

Experiment 2c

Data from questionnaire four shows that a ten week Tai Chi program does not have an effect on work related stress and physical complaints (Table 4). The control group shows a small significant decrease in work related stress and physical complaints after ten weeks. These results indicate that a ten week Tai Chi program has no significant effect on work related stress and physical complaints.

Table 4 Pre- and posttest scores on the work related stress and physical complaints questionnaire from the Tai Chi and control group

Group	**Pretest**		**Posttest**			
	Mean	**SD**	**Mean**	**SD**	**Z value**	**P value**
Tai Chi (n=14)	2.394	1.633	2.321	1.589	-0.013	0.495
Control (n=8)	1.659	1.183	1.511	1.155	-1.661	0.049

Discussion

Main results

This paper addressed the question what the effects of Tai Chi on work engagement, work related stress and physical health are. To do so participants followed a ten week Tai Chi program, meaning participants followed a one hour Tai Chi session every week. Before and after every session participants reported on physical tension, balance, mental relaxation and energy. This way the direct effects of Tai Chi were measured. To measure the effect of a ten week Tai Chi program participants reported twice, before and after the ten Tai Chi sessions, on three questionnaires. These questionnaires addressed work related functioning, work engagement, work related stress and physical health. Results showed that a Tai Chi session has a direct positive effect on physical tension, balance and mental relaxation, but not on energy. This is similar to the positive effects on balance which Lui (2008) reported. A ten week Tai Chi program causes a small significant increase in work related functioning, but an effect on work engagement, work related stress and physical health was not demonstrated. This failing of the effects to materialize is contrary to the review studies conducted by Hall et. al (2009) and by Wang et. al (2009). Overall is concluded that a Tai Chi session has a direct positive effect on physical tension, balance and mental relaxation. No convincing evidence on the effects of a ten week Tai Chi program was found.

Limitations

The results are possibly negatively influenced by turbulence during this pilot inside the health care institution. The management applied changes and more than a quarter of the original employees were dismissed. In addition, work engagement is a positive concept, which focuses on positive work-related aspects, while Tai Chi focuses on reducing stress. It was assumed that reducing stress would increase work engagement, but the one does not necessarily follow the other and vice versa. It is remarkable that participants experienced a decrease on physical tension and an increase on balance and mental relaxation in all of the ten sessions, but on energy only in two sessions. This is possibly due to the relaxing effect of the practiced type of Tai Chi. Some participants gave notice of being too relaxed after a session and not feeling energetic. This study was a pilot study, which brought its limitations

on the study design. The number of participants in the experimental group was low and the number of participants in the control group was half the size of the experimental group. Participants were not randomly assigned to the groups, which leads to low internal and external reliability of this study. Furthermore three out of the four used questionnaires were tailor-made, leading to low validity of this study.

Conclusion and recommendations

It is concluded that a pilot 10 week Tai Chi program has a beneficial effect on relaxation, but not on work engagement or mental and physical health. Considering the validity of this study and on the other hand fortifying results of previous research, it is premature to conclude that Tai Chi has no effect on work engagement or mental and physical health. Future research is recommended. This study was set up as a pilot study, nevertheless validated questionnaires would improve the validity. In the future, research on interventions to increase work engagement is recommended to focus on interventions that are work-related. For example increasing job resources (increasing self-efficacy, providing more support and feedback), which as described by Bakker and Demerouti (2007), increases work engagement.

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Appendices

Appendix I Questionnaire 1 (Session questionnaire)

From 0 -10 (0 = very bad/none, 10 = very good/very much):	1	2
How much **physical tension** do you experience?		
How do you experience your **balance**?		
How **mentally relaxed** do you feel?		
How much **energy** do you have?		

Appendix II Questionnaire 2 (Work related functioning)

	0 = low, 10 = high	Grade 0-10
1	Your level of concentration during work	
2	Your level of self-consciousness	
3	Your level of focus during work	
4	Your ability to eliminate unnecessary thoughts	
5	Your overview on your work activities	
6	Your way of dealing with setbacks	
7	Your way of dealing with demands and expectations of others	
8	Your attention and alertness during the day	
9	Your ability to work relaxed	
10	Your tolerance towards others	
11	Your contentment with your work	
12	The level to which you find your work satisfying	
13	Your physical health	
14	Your vitality and energy level	
15	Your balance between work and your personal life	

Appendix III Questionnaire 3 (Abbreviated UWES-9 / Work engagement)

The following statements are about how you experience your work en how you feel about this. Please report how many times a statement appears by filling in a number from 0 to 6.*

0 = never 1 = a few times a year or less

2 = once a month or less 3 = a few times a month

4 = once a week 5 = a few times a week

6 = everyday

		Grade 0-6
1	I am energetic on the workplace*	
2	When I am working I feel fit and strong*	
3	I am enthusiastic about my job*	
4	My work inspires me*	
5	I feel like working when I get up in the morning *	
6	When I am working very intensively, I feel happy*	
7	I am proud of the work do*	
8	I am fully committed to my job*	
9	I am dedicated to my job*	

*Questions derived from the UWES-9: © Schaufeli & Bakker (2003)

Appendix IIII Questionnaire 4 (Work related stress and physical health)

		Grade 0-6
1	I easily get tired	
2	I am easily irritated	
3	I am under stress at work	
4	I can concentrate very well	
5	I have stomachache	
6	I have muscular pain	
7	I am nervous	
8	I have trouble falling asleep and staying asleep	
9	I have headache	
10	I have back pain	
11	I feel stiff	