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EFFECTS OF QIGONG ON PERFORMANCE RELATED
ANXIETY AND PHYSIOLOGICAL STRESS FUNCTIONS IN
TRANSVERSE FLUTE MUSIC SCHOOLCHILDREN

A feasibility study

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Master thesis of Traditional Chinese Medicine

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Master thesis proposal in Traditional Chinese Medicine (TCM) submitted to Instituto de Ciências Biomédicas de Abel Salazar – Universidade do Porto.

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Resumo

Revisão da literatura: Os transtornos de ansiedade são condições psiquiátricas comuns que podem causar diminuição da qualidade de vida e enormes custos sociais. Algumas estatísticas indicam que um em cada três pacientes que sofrem destes transtornos apresenta uma resposta insuficiente aos tratamentos convencionalmente usados na medicina ocidental. Os distúrbios de ansiedade estão estreitamente correlacionados com a facilidade de aprendizagem. As alterações vegetativas que acompanham os síndromes de stresse podem também influenciar negativamente as capacidades funcionais dos indivíduos. Exemplo disto são os músicos que necessitam de um aprimorado controlo motor e respiratório. Nos flautistas a ansiedade pode potencialmente causar problemas que empiricamente incluem ansiedade, batimento cardíaco e pressão arterial acelerados, tensão muscular e mãos frias.

Objetivo do estudo: Este estudo pretende investigar se e como os efeitos físicos e psicológicos relacionados com a prática de Qigong podem ser objectivamente medidos. Para isso as medições de determinados parâmetros serão realizadas em alunos de flauta transversal, com idades compreendidas entre os 10 e os 12 anos, antes de audições.

O presente estudo é considerado como um primeiro passo para a criação de desenhos de estudo objetivos a serem sistematicamente planeados, com base na mensurabilidade dos efeitos relacionados com o Qigong. Até à data não foram encontrados quaisquer estudos científicos sobre a ansiedade relacionada com o desempenho. Além disso, o exercício da bola branca é empiricamente considerado altamente eficaz, mas nunca foi cientificamente examinado para esta finalidade. A principal vantagem deste tipo de Qigong reside no facto de um ciclo de exercícios durar apenas alguns minutos e requerer pouco movimento e espaço, o que permite a sua integração numa aula regular, sem perda significativa do tempo de ensino.

Métodos: Estudo prospectivo com controlo (lista de espera).

Parâmetros principais: EADS-C e cortisol salivar.

Parâmetros secundários: frequência cardíaca, pressão arterial, eletromiografia de superfície e tempo de reação (medido pela resposta a estímulos por MP36 Sistemas Biopac).

A termografia permite a medição do fluxo capilar das mãos antes e depois da sequência de exercícios de Qigong. Durante o desenvolvimento do estudo foi demonstrado que a termografia pode ser uma ferramenta útil para estudar objetivamente os efeitos relacionados com o Qigong. Em cooperação com o projeto de mestrado de Luís Matos, foi medida a termografia dos braços e pernas dos participantes no início do estudo e após 7 semanas.

Crítérios de inclusão: Alunos de flauta transversal com idades compreendidas entre os 10 e os 12 anos, capazes de seguirem as instruções requeridas para a prática de Qigong, depois de assinarem o termo de consentimento informado.

Os critérios de exclusão: Problemas psicológicos graves e experiência prévia com Qigong.

Intervenção: 8 crianças receberam aulas de Qigong (exercício da bola branca) durante 30 minutos, ao longo de 7 semanas, 2 vezes por semana, sendo que também foram instruídas para fazerem os exercícios diariamente em casa. O grupo de controlo, constituído igualmente por 8 crianças, não recebeu qualquer intervenção (lista de espera).

Resultados: Os resultados demonstraram que o Qigong reduz:

- a perceção subjetiva de ansiedade (4,5 pontos) (medida pela EADS-C);
- a frequência cardíaca (11 batimentos por minuto);
- a pressão arterial (6,54 mmHg);
- os níveis de cortisol salivar (0,198 µg/dl) em alunos de flauta transversal antes de audições.

Apenas a diminuição da frequência cardíaca foi significativa para um $\alpha = 0,05$ (valor de $p=0,005$). Em contrapartida não há evidências de que Qigong é eficaz na

redução da tensão muscular do trapézio (medida pelo SEMG) e na redução do tempo de reação.

A termografia, como uma avaliação funcional objectiva em tempo real, mostrou ser uma ferramenta importante para medir os efeitos do Qigong (dados apresentados na dissertação de mestrado do engenheiro Luís Matos).

Discussão: O estudo confirma que os efeitos relacionados com o Qigong podem ser convencionalmente objetivados por valores psicológicos e parâmetros fisiológicos, incluindo medições de cortisol salivar. O estudo revela que 2 novos parâmetros (EADS-C e fluxo capilar medido por termografia) podem ser escolhidos para medição dos efeitos do Qigong. Revela ainda que o batimento cardíaco, a tensão arterial e o nível de cortisol salivar são parâmetros objetivos que permitem medir os efeitos do Qigong na ansiedade relacionada com o desempenho.

Surpreendentemente e embora o tamanho da amostra seja $n=8/8$, os dados mostram alterações estatisticamente significativas ao nível do batimento cardíaco. Futuramente seria conveniente aumentar o tamanho da amostra, de forma a aumentar o poder estatístico dos dados.

Um dos principais problemas dos estudos de Qigong e de intervenção psicológica é a escolha dos controlos adequados. Neste estudo piloto concentramo-nos na mensurabilidade dos efeitos. Futuramente o controlo escolhido poderá ser substituído por um plano baseado na realização de qualquer outro tipo de exercícios de Qigong, por uma actividade de lazer ou outros. Aleatoriedade e participantes cegos devem ser fatores a incluir num futuro estudo.

Conclusão: Os efeitos do Qigong podem ser medidos objetivamente através de parâmetros psicológicos e fisiológicos como o cortisol salivar. Este estudo refere 2 novos parâmetros objectivos que podem ser usados na realização de um novo estudo sobre os efeitos do Qigong (bola branca) nos distúrbios físicos relacionados com a ansiedade.

Palavras-chave: Qigong, efeitos do Qigong, Medicina Tradicional Chinesa, ansiedade, ansiedade relacionada com o desempenho, stresse, alunos de música, o modelo de medicina tradicional chinesa de Heidelberg.

Abstract

Background: Anxiety disorders are common psychiatric conditions that can cause significant disability, poor quality of life and enormous social costs. Studies showed that one out of three patients suffering from anxiety shows insufficient response to standardized western treatment. Anxiety and improvement of learning are closely related. Vegetative changes as seen in stress syndrome may also impair functional abilities of the patients. This is frequently seen in musicians who require an ultimate motor and breathe control. In flutists performance-related anxiety may potentially cause problems that empirically include anxiety, heartbeat, blood pressure, muscular tension and cold hands.

Aim of the study: This study aims to evaluate if and how Qigong-related effects may be further objectified by physical measurable parameters and psychological scores. For this purpose we examined 10 – 12 year old music school children playing the transverse flute before auditions.

This is regarded as a first step towards the creation of objective study designs to be systematically planned on the basis of measurability of Qigong related effects. To our knowledge, there are so far no scientific studies on performance related anxiety and Qigong at all. Furthermore, the exercise system of the white ball is empirically highly effective, but was so far never scientifically examined for this purpose. The main advantage of this system is the fact that an exercise cycle only takes a few minutes and requires only little movement and space, so it could be integrated in class-teaching without significant loss of teaching time.

Methods: Prospective controlled interventional study with waiting list design.

Main parameters: EADS-C and salivary cortisol.

Side parameters: Heart rate, blood pressure, surface electromyography, time reaction (measured by stimulus response situation by MP36 BIOPAC Systems).

Thermography allows the measurement of capillary flow of the hands before and after training sequence. During the development of the study, it was shown that

thermography may be a useful tool for objectifying Qigong related effects. In cooperation with the master project of Luis Matos, thermography of the arms and legs was additionally measured at the beginning of the study and after 7 weeks.

Inclusion criteria: Music school children of 10 - 12 years of age playing the transverse flute, capable of following the Qigong instructions in terms of Portuguese language skills, after having signed the written consent.

Exclusion criteria: Major psychological problems and previous experience with Qigong.

Intervention: In the Qigong group 8 children were included and they received specific Qigong lessons of the so-called white ball Qigong over 7 weeks, twice a week, for 30 minutes. They also were instructed to do the exercises at home daily. In the control group 8 children were included and they didn't receive any intervention (waiting list design).

Results: Qigong reduced

- subjective perception of anxiety (mean of 4.5 as measured by EADS-C);
- salivary cortisol levels (mean of 0.198 µg/dl);
- heart rate (mean of 11 beats per minute);
- blood pressure (6.54 mmHg) in transverse flute schoolchildren before auditions.

However, only heart rate decrease showed a significant change for an $\alpha=0.05$ (p value=0.005). There is no evidence that Qigong is effective in the reduction of muscular tension of trapezius (measured by SEMG) and in the reduction of time reaction.

Thermography as a real time objective functional assessment showed to be an excellent tool for Qigong studies with highly significant measurability (data presented within the master thesis of the engineer Luis Matos).

Discussion: The study confirms that Qigong related effects may be conventionally objectified by psychological scores and physiological parameters including cortisol measurements.

In addition the study reveals that 2 new parameters can be chosen such as EADS-C and capillary flow as measured by thermography. The study also reveals that heart rate, blood pressure and salivary cortisol are objective parameters to measure the effects of Qigong on performance related anxiety

The data surprisingly show statistically significant changes, although the sample size is $n=8/8$. The data suggests to enlarge the sample size. For future studies further statistical power analysis is necessary.

It is a principal problem of Qigong research and psychological intervention to choose adequate controls. In this pre-study we focused on measurability of the effects. The control chosen here (waiting list design) may be changed to either another type of Qigong, to another occupation or others. Proper randomization and blinding procedures should be carried out to develop an objective study design.

Conclusion: Qigong effects can be measured properly by psychological scores and physiological parameters such as salivary cortisol. This study shows 2 new objective parameters that may be used to further document, the obvious effects of the white ball Qigong on performance related anxiety and related physical disorders as measured in this study.

Key words: Qigong, effects of Qigong, Traditional Chinese Medicine, anxiety, performance related anxiety, stress, music school children, Heidelberg Model of TCM.

Aos meus pais...

que são imensamente responsáveis pelo que eu sou até hoje...

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Abbreviations

ANA – Autonomic Nervous System

BP – Blood Pressure

DASS - Depression Anxiety and Stress Scale

Dr. - Doctor

EADS –C – Escala de Ansiedade, Depressão e Stresse para Crianças, de Lovibond e Lovibond

EMG – Electromyography

e.g. – for instance

HR – Heart Rate

IEMG – Intramuscular Electromyography

Pc – Pericardium

PNS – Parasympathetic Nervous Systems

Prof. – Professor

R – Renal

Rg – Regens

RAAS - Renin Angiotensin Aldosterone System

SD – Standard Deviation

SEMG – Surface Electromyography

SNS – Sympathetic Nervous System

TCM – Traditional Chinese Medicine

TR – Time Reaction

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Introduction

The present work is a thesis proposal within the framework of the Master degree of Traditional Chinese Medicine, lectured in Instituto de Ciências Biomédicas de Abel Salazar – University of Porto, under supervision of Prof. Henry Johannes Greten and co-supervision of Prof. Jorge Machado and Qigong Specialist Mário Gonçalves.

Anxiety disorders are common psychiatric conditions that can cause significant disability, poor quality of life and enormous social costs (Menezes et al., 2007). To treat anxiety, western medicine uses drugs such as benzodiazepines, buspirone, antidepressives, beta-blocking agents, antipsychotics and others (Andreatini, Lacerda and Filho, 2001). According to Menezes et al. (2007), a great number of patients fail to respond or remains with clinically significant residual symptoms after conventional treatment. According to the same authors one out of three patients shows insufficient response or does not get better with standard western treatment. Andreatini, Lacerda and Filho (2001) also affirm that in Brazil, just 50% of patients with anxiety disorders are successfully treated by western drugs.

Traditional Chinese Medicine is defined as “a system of sensations and findings designed to establish a functional vegetative state which can be treated with acupuncture, Qigong, tuina, Chinese pharmacology and dietetics” (Greten, 2010). The word Qigong is the combination of the words Qi and qong. According to the Heidelberg model, Qi is the “vegetative capacity to function of a tissue or an organ which may cause the sensation of pressure, tearing or flow”. Qi is also called the “vital energy” of the body (energy is defined as the capacity to work), and gong is the capacity to work with the Qi. Although it is used by millions of people, the scientific proof of Qigong related effects is poor for several reasons:

1. The effects are difficult to objectify: Besides psychological scores, salivary cortisol has been successfully used. It was also shown that patients with migraine and high blood pressure may profit from Qigong, but the studies do not reach scientific standards due to poor evaluation, lack of controls, or anecdotal type of data.

2. The Qigong methods are not properly and uniformly defined: The indications of the exercises only rarely allocated to western diagnoses, their details not sufficiently explained. In fact, Qigong does not equal Qigong, as there are more than 1000 styles officially taught (Li, Chen and Mo, 2002).
3. Insufficient controls: One can say that there is a general problem to create controls in psychotropic exercises such as Qigong, psychotherapy or yoga.
4. Insufficient blinding.

It is the purpose of this pre-study to address to the measurability of Qigong related effects. It uses the style of the “white ball” to overcome the problem of the definition of the exercises, as well as the allocation of exercises to clinical conditions. It does not focus on the problems of controls and blinding.

This study aims to evaluate if and how Qigong related effects may be further objectified by physical measurable parameters and psychological scores. For this propose we examined 10 – 12 year old music school children playing the transverse flute before auditions.

It should be taken into consideration the great difficulties to train and to convince adequately the children in order to participate in this study with a correct sequence and performance in Qigong practice. In the followed sessions it will be presented the state of art, study design, methods, ethical consideration, results, statistical analysis, discussion and the final considerations.

1. State of Art

For this literature review, we searched on data bases such as b-on, Pubmed, Science Direct and Google Scholar. We used the key words Qigong, effects of Qigong, Qigong for schoolchildren, medical effects of Qigong, Traditional Chinese Medicine, anxiety in children, stress in children, and others.

This review will be divided into four different parts: first we will refer some important data about anxiety in children and music teaching in Portugal, then we will define some essential concepts of Traditional Chinese Medicine according to the Heidelberg model, and after that we will talk about Qigong in particular and its effects.

1.1 Anxiety and music schoolchildren

1.1.1 *Anxiety, depression and stress*

Anxiety is defined as a manifestation of somatic tension and arousal with symptoms such as shortness of breath, feeling dizzy, dry mouth, trembling or shaking (Watson et al.^{1,2}, 1995). During childhood and adolescence anxiety is normal and allows the adaptation of the child/teenager to new and unexpected situations. Most of the children can deal with anxiety in a healthy way, since the anxiety is a transitory and a functional experience. However, if the child cannot cope with anxiety correctly, anxiety may become unhealthy and chronic. If, according to Wilson, Pritchard and Revalee (2005) (in Borges et al., 2008) children and teenagers can't deal with anxiety, they could present different with various depressive and anxious symptoms that could disturb their individual, familial and social development as well as their development at school. Anxiety disorders are common psychiatric conditions that can cause significant disability, poor quality of life and enormous social costs (Menezes et al, 2007).

To treat anxiety, western medicine uses drugs such as benzodiazepines, buspirone, antidepressives, beta-blocking agents, antipsychotics and others (Andreatini, Lacerda and Filho, 2001). According to Menezes et al. (2007), western medicine can't solve all cases of anxiety disorders since a great number of patients fail to respond or remain with clinically significant residual symptoms after the treatment.

Statistics show that one out of three patients presents an insufficient response or does not get sufficiently better with standard western treatments.

Kessler and his colleagues (2001) have done a study to describe the use of complementary and alternative medicines to treat anxiety and depression in the United States. According to their work 9.4% of total participants reported suffering from anxiety attacks in the past 12 months and 7.2% reported severe depression. A total of 56.7% of those with anxiety attacks and 53.6% of those with depression reported using complementary and alternative therapies to treat these conditions during the past 12 months. The authors concluded that complementary and alternative therapies are used more than conventional therapies by people with self-defined anxiety attacks and severe depression. The perceived helpfulness of these therapies in the treatment of anxiety and depression was similar to that of conventional therapies.

As said before, anxiety is defined as a manifestation of somatic tension and arousal with symptoms such as shortness of breath, feeling dizzy, dry mouth, trembling or shaking. In contrast, depression is defined as an absence of positive emotional experiences with symptoms such as feeling disinterested in things, lack of energy, feeling that nothing is enjoyable and that nothing in life has fun. However studies show that anxiety and depression are strongly correlated (Watson et al.^{1,2}, 1995).

Watson et al.^{1,2} (1995) developed a tripartite model of depression and anxiety that divides symptoms into 3 groups: “symptoms of general distress that are largely nonspecific, manifestations of anhedonia and low positive affect that are specific to depression, and symptoms of somatic arousal that are relatively unique to anxiety”. The authors concluded that anxiety and depression are strongly related. According to them, anxiety and depression states show nonspecific symptoms of general distress. This nonspecific group includes anxious and depressed states, as well as other symptoms such as insomnia, restlessness, irritability, poor concentration, that are prevalent in both types of disorder. In the tripartite model, these nonspecific symptoms are primarily responsible for the strong association between measures of anxiety and depression (Watson et al.^{1,2}, 1995).

Cole et al. (1998) have done a study in France, aimed to investigate the relation between anxiety and depression levels in children and adolescents. 330 students and their parents (n=228) participated in a 3 year longitudinal study and every 6 months

completed depression and anxiety questionnaires (Children's Depression Inventory, Revised Children's Manifest Anxiety Scale). The results show that high levels of anxiety predict high levels of depression in children and adolescents. This result supports the hypothesis done by Watson et al.^{1,2} (1995).

Borges et al. (2008) have done a study in Portugal to measure the levels of anxiety and coping of teenagers and children and their relation with age and gender. For that they studied 916 children and teenagers from different Portuguese schools. They used the multidimensional anxiety scale for children and the coping responses inventory- youth form to measure the results. The results show that children between 10 and 13 years old show more anxiety in some aspects like separation and fear of being alone in strange situations. In the other hand girls show more anxiety than boys in aspects like tension, somatic symptoms, perfectionism, fear of failing, separation, and anxiety in general. Also the use of complex coping strategies increases with age. Older children also become more independent and they don't need parents support to solve their problems.

According to the same authors, anxiety increases with a stress situation. Because of that, the evaluation of anxiety has to be careful and has to consider all the environment of the children. According to Rijavec and Brda (2002), and with Skinner and Wellborn (1997) (in Borges et al., 2008) there are some situations that could cause stress in children like problems at school and problems with family and friends. In case of teenagers the result of tests, school pressure, problems at school, and the authority of their parents can be effective stress causes.

1.1.2 Music teaching in Portugal

In Portugal the teaching of music has been growing in the last years. One of the main problems of the professional musicians and music school children is to deal with the anxiety and stress before the auditions and concerts.

Anxiety and improvement in learning are closely related. Vegetative changes as seen in stress syndrome may also impair functional abilities of the patients. This is frequently seen in musicians who require an ultimate motor and breath control. In flutists anxiety may potentially cause problems that empirically include, heartbeat, blood pressure, muscular tension and cold hands.

Studies suggest that Qigong, a traditional vegetative biofeedback therapy, might help to relax mind, muscles, tendons, joints and to change body functions (Sancier, Hole, 2001). This leads to the assumption that Qigong may be a helpful method to decrease the levels of stress and anxiety in music school children.

1.2 Traditional Chinese Medicine and anxiety

1.2.1 TCM according to the Heidelberg model

Traditional Chinese Medicine is defined as “a system of sensations and findings designed to establish a functional vegetative state which can be treated with acupuncture, Qigong, tuina, Chinese pharmacology and dietetics”. Acupuncture is based on the use of needles to stimulate some points of a conduit, tuina is the Chinese manual therapy, Chinese pharmacology is the use of plants to treat a vegetative functional state and dietetics is the use of food and nutrition to treat a determined condition (Greten, 2010). Qigong as we have said before is the combination of the words Qi and gong. Qi is defined as the “vital energy” and gong is the capacity to work with the Qi.

According to the Heidelberg model Traditional Chinese Medicine, like all other medicines, interprets symptoms. However the postulates on which the symptoms and the body functions are interpreted differ to a certain degree from western medicines.

1.2.1.1 The diagnose

The following overview of the diagnostic structure of TCM is adopted material from “Understanding TCM” (ISBN 978 3 939087 07 6) (Greten, 2010). Anxiety is mainly understood as a part of a deregulation functional pattern leading to sensitivity to cold, stiffness, loss of motoric power, and joint problems.

As we can see in figure 1, there are four parts of a diagnose:

- Constitution,
- Pathogenic factor (agent),
- Organ patterns (orb),

- Guiding criteria

The Four Components of Functional Diagnosis

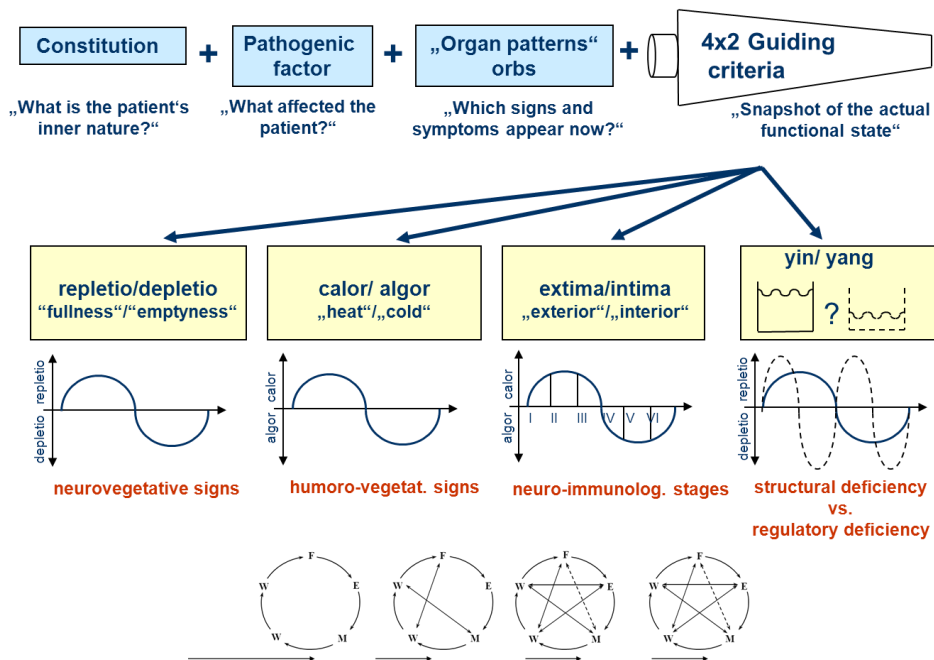


Figure 1 - Synopsis of the complex diagnosis in TCM. This diagnostic system is based on a mathematical consideration by Leibniz, which uses the terms yang and yin as a binary numbering code (Greten, 2010)

The constitution is a part of the diagnosis which defines the inner nature of the person as an expression of its physical appearance. This shows that Chinese Medicine has the concept that physical structure changes the functional behaviour of man, therefore his feelings, functions and the probability of certain symptoms. This is not much different to classical Greek descriptions of analogue characters like the choleric, sanguine, melancholic or phlegmatic. Nevertheless, these descriptions are not at all identical though analogous.

The pathogenic factor, the so-called agent, is what makes us sick. It is a functional power (Qi) which offends the pre-existing constitutive functional behaviour. In other words, the person is in his normal constitutive behaviour but something affects him which is called the pathogenic factor. This offence directly results in the affection of

some parts of the body and therefore produces actual, recent and sometimes different symptoms which are believed to be abnormal and thereby sick by the patient. In other words an agent is “a pathogenic factor eliciting specific signs and symptoms”.

Agents can be divided into neutral, exterior and inner agents. Neutral agents are for example overwork, overeating, malnutrition and others.

Exterior agents include humor, algor, ventus, and others.

Humor is described as “signs and symptoms as if you had been exposed to environmental humidity, such as swollen limbs and tissues, feeling of heaviness, dyspnea, generalized pain, and others. From a western medical view, these sign may originate from pre-edema and edema” (Greten, 2010).

Algor is described as “signs and symptoms as if you had been exposed to environmental cold, such as cold skin, stiff muscles, tearing and localized pain with gradual onset. From a western medical view, these signs may originate from regional deficiencies of capillary blood flow” (Greten, 2010).

Ventus is described as “signs and symptoms as if you had been exposed to a draught of air, such as running nose and eyes, reddish mucosa, swollen tonsils, spastic muscles, pain with sudden onset. From a western medical view, these signs may originate from mast cell-substance P reflexes and old reflexes of motor control as known from fish and other species” (Greten, 2010).

Examples of interior agents are emotions such as

- ira (anger),
- voluptas (lust),
- pavor (shock),
- maeror (grief),
- timor (anxiety),
- cogitation (exaggerated thinking and mental effort).

Anxiety, as an example, is allocated to the internal pathogenic factors. It may lead to a vegetative deregulation which consists of cold sensations, weak legs and tremor, loss of motor control etc.

The orb is the third major constituent of Chinese diagnosis. This word refers to the Latin word “orbis” which means circle. It is a circle or group of “diagnostically significant signs and findings that are grouped and named after organs or the region where some of the symptoms take place”. Sometimes this is referred to as the Chinese “organ teaching” which is a simplified understanding of the system.

In fact, an orb is only a group of diagnostically significant signs that include possible symptoms in the region of a western organ. This is why the correlation of western organs and Chinese orb names is relatively loose. One could therefore name this an organ-named functional pattern rather than an organ. For instance, the pulmonary orb refers to signs and symptoms that are related to the motion that we call expiration. While this respiratory movement takes place within the body, vegetative functional changes appear like changes in muscular tone, changes in immune functions like flooding capillaries in different capillary beds, like letting return the blood to the heart during inspiration (negative pressure in the chest). So the signs differ a lot from airway infections in many cases.

After defining these symptoms as constitution-related, factor-related and resulting pattern-related, the symptoms are then interpreted in the context of the whole body regulation by the so-called eight Guiding Criteria. These Guiding Criteria can be understood as the teaching of body regulation:

- 1- Repletion and depletion (“fullness” and “emptiness”) in a western understanding refer to the functional capacity mostly induced by the vegetative system;
- 2- Calor and algor (“heat” and “cold”) represents the humoro-vegetative regulation since calor is an increased microcirculation with inflammatory effects and algor a decreased microcirculation with lack of inflammatory effects;
- 3- Extima and intima (“outside” and “inside”) refer to the neuro-immunological regulation;
- 4- Yin and yang.

1.2.1.2 *The guiding criteria are based on Yin, Yang, the phases and orbs*

Changes in the functional capacity result in visible signs that add to the creation of the findings and symptoms. This teaching is not coincidentally formed but that the origin of this teaching may be a precise logical system based on a numbering system of yin and yang.

The famous mathematician Leibniz analysed the oldest book of mankind, the I Ging. This book is believed to date back at least 3,000 years and according to some other sources the origins date back 5,000 years. This is the oldest book of China and mankind and it was designed to systematically describe the course of life, its changes, its modalities, and it would offer advice to our personal and emotional life-style and personal guidance. Therefore, it was described as the Book of Changes. The book was translated in an admirable way by a missionary, a theologian from Germany, called Richard Wilhelm and it was published in 1923. Ever since, this has evoked the curiosity of the European and American users and thinkers.

Leibniz though, 300 years before, found out that the bars and symbols in this book have a mathematical meaning far from philosophy. On this binary numbering system Boole's algebra and other bases for computer and knowledge of nowadays are based. Leibniz also showed the rules, the *arithmeticae binariae* and the ways to calculate with these binary numbers. He built the first calculator of Germany in 1643.

To give a short description what Leibniz found, we changed the lines and symbols of the I Ging into white and black bars. Within the I Ging the white bars are continuous bars, meaning yang, whereas the black bars are discontinuous bars and mean yin. To make it more visible and for practical reasons we reduced this to black and white bars.

Mainly we can see that in the first line one of these graphs (a monogram) means 1 or 0, so we can develop the numbers 1 or 0 out of these bars. The second line shows bigrams, or two-lined symbols, which means that we can develop the numbers 1 to 4 out of two yin-yang lines. Accordingly, out of three of these lines, a trigram, we can develop the numbers 1 to 8. In classical Chinese natural sciences and philosophy also these binary numbers were used to describe circular movement such as shown in the Figure 2.

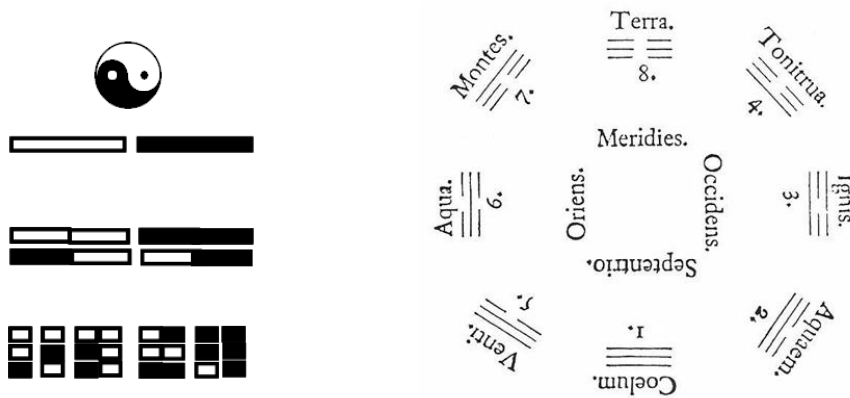


Figure 2 - The left part of the picture shows how yang lines (white) and yin lines (black) can be used as monograms (1 and 0), bigrams which compose two lines to form 1,2,3,4, or even trigrams (1-8) (Greten, 2010)

Instead of writing 1, 2, 3, 4 they would use the bigrams to symbolise the quarter sections of a circular movement. For instance, such a movement is the circular process of the seasons – spring, summer, autumn and winter. It could also be used for other circular processes like the day or functional behaviour of man. Within the 3rd century before Christ these bars were more and more exchanged by the symbols and emblems for Wood, Fire, Metal and Water.

We can describe four parts of a circular procedure by bigrams, but we can also have a more precise description of circular functions by trigrams. Instead of quartering the circle, we would have 1/8th of the process as one part of the process.

1.2.1.3 Why are circular functions so important for medicine?

To explore how yin and yang and circular functions are important for medicine, we refer to a simple model of regulation, cybernetics. This word comes from the Greek word *kybernetes* who is the man on a ship who takes the steering wheel. In other words, steering of functions in complex systems are cybernetic processes. To begin with we refer to a simplified mono-causal kind of linear function:

A water basin has an electric heater which is regulated by a thermostat. A target temperature is defined, in this example 37 °C (figure 3).

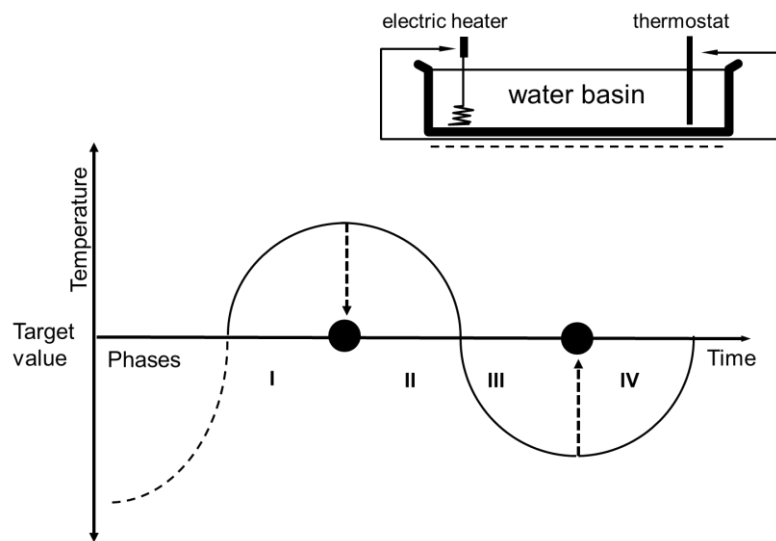


Figure 3 - Water basin model (Greten, 2010)

Before work in the morning, the incubator will have reached room temperature. In phase 1 we may switch on the system. The thermostat will switch on the electric heater as the actual temperature is lower than the target temperature. This will take some time and temperature will rise to 37 °C (Phase 0).

In stage I, when the target temperature has been reached, the thermostat will cut off electricity to the heater. This means that the heater won't furthermore gain more energy. Nevertheless the heater is still warmer than the water. If we switch off the heat, we cannot yet touch the plate. This amount of heat is called afterheat, in a technical sense, and it causes a peak of temperature.

In stage II this excess afterheat is gradually used up, so the water cools down back to the target value. After cooling down to 37 °, the thermostat will switch on the heater again.

During stage III it is switched on. Nevertheless, it takes some time until the heater is hot again. This again is comparable to our electric stove. Switching on the heater means that we can still touch the plate until it is hot. This phenomenon is technically called latency.

In stage IV after some time, the heater will be warmer than the water and the temperature and energy content of the basin will rise. This procedure happens now in a repetitive manner. An endless chain of up and down movements will be taking place in such a heated regulated system.

At first sight this is astounding, as it means that such a regulated system does not hold the target value as we might expect. It is either too hot or too cold. Likewise, afterheat causes the peak in temperature and latency causes the low. In a simplified description this resembles a sinus wave.

We have some historical hints pointing to the fact that classical Chinese regarded these cyclic processes actually as cyclic, as a circle. From a nowadays standpoint this is only a rough assumption as the actual course of temperature is not exactly a sinus wave. Nevertheless, for the simplicity and for a better access to this model we name this the sinus curve of regulation.

Looking at a pipe organ player we see that the hand always moves in a cyclic manner around the axis of the pipe organ. Looking from a perpendicular perspective, this is an up and down movement in the middle of which the axis is situated. Likewise, a standing pipe-organ player has an up and down movement (yang and yin movement) of his hand. However, when he moves forward with his instrument, the movement of his hand describes approximately a sinus wave. Therefore, a sinus wave is also called a circular function.

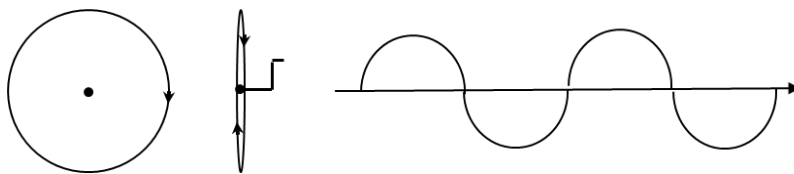


Figure 4 - Movements of the hand of a pipe organ player seen from the side (left), from the front (middle) and when walking (right) (Greten, 2010)

A sinus wave is a circular movement which we regard from another projective standpoint. Looking from the different angle therefore changes the circular movement into a sinus wave movement.

When the hand is up, it will then move down because the axis turns it down. The axis in our regulatory example is the target value. We may symbolize this by a dot on the target value line, the axis (Earth 1). When the hand is down, it will then move up. This change of direction is mediated by the axis again. This upward power can be symbolized by another dot on the target value line (Earth 3).

Referring to the classical circle of yin/yang descriptions of a circular movement, we can insert in our regulatory model the phases Wood, Fire, Metal and Water as quarter sections of the circular movement. Actually this symbol is a nice description for the fact that the target value (here called Earth), the centre of the movement, exerts a down-regulation in the first half of the movement and an up-regulation in the second half of it.

Chinese culture tends to put technical terms into emblems. In fact, all Chinese language is expressed by emblems and classical characters. If we follow this tendency on a mathematical level, we could express the mathematical content, not the philosophical content, of this consideration by a circle that we draw around our technical term. What comes out is the so-called monad or in Chinese terms the *fou qi* sign or the *tai ji* sign.

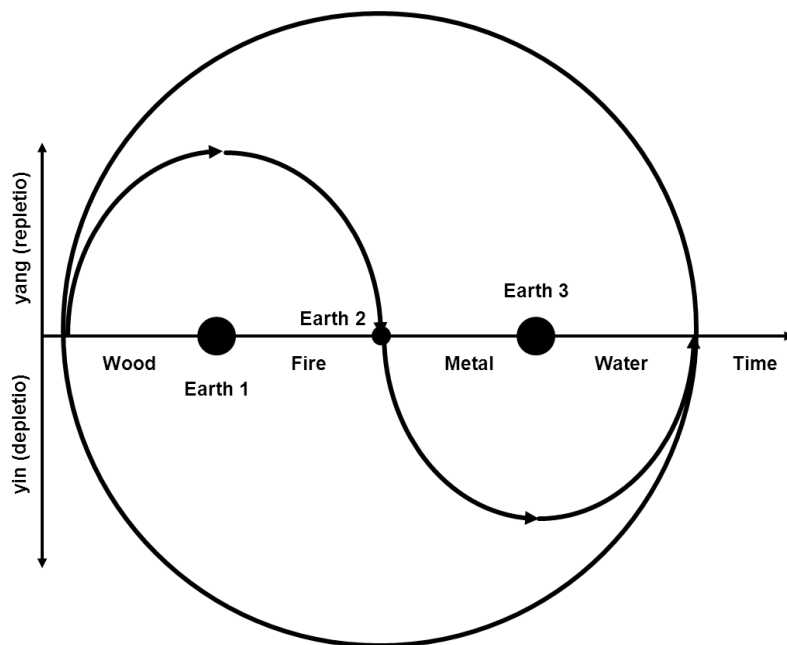


Figure 5 - Phases (Greten, 2010)

This sign is also referred to as the yin/yang symbol. Its mathematical meaning is that yin and yang form a binary language of numbers that are able to describe circular functions such as in regulation. We therefore consider this sign to be a symbol for the scientific approach to natural processes rather than a mystical, philosophical approach which is common in the public presentation of Chinese Medicine nowadays.

1.2.1.4 Why is this good for medicine?

On the ordinate we may not only plot the temperature but other values as well, for example the overall vegetative activity of man. High activity would then be yang or repletion, low activity would be yin or depletion. In other words, one of the possible interpretations of yin and yang are:

- yang above target value and
- yin below target value.

In the yang phases sympathetic functions dominate more than in the yin phases. In the yin phases, however, the parasympathetic (vagal) activity is relatively more present. Of course, the vegetative system consists of more than sympathetic and parasympathetic activities.

In the first major description of the vegetative system leading to the Nobel Prize in 1927, the original description is to categorize vegetative functions and its nervous system into sympathetic, parasympathetic and intestinal nerve fibres. For instance, the enteric nerve system is less active while we are highly agitated, as defecation would be dysfunctional in stress and fight situations. On the other hand, in the phases of down-regulation like in the phase of Fire and even in lack of energy (Metal), the enteric nerve system is more active to restore energy levels. We can also insert in the picture muscle tonus and motion patterns by hypertonic, hyperdynamic, hypotonic and hypodynamic functional patterns or the RAAS (renin angiotensin aldosterone system) which is more active in the yang phases above the target value and less active in the yin phases below the target value.

Like this one could design a whole concept of a transmitter concert according to western medicine. Likewise, the concert of transmitters and the neuronal pathways

involved would define a complex pattern of physical functions which is indicated schematically and in a reduced form in the lower part of the figure 6. This can be called the western physiological description of such a vegetative sinus curve.

In the upper part of the figure 6, functional figurines symbolise the clinical appearance of these mechanisms in terms of visible signs. For instance, the coppersmith in Wood has a lot of extensor muscles being active, and blood pressure presumably is higher than in the Lady reading the bible in the phase of Metal. The patterns named above exactly correspond to the clinical description of Chinese Medicine. In other words, the description by groups of clinical signs in the upper part of the figure describes the same functions that western medicine describes as a transmitter and neuronal concert of the vegetative system.

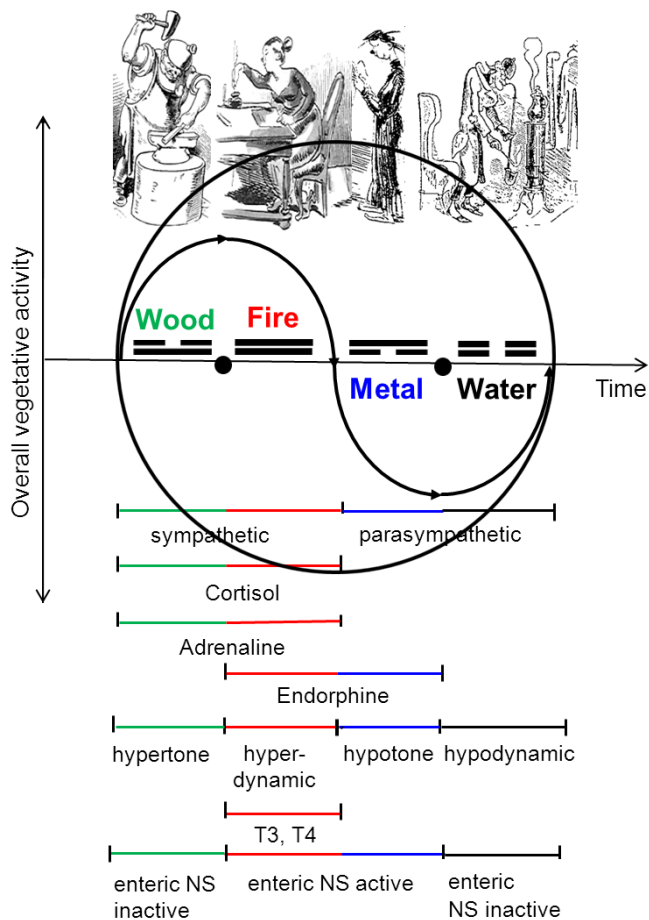


Figure 6 - Phases (Greten, 2010)

One could therefore say: the upper part contains the Chinese way of description, the lower part contains the western description. Of course this is a mathematical function – irrespective of whether we express this by yin/yang lines or by Wood, Fire, Metal and Water. The Chinese description would be that the left part (Wood and Fire) gets the category of yang, whereas the right side (Metal and Water) is yin. By trigrams we can then create the numbers 1 – 4 and that was later replaced by Wood, Fire, Metal and Water, the so-called phases. The signs and symptoms which indicate the phases are referred to as organ patterns or orbs (circle of diagnostically relevant signs). Four of these are especially essential to understand the unity of signs and emotional expression.

1.2.2 According to TCM and to the Heidelberg model emotions and anxiety are associated with vegetative functional changes called organ patterns or orbs

As we have already referred to, there are four phases: Wood, Fire, Metal and Water. There is an additional phase called earth which is responsible for turning the axis, which is neglectable in this context for the moment. All these correspond to functional patterns named organ patterns or orbs, which will be briefly described here.

According to the Heidelberg model wood is described as the phase of creating potential (energy). This means that if a person is on the phase wood, he is full of energy and he will release this potential quickly if it is necessary. This person may seem like an explosive which blows up the energy and a social conflict. This phase could be expressed by hepatic or felleal orb. A person expressing hepatic orb will have hypertonic muscles, shouting voice, opening eyes as it is seen in the Figure 7. The emotion related to this orb is ira (anger).

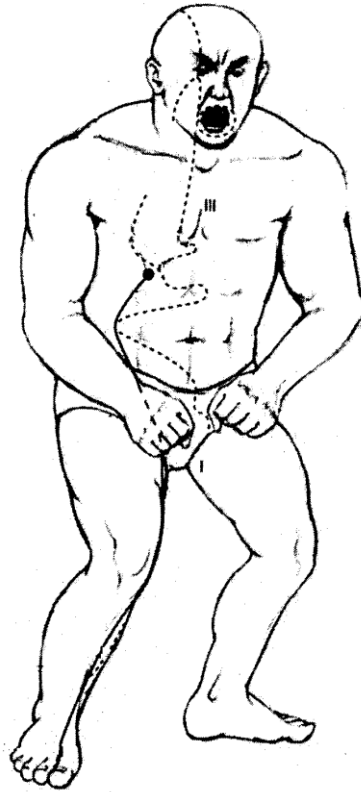


Figure 7 - Hepatic orb, the emotional expression is referred to as ira (Greten, 2010) Chinese Medicine understands this state as a consequence of regulation of vegetative functions.

Fire is described as the phase of transformation of potential into function. Creating such function from an elevated potential means that a hyperfunctional state can be observed in this phase. This phase could be frequently expressed by cardiac or pericardiac orb. A person expressing signs of cardiac orb will be hyperdynamic, will present laughing voice, brilliant eyes and he will speak moving the hands, as we can see in Figure 8. The emotion related to this orb is voluptas. Pericardiac people are full of unrest and they are characterized by never having time. Pericardiac people are commonly cardiac with a weak yin, which have been humiliated so far that their anxiety is high.

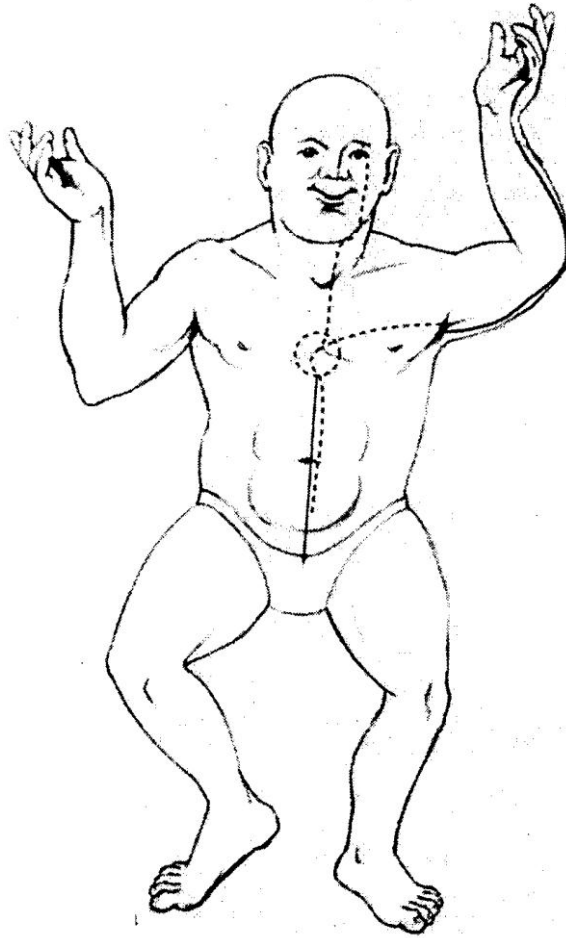


Figure 8 - Cardiac orb, the emotional expression is referred to as voluptas (Greten, 2010) Chinese Medicine understands this state as a consequence of regulation of vegetative functions.

Metal starts when the polarity changes. This means that metal is described as the phase of relaxation. This phase is responsible for the rhythmical functions of the body, like the motion of breathing. This is the way the functions of metal are mostly expressed by the pulmonary orb. A person in this phase will be hypotonic, will present a wailing voice, hanging shoulders and lack of energy as we can see in Figure 9. The emotional state related to this orb is called maeror (agony, grief).

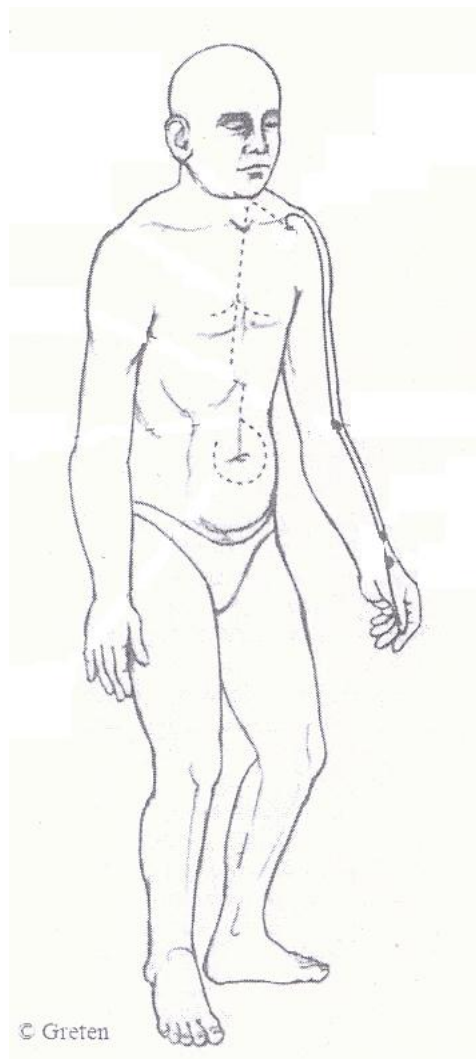


Figure 9 – Pulmonary orb, the emotional expression is referred to as maeror (Greten, 2010) Chinese Medicine understands this state as a consequence of regulation of vegetative functions.

Water is the phase in which the energetic potential is regenerated. Regeneration of energy during the sleep and reproductive functions are expressions of the phase water. This phase is related to renal orb. A person expressing renal orb signs is hypodynamic, with unemotional voice, weak legs and lumbar region as we can see in Figure 10. The emotional state related to this orb is called timor (anxiety) that leads to over-rationality.

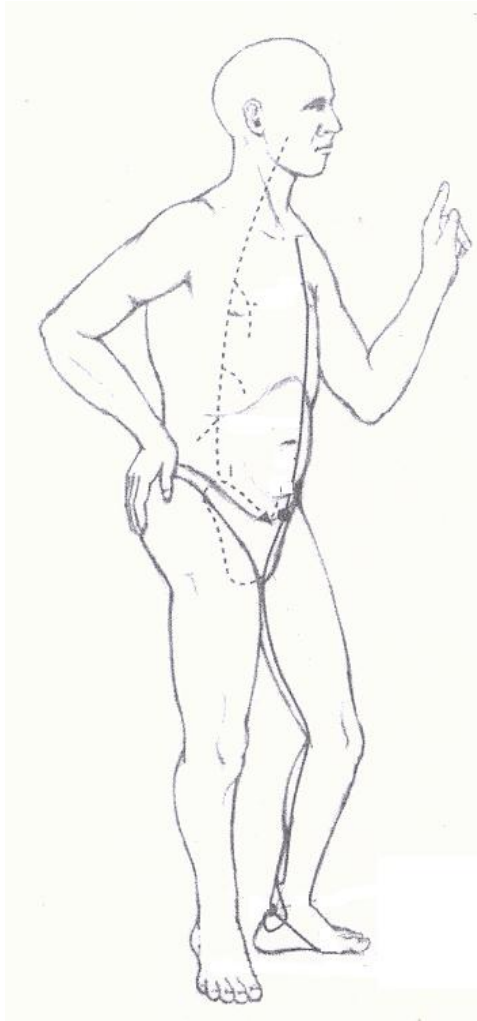


Figure 10 – Renal orb, the emotional expression is referred to as timor (Greten, 2010) Chinese Medicine understands this state as a consequence of regulation of vegetative functions.

To explain anxiety we will focus on fire/water axis. As we have referred before the renal personality pattern includes regenerative vegetative functions, so in this phase there are a lack of energy and a lack of yin (cellular functional capacity). It is supposed that this makes the renal person subconsciously vulnerable and leads to the need of more emotional security. This may be called anxiety which is mostly hidden under a rational mask. Anxiety may block and may paralyze the person in a moment of challenge. Renal people tend to plan their lives and they may become nervous and anxious when incalculable events happen. This anxiety that leads to over-rationality

could be called timor, and as we have already referred, timor is the emotional state related to the renal orb and constitution.

As we have said before pericardiacs are frequently cardiacs with a lack of yin who have been humiliated so far that their anxiety is high. Renal types rationalize their anxiety while pericardiacs act out anxiety by constant hyperactivity. Both may be empirically stated for challenging situations like auditions, in which some individuals seem to be “paralysed and cold” (renal pattern), whereas others are “hectic and panic” (pericardiac pattern). To diminish anxiety it is necessary to work both on fire and water patterns, and to keep people safe and secure.

1.3 Qigong effects in the language of TCM

According to Dorcas and Yung (2003), Qigong can be defined as “an indigenous Chinese holistic form of exercise that originated at least 5000 years ago”. More than 1000 forms of Qigong are practiced today in China (Li, Chen and Mo, 2002). According to Li, Chen and Mo (2002), the original purpose of Qigong practice hasn't been used for treating diseases but for preventing them. Qigong doesn't treat just the symptom or the disease, but helps the person to restore what is called “the Qi flow”, in western terms, their capacity to adapt functionally by their vegetative nervous system.

Although it is speculated that most Qigong forms bring health benefits, medical Qigong is a small and specialized area of Qigong that has been specifically developed for treatment and cure of diseases (Chen, Yeung, 2002).

Qigong consists primarily of meditation, physical movements and breathing exercises. Qigong masters developed the skill of feeling the sensation of Qi and work with it using their mind and intention (Sancier, 1996). According to Yu (1999) (in Tsang et al, 2003) Qigong may have an effect comparable to antidepressants.

According to Gonçalves (2010) Qigong works with the so-called 3 treasures of Traditional Chinese Medicine: Qi, Shen and Jing. According to the Heidelberg model, and as we have said before, Qi is the “vegetative capacity to function of a tissue or organ which may cause the sensation of pressure, tearing or flow. Shen is a “functional capacity to put order into mental associativity and emotions, thus creating mental presence”. The functional state of Shen is evaluated by the coherence of speech, the

gloss of eyes and fluent fine motor capacities (Greten, 2010). According to the same model Jing is translated by the term of structive potential. Structive potential means the possibility to create structure by cell populations. It refers to the general regeneration of body structure as well as the build up of organs during embryology. Structive potential also refers to the potential of the structure to exert function. This is comparable to the basic repertoire of functions that the cells are offered in western medicine by the nucleus of the cell (Greten, 2010). Using more common terms, Qi is the energy, Shen is the mind and Jing is the body with its functional and regenerative capacities. As a conclusion, Qigong works with functional capacities, with the body and with the mind. Qigong is also believed to relax the body, to promote the flow of Qi, blood, oxygen and nutrients to the cells of the body and to promote the removal of waste products from cells (Sancier, 1996).

1.4 Measurable and hypothetic effects of Qigong

Chinese studies claim that Qigong, a traditional vegetative biofeedback therapy, helps to relax mind, muscles, tendons and joints by exercises involving physical movements, focused meditation, breathing and self massage. It is speculated that as the injured tissues become more relaxed, vasoconstriction would decrease and blood circulation increase. This phenomenon could promote the removal of metabolic waste and increase delivery of pain killers such as endorphins (Sanciers, Hole, 2001).

In fact, practicing Qigong may favorably affect many functions of the body, permitting the reduction of the dosage of drugs. Studies also suggest that Qigong provides greater health benefits than the use of drug therapy alone in certain cases. As an example, for hypertensive patients Qigong exercises combined with drug therapy reduce the incidence of stroke, death and the dosage of drugs required for blood pressure maintenance. In asthma patients the combined therapy has permitted the reduction in drug dosage, duration of hospitalization and costs of therapy. It also improved the immune and cardiovascular systems and increased the general condition of patients (Sanciers, 1999).

There are a great number of cancer patients using TCM as an alternative medicine to help treat cancer. A systematic review was done by Chen and Yeung (2002) with more than 50 studies about Qigong therapy for cancer in China.

Unfortunately, most of them can only be considered to be of anecdotal value, as they in most of the cases do not meet western scientific standards. The authors concluded that Qigong therapy may improve immune function, increase microcirculation and raise the pain threshold. The studies on Qigong and its curative effect on cancer have demonstrated consistent results for inhibitory effect on cancer growth and metastasis in clinical observation. Patients who practice Qigong had more improvement or better survival rate than patients who don't.

1.4.1 Vegetative Physiological Effects

Machi (1994, in Sancier, 1999) demonstrated with thermography that Qigong exercises can increase skin temperature, which implies greater blood circulation in some areas of the body. Qigong also can affect brain waves, blood pressure and heart rate (Machi, 1994, in Sancier, 1999). At the same time, Sanciers (1996, 1999) speculate that an increase in blood circulation can help to explain the effect of Qigong on many different functions of the body. Increased blood circulation enhances delivery of oxygen and nutrients to the cells and increases the efficient removal of waste products. These may help stressed tissue increase the efficiency of body functions including immune response. Those studies suggest that Qigong exercises are effective for balancing organs of the body.

1.4.2 Qigong and Stress (as measured by blood pressure, heart rate, urinary catecholamines, cortisol level)

The following studies are quoted for an anecdotal documentation of qigong related effects. Some of the studies were insufficient described in terms of methodology, statistics, out come and controls. The results of these studies are contradictory, the Chinese functional diagnosis not consider and the allocation of the exercises to the clinical pictures generally remain unclear. However none of these studies refer to the white ball exercises

Lee et al. (2003) have carried out a study to determine the effects of Qigong on blood pressure, urinary catecholamines (indicators of stress) and lung function in middle aged patients with essential hypertension. The examiners formed 2 groups

(control group and Qigong group) of 29 participants each one. The Qigong group did 30 minutes of shuxinping-xuegong per day during 10 weeks. Blood pressure, urinary catecholamines, forced vital capacity and forced expiratory volume per sec were measured before and after 10 weeks. The results show that after 10 weeks, the levels of blood pressure were smaller in the Qigong group than in the control group as well as the levels of catecholamines. At the same time the Qigong group improved the lung function. The examiners concluded that Qigong can help to improve the lung function and reduce blood pressure and stress in middle aged patients. These results suggest that Qigong has relaxation effects and stabilizes the sympathetic nervous system in patients with essential hypertension.

Another study carried out by Skoglund and Jansson (2006) in England, aimed to investigate the effects of Qigong on stress among computer operators. 20 women were divided into 2 groups. The Qigong group (n=10) had daily sessions of 30 minutes, from Monday to Friday, during 5 weeks and the control group (n=10) continued with their usual daily work. Heart rate, blood pressure and finger temperature were measured at the beginning and at the end of the working day as well as the perception of stress (Borg's 0-20 grading scale). 24 hours urine samples were collected in the first and in the last weeks to measure catecholamines. The results showed that Qigong reduces heart rate, finger temperature and noradrenaline in urine. Although there were no effects on blood pressure and on the level of perceived stress, symptoms such as low back pain were significantly reduced. These results show that Qigong may have an effect of the activity of the sympathetic nervous system and may reduce stress in computer operators.

In Hong Kong, Jones (2001) carried out a study to investigate the changes in cytokine production in healthy subjects practicing Qigong. Cytokines are glycoproteins which are involved in immune response as pro-inflammatory and anti-inflammatory regulators. 19 participants were asked to practice two hours of Qigong (Guolin Qigong) per day during 14 weeks. Blood pressure, pulse rate, blood cortisol level and production of cytokines were measured before training and after 3, 7 and 14 weeks. The results showed no significant changes in systolic or diastolic blood pressure but the pulse rate decreased. This preliminary study indicates that blood levels of cortisol may be lowered by short-term practice of Qigong and that there are concomitant

changes in the number of cytokines. These results show that Qigong improves the stress-coping skills of the participants, however further studies are needed.

Maldonado et al. (2005) have carried out a study, in Spain, based on examination of Qigong effects in the quantity of hormones, anxiety, blood pressure and subjective quality of sleep in university students. 25 students were divided into control group (n=13) and Qigong group (n=12). The Qigong group completed a program of 30 minutes of Qigong lessons 5 times a week, and self-practice during the weekends, for 1 month. The evaluation of blood cortisol, ACTH, TSH and PTH, blood pressure, anxiety (Escala de ansiedad de Hamilton and Inventario de ansiedad de Beck) and subjective quality of sleep (Cuestionario de calidad subjetiva de Pittsburg) took place at the beginning and at the end of the study. Results showed no significant differences between the 2 groups in blood pressure and subjective quality of sleep. However the Qigong group had lower cortisol, ACTH and anxiety levels than the control group, which suggests that the regular practice of Qigong may inhibit the hypothalamic-pituitary-adrenal axis.

Lee et al.¹ (2004) have carried out a study to investigate the effects of Qigong on anxiety and plasma concentrations of cortisol, ACTH and aldosterone. 32 men were divided into 2 equal groups. The Qigong group completed a program of Qigong exercises daily, during 4 weeks. The exercises were directed by a Qigong master during 60 minutes per session. The control group also performed the movements without gathering or moving Qi. Measurements were done at the beginning and at the end of the program using blood samples. The participants also answered to the Spielber's state-trait anxiety scale, which includes 20 items to measure the acute level of anxiety. Results showed that anxiety decreased 26% in the Qigong group and just 9% in the control group. These results suggest that the movements used in Qigong could positively affect anxiety states, however this effect is much smaller than that associated with Qi training. The results also showed that blood concentrations of ACTH, cortisol and aldosterone were significantly smaller in the Qigong group than in the control group. In conclusion, those results suggest that Qigong had a significant effect on hypothalamic-pituitary axis, which might reflect stabilization of anxiety level.

Lee et al.² (2004) have done a study aimed to investigate the effectiveness of Qigong on blood pressure and several blood lipids such as HDL, total cholesterol,

apolipoprotein A1 and triglycerides in hypertensive patients. 36 participants were divided into a Qigong group (n=17) and a waiting-list control group (n=19). The Qigong group completed a program of shuxinpingxuegong during 8 weeks, 30 minutes twice week. Measurements were done at the beginning and at the end of the study by blood sampling and auscultatory method. Results showed a significant decrease in blood pressure, HDL, total cholesterol and apolipoprotein A1 in the Qigong group ($\alpha=0,001$). The authors concluded that Qigong could reduce blood pressure and change lipid metabolism to benefit health. Furthermore it can be hypothesized that Qigong has antihypertensive effects and reduces blood pressure via modulation of lipid levels.

These studies suggest that Qigong exercises, over even a short period of time, may be able to significantly reduce symptoms of stress by diminishing blood pressure, heart rate, cortisol levels and other stress related parameters.

1.4.3 Qigong and Mood

The studies quoted here, as mentioned in the introduction, may suffer from some methodological shortcomings, but are quoted here to underline these difficulties and the necessity to develop better study designs.

Tsang and colleagues (2003) studied, in China, the influence of Qigong (eight brocades section adapted) in the elderly diagnosed with depression. For that, 50 participants were divided into two groups: the experimental group, with a mean age of 72.9 (SD = 9.5) years old, and the control group with a mean of 76.3 (SD = 8.4) years old. Both groups received basic rehabilitation activities for 12 weeks. The experimental group also received one hour practice of Qigong, twice a week, during 12 weeks. The experimental group was also advised to practice Qigong exercises daily for at least half an hour. The results were measured with different scales and questionnaires, which measure the degree of depression (geriatric depression scale), the state of physical, psychological and social (Perceived benefit questionnaire), quality of life (Hong Kong Chinese World Health Organization version quality of life) and self-concept (self-concept scale). The researchers concluded that Qigong improves physical health, psychological and social development of elderly people, reducing the degree of depression and increasing their quality of life. However, the results were not statistically significant.

Chow and Tsang (2007) have done a literature research to study the effects of Qigong on people with anxiety disorders. The investigators concluded that Qigong could be considered a valid alternative to treat anxiety disorders. Pharmacological treatment could have side effects such as nausea, vomits and addiction. Qigong can be implemented at home or outdoor at any time during the day, it is convenient, inexpensive and easy to do.

Oh and his colleagues (2010) carried out a study, in Australia, aimed to evaluate the use of medical Qigong compared with usual care to improve quality of life of cancer patients. They recruited 162 patients divided in 2 groups: the control group (n=83) and the intervention group (n=79). The intervention group received usual medical care and attended a Qigong program during 10 weeks, 90 minutes per week. They also were invited to practice Qigong at home daily for at least 30 minutes. The measurements were done at the beginning and at the end of the study. Quality of life, fatigue and mood status were measured by Functional Assessment of Cancer Therapy, General and Functional Assessment of Cancer Therapy and Profile of Mood State. The inflammatory marker serum C- reactive protein was monitored too. The results showed that Qigong significantly improved quality of life, fatigue, mood disturbances and inflammation. The authors concluded that medical Qigong can improve quality of life, mood status and reduce specific side-effects of treatment in cancer patients.

Li, Chen and Mo (2002), carried out a study in China to explore the effectiveness of Qigong therapy on detoxification of heroin addicts compared to medical and nonmedical treatment. Participants were randomly assigned to one of three groups, 34 were included in the Qigong group, 26 in the medication group and 26 in the no treatment control group. The first group practiced 2 to 2,5 hours of qigong (Pan Gu Qigong) daily during 10 days. The medication group received the detoxification drug during 10 days using gradual reduction method. The control group received only basic care and medications to treat several symptoms like pain, diarrhea and sleep disorders. The examiners used the urine morphine test, electrocardiogram, withdrawal syndrome evaluation scale and Hamilton anxiety scale before and during the 10 days of intervention. The investigators reported that the reduction of withdrawal symptoms were faster in the Qigong group than in the other groups. Both the Qigong and the medication group had lower anxiety scores than the control group, but the scores of anxiety were lower in the Qigong group than in the medication group. By day

5 of treatment, all participants of Qigong group had negative urine tests compared to day 9 for the medication group and day 11 for control group. These results suggest that Qigong may be an effective alternative for heroin detoxification without side effects.

Those studies suggest that Qigong has a positive effect on anxiety disorders and depression. It is also suggested that Qigong can improve quality of life, mood status and reduce specific side-effects of treatment in cancer patients. Qigong may also be a helpful complement for heroin detoxification.

1.4.4 Effects of Qigong on schoolchildren

There are also some studies about the effects of Qigong on schoolchildren.

Witt et al. (2005) did a pilot study in Germany, to evaluate the effects of Qigong lessons on schoolchildren in terms of their achievements at school, social behavior and general health. The sample consisted of 90 children aged between 7 and 13 years old, were divided into two homogeneous groups: control group and experimental group. The experimental group received Qigong lessons (xiang-gong) over 6 months, twice a week, during 15 (level 1) or 25 minutes (level 2). To measure the results teachers, parents and children answered standardized questionnaires at the beginning and at the end of the study. The 5 teachers also answered semi-structured in-depth interviews. After 6 months, the Qigong group showed significantly better results in the teacher questionnaire but no effects were found in the parent questionnaire. The result showed that during the study, the number of complains remained similar, whereas the severity of the medical complains decreased in both groups. However, the teacher questionnaire reported that Qigong influences grades and social behavior of the children positively. Evaluating these data from our point of view one might speculate that the teachers expectations might have been different from the parents more neutral expectations which may question the methodological approach.

However, qualitative analyses and so forth indicated a relevant decrease of individual complains for some children in the Qigong group (warmer hands and feet, fewer allergy problems). Teachers also reported that Qigong exercises had calming and relaxing effects on the children. The authors concluded that Qigong helps to

improve social behavior and grades but further studies are needed to generalize these results.

Another pilot study carried out in Germany by Witt et al. (2007) aimed to study the effects of xiang-gong in the health of schoolchildren with 10-11 and 16-17 years old. For that, 140 children from 4 different schools received Qigong lessons, twice a week, during 15 (level 1) or 25 minutes (level 2) over 6 months. At the end of the study semi-structured in-depth interviews were conducted with the participating teachers. The reported effects were of a social nature as well as improvement in vitality, medical and psychological health. Teachers also reported that students became calmer, more energized, "harmonize" and less aggressive after exercise. The only negative effect was the existence of nightmares during an early stage. The investigators concluded that Qigong helps to enhance vitality and community strength and also social, psychological and in some cases medical improvement.

These two studies suggest that Qigong could be integrated into regular school classes and it could help to improve the social behavior, grades and general health.

Those studies also suggest that Qigong has good effects on many functions of the body including the regulation of blood pressure, heart rate, urinary catecholamines and cortisol level. Those references also suggest that depression and anxiety disorders could benefit from Qigong exercises. In the same way, studies suggest that Qigong can help to increase quality of life in cancer patients and to reduce drug dosage in health condition such as asthma and hypertension. Despite those conclusions, some of those studies have small samples and they aren't random. They also use different types and different Qigong exercises, during different periods of time and frequency.

Western medicine classifies the different pathologies according to their similar symptoms and causes. In TCM it is needed an individual approach to each case and to each patient. For example according to TCM, hypertension could be caused by different conditions and the treatment is completely different according to the cause. This fact is difficult to coordinate with a rigorous investigation. According to the Heidelberg model, standardized TCM treatments aren't so efficient as individualized treatments. Doing investigation it is needed to standardize protocols. Those standardized protocols don't present the same effects as individualized treatments and this fact must be referred.

2. Study design

2.1 Investigation question and aim of the study

Investigation question:

Do Qigong exercises influence the anxiety levels and the physiological stress functions of 10 - 12 year old music school children playing the transverse flute before auditions and concerts?

Are those effects possible to be further objectified by physical and psychological measures?

Aim of the study: This study aims to evaluate if and how Qigong related effects may be further objectified by physical measurable parameters and psychological scores. For this propose we examined 10 – 12 year old music school children playing the transverse flute before auditions.

2.2 Objectives

- To evaluate if and how Qigong related effects may be objectified by the level of salivary cortisol;
- To evaluate if and how Qigong related effects may be objectified by psychological scores using EADS-C;
- To evaluate if and how Qigong related effects may be objectified by the superficial muscle tension (of trapezius muscle);
- To evaluate if and how Qigong related effects may be objectified by heart rate and blood pressure immediately before the audition;
- To evaluate if and how Qigong related effects may be objectified by reaction time;
- To study the influence of Qigong exercises on anxiety and physiological stress functions of 10 to 12 year old music school children playing the flute.

3. Methods

Definition of the study. This is a prospective controlled interventional study with waiting list design.

3.1 Recruitment

Academia de Música de Paços de Brandão, Academia de Música e Artes de Rio Meão, Academia de Música de Santa Maria da Feira and Conservatório de Música de Fornos were contacted to integrate the study. Those academies were chosen because they are located near Porto and they are convenient to the investigators. Just the first two agreed to participate. The first contact was done with the directors of the respective academies. After pedagogical council approval, parents and children were contacted by the investigators and by the respective academy to integrate the study. Parents and children who fulfilled the inclusion criteria, were invited to a meeting and they were informed about the study.

After having been signed the informed consent form (annex 4) by the participants and their legal representatives, the children were distributed to either the control group or the study group, according to their interest and schedule to integrate Qigong classes. Because of those facts we can't consider this a random sample.

3.1.1 Inclusion criteria

- Music school children of 10 - 12 years of age playing the transverse flute;
- Capability to follow the Qigong instructions in terms of Portuguese language skills;
- Written consent.

3.1.2 Exclusion criteria

- Major psychological problems;

- Previous experience with Qigong.

3.2 Intervention

3.2.1 Control group

In the control group 8 children were included and they didn't receive any intervention (waiting list design). Due to the low number of children available we failed to randomize the allocation to the groups. The children were allocated to the groups by pragmatic arguments, for example whether they were available at the qigong practice hours.

3.2.2 Qigong group

In the Qigong group 8 children were included and they received specific Qigong lessons of the so-called white ball Qigong over 7 weeks, twice a week, for 30 minutes. They also were instructed to do the exercises at home daily.

The intervention was done from 18th March until 6th May.

3.2.2.1 Qigong exercises and their explanation

According to TCM (Greten, 2009), an emotion is an inner movement (Latin *emovere* = to move out of something) of the so-called centered inner posture, a balanced functional vegetative state. This state is referred to as the balanced or Earth-position in which a total balance of emotionality is observed. Inner motions, such as symbolized by the phases lead to so called organ pattern or orbs, a part of which is an emotional shift towards the so called basic emotions in TCM. They are also known as inner agents and may lead to

- *maeror* (eg. inner pain)
- *voluptas* (eg. over-excitement)
- *ira* (eg. aggression) and

- timor (e.g. hidden or open anxiety)

According to the same author, TCM holds that emotions are originated in the body so, by balancing our body functions, we automatically balance and diminish pathologic emotional patterns within our vegetative nervous system.

This thesis explains the obvious natural feedback leading to emotional self-healing by certain Qigong exercises. In brief, Qigong allows the practitioner, by imagination, motion, breath-control, to be more psychosomatically balanced. This process of subconscious self-regulation is programmed and learned. By the time, this balanced state may be neurologically conditioned, and remains in our vegetative nervous system, becomes part of our inner nature. By the time we will become more stable with challenge, resulting in a better quality of life.

To do Qigong exercises it is needed that the child assumes the following posture:

- The back must be straight;
- The knees must be put in a way that the child can feel R1 (renal 1: fons scatenus): a little bit bent with no rotation;
- The pelvis must be in retroversion and without the lumbar curve.

a) Man between heaven and earth

With this exercise the child must connect to the ground because he/she will “connect to the biggest yin that exists”. This concept of TCM, refers to the 4th guiding criteria which distinguishes between a naturally labile state (yin deficiency) and other causes of deregulation. The picture also suggests that the earth gives strength and security. Connecting to the ground, the child will activate the renal orb and therefore he/she will be free from anxiety. At the same time all regulation becomes constant because yin is endlessly big. To connect to the ground the child must feel R1 and transfer his/her weight to the earth (Greten, 2009).

The next step is to connect to the sky. Connecting to the sky, the child will connect the renal and the cardiac axis and he/she will connect to his/her intuitive intelligence and will be able to have an intuitive access to his/her inner inborn way of life. At the same time the child will be connected to heavenly guidance. To connect to

the sky the child must feel Rg 20 (conventus omnium yang) and feel the line which crosses all the body since R1, passing through the dantian, until Rg 20 (Greten, 2009).

After the connection between heaven and earth is completed, boys must breathe out 7 times and girls must breathe out 8 times.

b) The white ball

The white ball is an important exercise that connects the Qi flow of the 2 hands, activating pericardiac flow (which is the hepatic orb of upper caloric) by Pc8 (medium palmae). Accumulated stress in upper caloric flows off and pathological repletion is relieved. At the same time, Pc 8 is considered to represent all orbs of the body as well as each finger is also associated to the phases. Connecting the Qi of the two hands promotes a big balancing and clearing effect. To connect the Qi of the 2 hands the child must close the eyes, hold the arms in front of the dantian as if he/she is holding a ball and adjust the distance between the hands (Greten, 2009).

After connecting the two hands, it is necessary to purify the Qi between the hands. The image of flowing out of the body is an old concept of Chinese medicine. By visualizing a purifying effect, the nervous system is cleaned up, pain free and emotionally positive. To purify the Qi of the white ball, the child must imagine that all bad things go out to the nature, and the ball becomes more and more white and shining. In the end the child must breathe out 7 times (for boys) and 8 times (for girls) (Greten, 2009).

c) Feeding the kidney region

Feeding the kidney region is important because it strengthens the substance of the child. To do that the child must put his/her hands above the navel (at the level of the dantian). First, girls must put the right hand and then the left hand, boys must do the contrary. Pc 8 of both hands must be connected with the dantian. After that, the child must put his/her hands above the kidney region and feel the Qi flow (Greten, 2009).

d) Closing the girdle conduit

It is very important that, before finishing the exercises, the child closes the girdle to close the surface and be protected. To do that, the child must move the hands until

the dantian, connecting again the point Pc 8 by placing one hand over another and connecting these two points with the dantian (Greten, 2009).

e) Thanking the principal

Before finishing it is necessary to find the appropriate relation with the world. To do this the child must bend his/her wrists perpendicularly, rotate downward and bend the neck which may follow the movement of the hands (Greten, 2009).

3.3 Measurements

- Subjective anxiety perception: “Escalas de ansiedade, depressão e stresse de 21 itens de Lovibond e Lovibond”;
- Heart rate and blood pressure: M6 Comfort (Omron), automatic blood pressure monitor;
- Basal muscular tension of trapezius muscle: Electrical Potential measurements by Superficial Electromyography using MP36 - BIOPAC Systems, inc;
- Time reaction: Stimulus response situation by MP36 BIOPAC Systems, inc;
- Levels of cortisol in the saliva by the Salivette (Sarstedt).

Ideally all students must play in an audition on 17th March and on 6th May, and measurements must be taken during those days. All participants of the Qigong group follow the expected program but, unfortunately, 5 students of the control group can't be present in the last audition. For this reason we did another audition on 19th May. The conditions of the first and of the second audition were the same since the students played in a neutral place. The third audition was in Academia de Música de Paços de Brandão, a familiar place for all students. Another different aspect was the amount of public that attended to the audition since the first and the second auditions had much more public than the third audition. We were conscious that those facts could influence the results but this was the only solution found to solve the problem.

The saliva cortisol measurement ideally took place in the morning of the audition's day, before breakfast. Unfortunately in the first audition, 3 students of the control group forgot to do the measurement during the morning. To solve this problem they did the measurement during the afternoon, at the same hour in the first and in the second auditions. In the second audition two of the Qigong students forgot to do the measurement. To solve this problem again we canceled the first measurement and for this reason we just have six measures of saliva cortisol in the Qigong group and eight in the control group.

The scores were done during the audition's day by all students with no exceptions. Heart rate and blood pressure were measured by a nurse immediately before the student goes to stage. Reaction time and basal muscular tension of trapezius muscle were measured 2 hours before the concert.

Thermography allows the measurement of capillary flow of the hands before and after training sequence. Measurements were done by Luis Matos at the beginning and at the end of the study (data shown on the master thesis of Luis Matos).

3.3.1 Escalas de depressão, ansiedade e stress para crianças (21 itens)

The Escala de depressão, ansiedade e stress (EDAS) is the Portuguese version of Depression anxiety and stress scale (DASS) of Lovibond and Lovibond (1995). Theoretically the DASS corresponds with the tripartite model of anxiety and depression of Watson et al. ^{1,2} (1991). This model suggests that anxiety and depression share some features but have some different signs too. Depression is characterized by low positive affect and anhedonia, while anxiety is characterized by symptoms of arousal. At the same time depression and anxiety have in common a non-specific factor of general distress. The properties of DASS were evaluated by Lovibond and Lovibond. They used a normal sample of 717 participants who were also administered the Beck Depression Inventory and the Beck Anxiety Inventory. The DASS showed satisfactory psychometric proprieties: 0.81 correlation to Beck Anxiety Inventory and 0.74 to Beck Depression Inventory (Lovibond, Lovibond, 1995).

Ribeiro, Honrado and Leal (2004) adapted the DASS to Portuguese population and gave it the name of "Escala de ansiedade, depressão e stress de 21 itens". They

also correlate the short (21 items) and the long (42 items) version of the scale. The results showed that the Portuguese version of DASS has similar proprieties as the original version of the same scale, and could be used with good internal consistence of 0.85 for depression, 0.74 for anxiety and 0.81 for stress in Portuguese population. They also concluded that there are a great correlation between the long and the short version of the scale (96% for depression, 90% for anxiety and 89% for stress).

Leal et al., in 2009, adapted the EADS to children and called it “Escala de depressão, ansiedade e stresse para crianças” (EADS-C). They applied the scale to 361 children with ages between 8 and 15 years old. The results showed that the EADS-C could be applied to this population with internal consistence of 0.78 for depression, 0.75 for anxiety and 0.74 for stress.

The EADS-C is conceptually equal to EADS but the vocabulary was revised to be easily understood by children. The final version of EADS-C is composed by 3 sub-scales of 7 items each one that evaluate depression, anxiety and stress. The depression scale includes items that measure symptoms typically associated with dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest or involvement, anhedonia, and inertia. The anxiety scale includes items that are primarily related to symptoms of physical arousal, skeletal muscle effects, situational anxiety, and subjective experience of anxious affect. Stress scale includes items that measure difficulty in relaxing, nervous arousal, being easily upset or agitated, irritable or over reactive, and impatient (Ribeiro, Honrado and Leal, 2004; Leal et al., 2009). For each item the children may say if he/she passed through the respective symptom in the last week. The EADS-C uses a scale of 4 different frequency or gravity degrees: 0 means “I don’t have”, 1 means “I have sometimes”, 2 means “I have frequently” and 3 means “I have most of the time” (Leal et al., 2009).

Children answered the questions of the scale at the beginning and at the end of the study, before the audition, on audition`s day, with parents help. The EADS-C is complete in annex 3.

3.3.2 Heart rate and blood pressure

According to Choi and Osuna (2009), stress is a term that describes body reactions to a range of perceived physical or psychological threats. If it becomes chronic, stress can cause serious health consequences and it is a risk factor for heart diseases. According to the same authors, heart rate, blood pressure, muscular tension and respiration are physiological indicators of stress. Lundberg et al. (1994) also affirm that heart rate and blood pressure increase with stressful situations and therefore they are good indicators of stress and anxiety states.

The autonomic nervous system (ANS) belongs to the peripheral nervous system and one of its functions is the maintenance of the body under stable conditions. The ANS has two divisions: the sympathetic nervous system (SNS) and the parasympathetic nervous system (PNS). The SNS prepares the body to act in cases of potential threats and the PNS does the opposite and brings the body back to a rest state. Both SNS and PNS innervate the sinoatrial node, the primary pacemaker of the heart. The SNS activation increases heart rate and the PNS activation decreases it. This physiological explanation allows the assumption that heart rate and blood pressure are good indicators of stress (Choi and Osuna, 2009).

The measurements were done immediately before the child goes into the stage, by a nurse, at the beginning and at the end of the study, using M6 Comfort (Omron), automatic blood pressure monitor. The child was resting during at least 15 minutes, in a sitting position, with both feet on the floor, and it wasn't allowed to talk during the measurement. The arm is a little bit bent and the brace was located above the elbow, bellow the humeral artery.

Blood pressure values will be presented according to the formula of blood pressure mean (Ribeiro, Garcia, Fiori, 2007):

$$\frac{\text{Systolic BP} + (\text{Diastolic BP} \times 2)}{3}$$

3

3.3.3 Surface Electromyography (SEMG)

Electromyography measures the electrical activity of skeletal muscles and it is a direct representation of the outflow of motoneurons in the spinal cord to the muscle as

a result of voluntary or reflex activation. Electromyographic data could be taken using surface or intramuscular electromyography. SEMG recordings provide a safe, easy and noninvasive method (it isn't necessary to penetrate the skin) that allows objective quantification of the energy of the muscle. Active motor units are registered from two active electrodes over the muscle. However, SEMG is usually more susceptible to artifacts than intramuscular electromyography (IEMG). SEMG records may contain electrical activity coming from other muscles (Türker, 1993).

According to Türker (1993) to make useful recordings with SEMG it is necessary to use superficial electrodes from large superficial muscles and take appropriate precautions. The precautions include the use of active surface electrodes (Soderberg, 1984) choose a bipolar recording technique (Soderberg 1992), ground the subject (Gans, 1986) and the use of very short leads (Soderberg, 1984). Active surface electrodes have high input resistance and therefore they aren't sensitive to changes in the electrical resistance of the skin. They amplify the signal several times before connecting to the next amplifier and therefore minimize movement-related artifacts and resistance-related changes in electromyographic signs. Ground the subject by using a ground electrode is used to minimize or eliminate the noise from electromyographic records. The length of the leads connecting the recording electrodes to the amplifiers should be kept as short as possible to minimize the amount of electrical noise being picked up from the power sources around the subject. In another way, intramuscular electrodes must be preferred for recording the activity from small peripheral muscles or muscles located deep within the body.

In this investigation we measured the basal muscular activity of trapezius muscle, according to Hansson et al. (2000) as this is a superficial muscle, it is accessible for SEMG. According to Lundberg et al. (1994), the psychological stress increases muscular tension of the trapezius muscle measured by EMG. The authors also affirm that the results are consistent with the assumption that psychological stress plays a role in musculoskeletal disorders by increasing muscular tension. In the same way, Krantz, Forsman and Lundberg (2004) also affirm that psychological and physical stress increases the muscular tension of the trapezius muscle, measured by SEMG, as well as the incidence of musculoskeletal disorders. They also say that there is an association between sympathetic arousal and muscular activity.

Borini et al. (2010) have carried out a study to evaluate the influence of non-experimental anxiety on electromyographic activity of masseter and temporal muscle. The authors concluded that anxiety can influence electromyographic records even in non-experimental situations. Conrad and Roth (2006) have done a study to investigate the influence of relaxation techniques on anxiety disorders. According to their review, anxiety increases the general muscular activity measured by SEMG.

According to these 4 studies, muscular activity measured by SEMG is a good indicator of stress and anxiety. The measurement was taken approximately 2 hours before the audition, at the beginning and at the end of the study using MP36 - BIOPAC Systems, inc. For the measurement we used 2 active surface electrodes and 1 grounding electrode to ground the subject. The recording technique was the bipolar recording technique and the leads were as short as possible.

3.3.4 Time reaction

Anxiety, as a negative emotion, is frequently accompanied by changes in cognitive processing. Attention deficit is often seen when subjects have to deal with threat or stressed situations (Fales et al., 2008).

According to Wilson, Smith and Holmes (2007) there are two theories that explain the relationship between anxiety and performance: the conscious processing hypothesis (Masters, 1992) and the processing efficiency theory (Eysenck and Calvo, 1992). The conscious processing hypothesis (Masters, 1992) suggests that stress situations increase anxiety and self-consciousness about performing successfully. This heightened self-consciousness causes a breakdown of automated movement units into a more consciously controlled sequence of smaller separated units. This process slows performance and creates opportunity for error at each transition between units. The processing efficiency theory predicts that cognitive anxiety, in the form of worry, reduces processing and storage capacity of working memory, reducing the resources available for a given task. This theory also proposes that worry causes a diversion of attention from tasks.

In this study, children were submitted to a relative simple task: they had to listen 3 sequences of 10 sounds each one and press a button immediately after listening to

the sound. The first and the second sequences were non rhythmical and measured the time reaction and the attention level of the participants. The third sequence was rhythmical and measured the learning capacity of the children. The expected results would be the decreasing of the time reaction from the first to the third sequence. If children presented a low attention level and a high stress state the expected results would be a constant time, an irregular atypical time or even an increasing in the time from the first to the fourth sequence.

The measures were done at the beginning and at the end of the study, approximately 2 hours before the audition, using the MP36 BIOPAC Systems, inc.

3.3.5 Levels of cortisol in the saliva

According Aardal and Holm (1995) the measurement of cortisol levels provides a reliable tool for investigations of hypothalamus-pituitary-adrenal axis activity. The cortisol levels could be measured in the serum, urine or in saliva. In serum, cortisol is mainly protein-bound and only 5-10 % of total plasma cortisol isn't bound to proteins. This free plasma cortisol diffuses rapidly into saliva. In urine cortisol exists only in free form and the values don't always correctly mirror the free cortisol concentration in serum (Kiess et al., 1995, Aardal and Holm, 1995). There are some advantages of collecting saliva samples instead of serum samples. Collecting saliva is a simple sampling procedure and thereby the avoidance of stress-induced rise in cortisol concentration. In the same way the sample can be easily taken at home and the stability of cortisol in saliva allows the transportation at room temperature. According to Aardal and Holm (1995) saliva may be used for cortisol measurements with good results, in situations where blood sampling is difficult to perform (Aardal and Holm, 1995).

According to Lundberg et al. (1994), cortisol level is a good and valid indicator of stress and anxiety conditions. Kiess et al. (1995) have carried out a study in Germany to measure the variety of saliva cortisol levels with age, pubertal state and weight. They measured the salivary cortisol in 138 healthy infants, children and adolescents and in 14 adults, at 8.00 am, 1.00 pm and 6.00 pm. They concluded that cortisol levels are age-dependent. After 6 years old the values correlate significantly with pubertal state. Cortisol levels also increase with body weight and body mass index.

The samples were done at the beginning and at the end of the study during the audition's day, always at the same time. It was used salivette with synthetic swab for cortisol determination. Parents helped and supervised the sampling. The sampling was done preferentially immediately after the child woke up, in sitting position and after he/she washes the mouth with water. During the procedure, no one touches the cotton. To obtain as much saliva as possible, child chewed the cotton during 2 minutes and putted the cotton above the tongue during 3 more minutes. All the participants were informed that children can't use facial creams or lipstick, wash the teeth, use dental floss, eat or drink nothing except water before the sampling and they also cannot do dental treatments 24h before the sampling. The samples were stored in the dark at room temperature, and were taken to the laboratory after 72 hours.

3.4 Statistical analysis

All variables were analyzed to know if their decrease or increase were statistically significant. The analyzes were done using SPSS 17.0. According to Fortin (1999), it is very important to choose the right test to analyze the results. There are 2 types of tests that we can use to conduct a statistical analysis: parametric and non-parametric tests. To use a parametric test the variables have to describe a normal distribution of the population and samples must be independent and random. On this study the samples are independent but they aren't random. Non-parametric tests may also be used when the sample is reduced, as our sample is constituted by 8 children in each group, we must use a non-parametric test. Those are sufficient reasons to use a non-parametric test. Non-parametric tests are less powerful than parametric tests since the only condition is the independence of the measurements, although they are a good alternative. A non-parametric test is also relatively insensible to extreme observations.

To analyze our data, the most appropriated test is the Mann-Witney test. The Mann-Witney test is one of the most sensitive non-parametric tests and a great alternative to t-test. The conditions to use the Mann-Witney test are: ordinal or quantitative variables, independent samples and continuous variables (the values can be divided).

4. Ethical Consideration

According to Fortin (1999), legally and ethically the minor participants cannot give their informed consent, and this is therefore usually given by their parents or guardians. However, if the children have the capacity to understand the purpose of the study, they should be informed and their consent should be attached along with the consent of their parents. All participants were informed about the aim of the study, its objectives and procedures. The data was completely anonymous and confidential, used only by the study investigator. The right of self-determination was respected, since the participants and their legal representatives, as autonomous persons, were invited to participate in the study (Fortin, 1999). The inclusion in this investigation was completely voluntary and didn't constitute any risk to the health of the children.

After providing a description of the study, a written informed consent was obtained from the children and their legal representatives (4rd annex). In accordance with Fortin (1999) "to obtain a written consent, free and clear of the subjects is essential to the maintenance of ethical conduct in research". All ethical principles were respected in this investigation: the right to self-determination, privacy, anonymity, confidentiality, discomfort and injury (Fortin, 1999).

On 12th May of 2011, the Ethical Commission of University of Porto, analyzed the proposal and gave an approval to the thesis, since all ethical principles were respected. The document with this approval is in annex (5th annex).

5. Results

5.1 Data

The sample was divided into 2 similar groups of 8 children each. The Qigong group was composed by 1 boy and 7 girls with a mean of 11.5 (SD=0.7) years old, and the control group was composed by 2 boys and 6 girls with 12 years old. Children of the Qigong group were instructed to do the exercises every day during 7 weeks, and they also were instructed to register when they do the exercises. Table 1 - Percentage of days and assiduity to Qigong classes shows that percentage and their assiduity to the classes.

	Number of days	Percentage	Classes (max 14)	Percentage
Student 1	15	30.6%	9	64.3%
Student 2	26	53.1%	13	92.9%
Student 3	43	87.8%	13	92.9%
Student 4	19	38.8%	11	78.6%
Student 5	15	30.6%	8	57.1%
Student 6	40	81.6%	12	85.7%
Student 7	45	91.8%	13	92.9%
Student 8	17	34.7%	11	78.6%

Table 1 - Percentage of days and assiduity to Qigong classes

Table 2 and Table 3 show the difference between the initial and the final results, therefore a negative value means that the parameter gets worse, and a positive value means that the parameter gets better. Table 2 shows the results of the Qigong group and Table 3 shows the results of the control group. The last two lines of both tables show the mean and the standard deviation of the respective values. The values of EADS-C is the score obtained by the children, HR (heart rate) is represented in beats per minute, BP (blood pressure) is represented in mm/Hg, SEMG (surface electromyography) values are represented in mV per second, TR (time reaction) is expressed in seconds and cortisol is expressed in $\mu\text{g/dl}$. Integral values are presented

in annex 6. Blood pressure values were calculated by using the formula of mean blood pressure (Ribeiro, Garcia, Fiori, 2007):

$$\frac{\text{Systolic BP} + (\text{Diastolic BP} \times 2)}{3}$$

3

Qigong group	EADS-C	HR	BP	EMG	TR	Cortisol
Student 1	-1	12	12.33	0.0051	0.01633	-
Student 2	0	6	0.33	-0.0026	-0.009	0.131
Student 3	19	6	15.67	-0.0023	0.00967	0.5
Student 4	-1	5	7.33	-0.0036	-0.0103	0.311
Student 5	-1	3	-2.67	-0.0051	0.006	0.116
Student 6	3	17	-0.33	-0.0041	-0.027	0.125
Student 7	3	15	2.33	-0.0065	0.01567	-
Student 8	6	24	17.33	-0.0033	0.04833	0.404
Mean	3.5	11	6.54	-0.0028	0.00621	0.198
Standard deviation	6.76123	7.2899	7.77	0.00347	0.02263	0.186

Table 2 - Difference between the 1st and the 2nd measurements (Qigong group)

Control Group	EADS-C	HR	BP	EMG	TR	Cortisol
Student 9	-13	-7	7.33	0.0023	0.019	-0.355
Student 10	9	-7	1.67	-0.0011	0.05167	-0.072
Student 11	3	13	9	-0.0018	0.01567	0.245
Student 12	4	-15	4	-0.0014	-0.0137	0.695
Student 13	-1	-8	8.67	-0.0033	0.09567	0.31
Student 14	2	-11	16.67	-0.0023	-0.027	0.025
Student 15	1	5	-3.33	-0.005	-0.0263	0.088
Student 16	3	-6	4.67	-0.0036	-0.0243	0.144
Mean	1	-4.5	6.04	-0.002	0.01133	0.135
Standard deviation	6.3471	9.0711	5.81	0.00217	0.04408	0.306

Table 3 - Difference between the 1st and the 2nd measurements (control group)

Results show that subjective perception of anxiety and blood pressure decreased in both groups, however the decrease was bigger in the Qigong group. Heart rate decreased in the Qigong group and increased in the control group. Muscular tension of trapezius muscle increased in both groups, however the increase was a little bit bigger in the Qigong group. Time reaction decreased in both groups, however the decrease was bigger in the control group.

During the development of the study, it was showed that thermography may be a useful tool for objectifying Qigong related effects.

5.1 Statistical Analysis

The hypotheses to test are:

H0: The values to test are similar $\mu_1 = \mu_2$

H1: The values to test are different $\mu_1 \neq \mu_2$

The α chosen is 0.05.

EADS-C

The data related to EADS-C in the Qigong and in the control groups is represented on Figure 11.

Qigong group:

Mean: 3.5

Standard deviation: 6.76

Control Group

Mean: 1

Standard deviation: 6.35

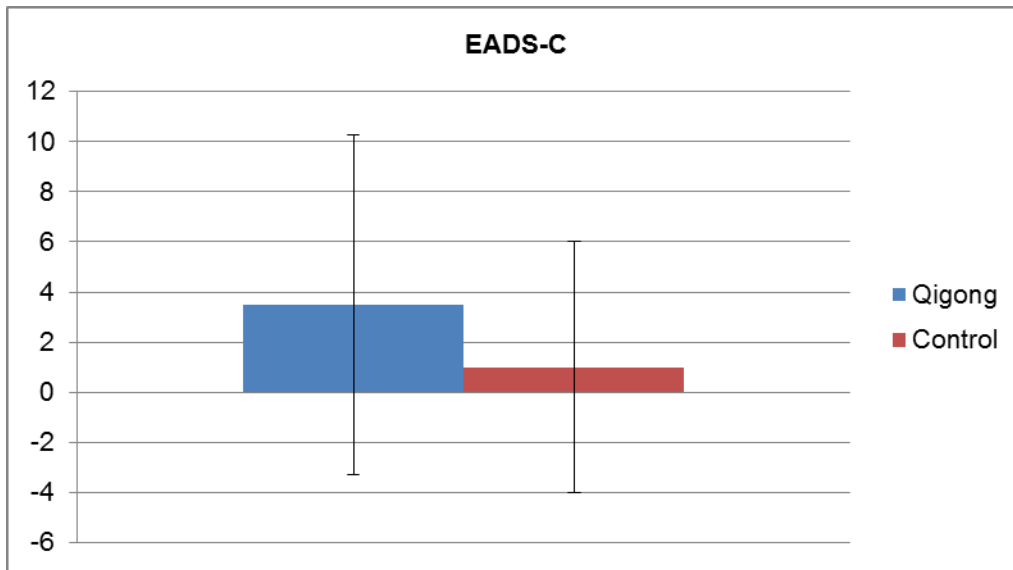


Figure 11 - Mean and standard deviation of subjective perception of anxiety

H0: $\mu_1 = \mu_2$

H1: $\mu_1 \neq \mu_2$

p value = 0.959 (bilateral test)

As p values is superior to α we can't accept H0. This means that subjective perception of anxiety isn't statistically significant

Heart rate

The data related to heart rate in the Qigong and in the control groups is represented on fFigure 12.

Qigong group:

Mean: 11

Standard deviation: 7.29

Control Group

Mean: -4.5

Standard deviation: 9.07

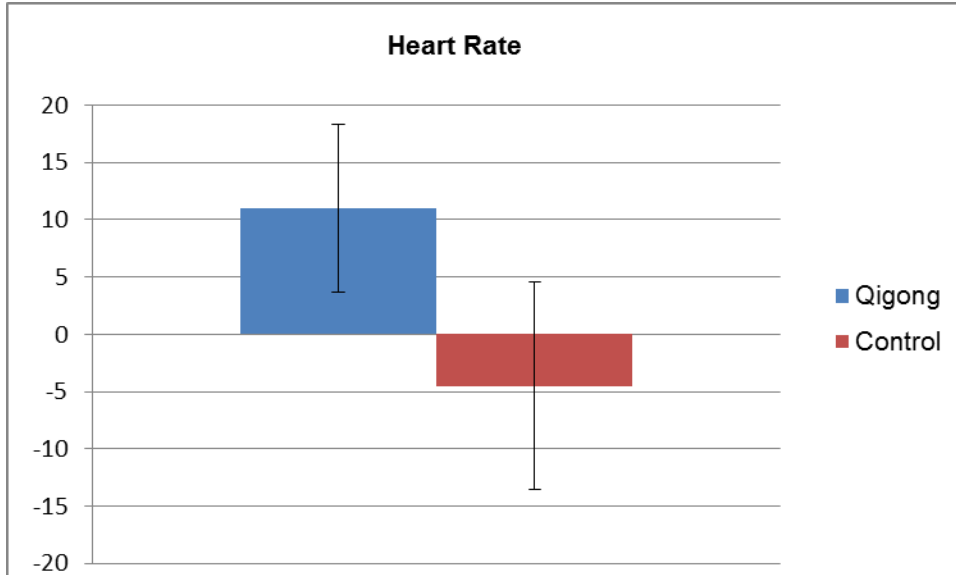


Figure 12 - Mean and standard deviation of heart rate

$H_0: \mu_1 = \mu_2$

$H_1: \mu_1 \neq \mu_2$

p value = 0.005 (bilateral test)

As p values is inferior to α we accept H_0 . This means that heart rate decreasing is statistically significant.

Blood pressure

The data related to blood pressure in the Qigong and in the control groups is represented on Figure 13.

Qigong group:

Mean: 6.54

Standard deviation: 7.77

Control Group

Mean: 6.04

Standard deviation: 5.81

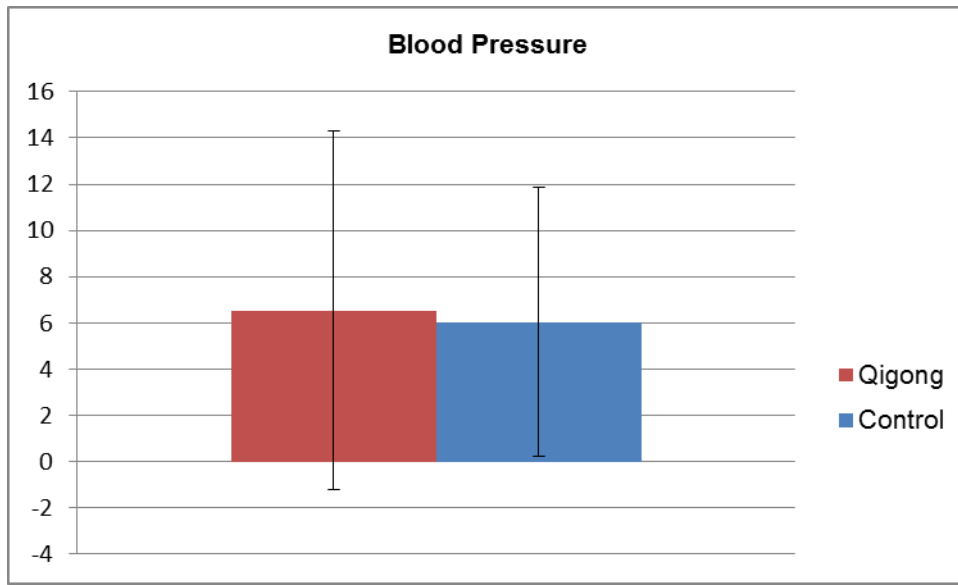


Figure 13 - Mean and standard deviation of blood pressure values

H0: $\mu_1 = \mu_2$

H1: $\mu_1 \neq \mu_2$

p value = 0.959 (bilateral test)

As p values is superior to α we can't accept H0. This means that blood pressure decreasing isn't statistically significant.

Surface Electromyography

The data related to surface electromyography in the Qigong and in the control groups is represented on Figure 14.

Qigong group:

Mean: -0.0028

Standard deviation: 0.0035

Control Group

Mean: -0.002

Standard deviation: 0.0022

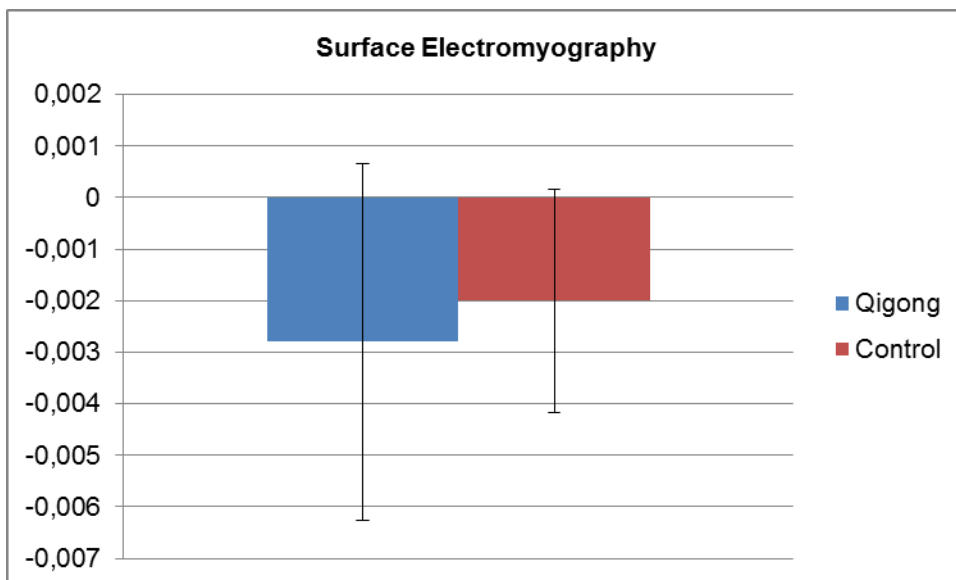


Figure 14 - Mean and standard deviation of surface EMG

$H_0: \mu_1 = \mu_2$

$H_1: \mu_1 \neq \mu_2$

p value = 0.195 (bilateral test)

As p value is superior to α we can't accept H_0 . This means that electromyography increasing isn't statistically significant.

Time reaction

The data related to time reaction in the Qigong and in the control groups is represented on Figure 15.

Qigong group:

Mean: 0.00621

Standard deviation: 0.02263

Control Group

Mean: 0.01133

Standard deviation: 0.04408

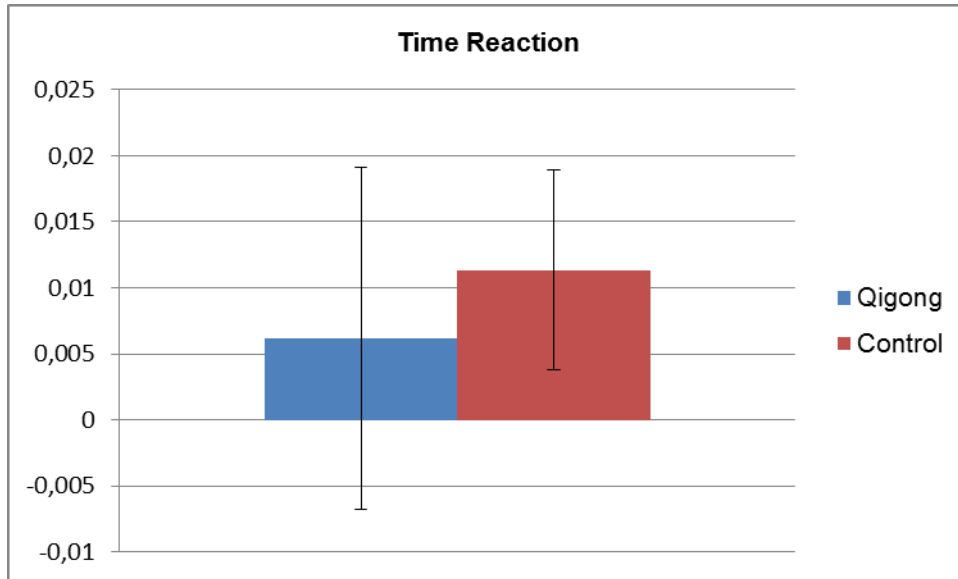


Figure 15 - Mean and standard deviation of time reaction

$H_0: \mu_1 = \mu_2$

$H_1: \mu_1 \neq \mu_2$

p value = 1.00 (bilateral test)

As p values is superior to α we can't accept H_0 . This means that time reaction values aren't statistically significant.

Cortisol

The data related to salivary cortisol in the Qigong and in the control groups is represented on Figure 16.

Qigong group

Mean: 0.198

Standard deviation: 0.186

Control Group

Mean: 0.135

Standard deviation: 0.306

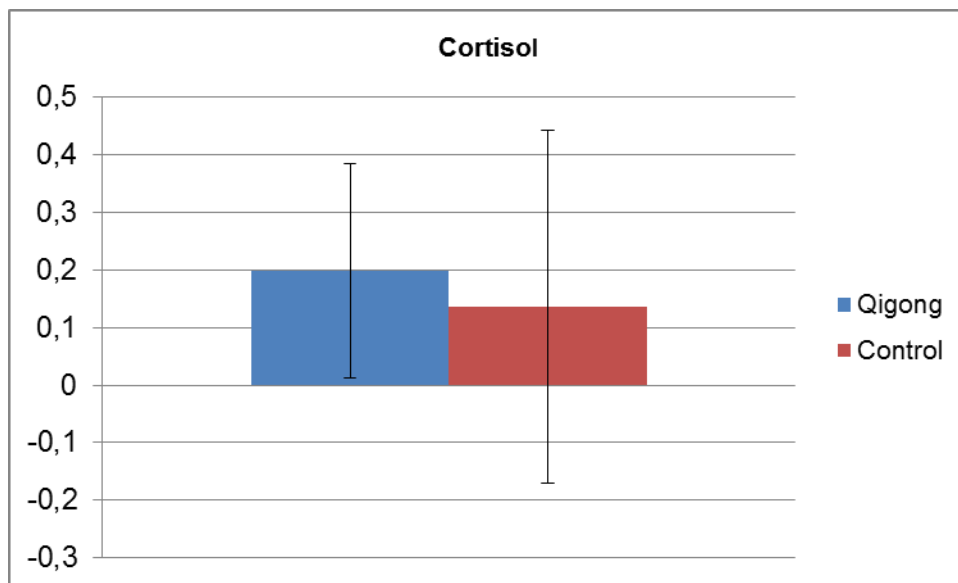


Figure 16 - Cortisol levels

$H_0: \mu_1 = \mu_2$

$H_1: \mu_1 \neq \mu_2$

p value = 0.245 (bilateral test)

As p value is superior to α we can't accept H_0 . This means that cortisol values aren't statistically significant.

6. Discussion

Subjective perception of anxiety: EADS-C

According to our data, subjective perception of anxiety diminished in both groups, however this decreasing was higher in the Qigong group than in the control group. According to the same data, this difference between both groups isn't statistically significant.

Skoglund and Jansson (2006) have conducted a study in England, to investigate the effects of Qigong on heart rate, blood pressure, finger temperature and perceived stress in computer operators. The Qigong group (n=10) had daily sessions of 30 minutes, from Monday to Friday, during 5 weeks and the control group (n=10) continued with their usual daily work. The level of perceived stress rated by Borg's scale didn't change during the 5 weeks in both groups.

In contrast Maldonado et al. (2005) have conducted a study in Spain, to examine the effects of Qigong on subjective perception of anxiety and other parameters, in university students (n=25). The Qigong group (n=13) completed a program of 30 minutes of Qigong lessons, 5 times a week, and self-practice during the weekends, during 1 month. Measurements were done at the beginning and at the end of the study. Results showed that Qigong group had significant ($\alpha=0.05$) lower anxiety levels measured by Hamilton anxiety scale, than the control group.

Lee et al.¹ (2004) have done a study to investigate the effects of Qigong on subjective perception of anxiety, plasma concentrations of cortisol, and other parameters. The Qigong group (n=16) completed a program of Qigong exercises daily, during 4 weeks, 60 minutes per session. The Control group (n=16) also performed the movements without gathering or moving Qi. Measurements were done at the beginning and at the end of the program. The participants asked to the Spielber's state-trait anxiety, which includes 20 items to measure the acute level of anxiety. Results showed that anxiety decreased 26% in the Qigong group and just 9% in the control group. These results suggest that the movements used in Qigong could positively affect anxiety states, however this effect is much smaller than that associated with Qi training.

In those three studies sampling was reduced as well as the time of Qigong practice. The type of scale used is also different. There are studies defending that Qigong can't reduce subjective perception of anxiety, however there are also studies defending that Qigong can significantly reduce this parameter. According to our study Qigong can reduce subjective perception of anxiety in transverse flute schoolchildren before auditions, however this decreasing isn't significant comparing to the control group.

Heart Rate

According to our data, heart rate decreased in the Qigong group and increased in control group. The statistical analysis showed that this difference is significant for $\alpha=0.05$.

Skoglund and Jansson (2006) have done a study, in England, to investigate the effects of Qigong on heart rate (and other parameters) in computer operators. The Qigong group (n=10) had daily sessions of 30 minutes, from Monday to Friday, during 5 weeks and the control group (n=10) continued with their usual daily work. Results showed that heart rate was significant reduced in the Qigong group ($\alpha=0.05$).

In Hong Kong, Jones (2001) conducted a study to investigate the changes in cytokine production, blood pressure, heart rate, blood cortisol level in healthy subjects (n=19) practicing Guolin Qigong daily over 14 weeks. Measurements were taken before training and after 3, 7 and 14 weeks. Results showed that heart rate decreased but this difference isn't significant.

According to those studies Qigong can diminish heart rate, however just one concluded that this reduction is significant. According to our study Qigong helps to reduce heart rate in a significant value. With those data we can conclude that Qigong can reduce significantly heart rate in transverse flute schoolchildren before the concerts.

Blood Pressure

Results show that blood pressure diminished in both groups, but this decreasing was higher in the Qigong group. This difference isn't statistically significant.

Lee et al. (2003) have carried out a study to determine the effects of Qigong on blood pressure, and other parameters, in middle aged patients with essential hypertension. The Qigong group (n=29) did 30 minutes of shuxinpingxuegong per day during 10 weeks. Blood pressure was measured before and after 10 weeks. The results showed that the levels of blood pressure were significantly smaller ($\alpha=0.001$) in the Qigong group than in the control group (n=29). The examiners concluded that Qigong helps to reduce blood pressure in middle aged patients with essential hypertension.

Lee et al.² (2004) have carried out a study to investigate the effectiveness of Qigong on blood pressure and several blood lipids in hypertensive patients. Patients were divided into Qigong group (n=17) and waiting-list control group (n=19). The Qigong group completed a program of shuxinpingxuegong during 8 weeks, 30 minutes, twice week. Measurements were done at the beginning and at the end of the study by blood sampling and auscultation method. Results showed a significant decrease in blood pressure in the Qigong group ($\alpha=0,001$). The authors concluded that Qigong could reduce blood pressure and change lipid metabolism to health benefit.

In contrast, there was a study done by Skoglund and Jansson (2006), in England, to investigate the effects of Qigong on blood pressure (and other parameters) in computer operators. The Qigong group (n=10) had daily sessions of 30 minutes, from Monday to Friday, during 5 weeks and the control group (n=10) continued with their usual daily work. Results showed that Qigong had no effects on blood pressure.

In the same way, Jones (2001) carried out a study in Hong Kong to investigate the changes on blood pressure (and other parameters) in healthy subjects (n=19) practicing Guolin Qigong daily over 14 weeks. Measurements were taken before training and after 3, 7 and 14 weeks. The results showed no significant changes on systolic or diastolic blood pressure.

Another study was done by Maldonado et al. (2005), in Spain, to examine the effects of Qigong on blood pressure (and other parameters) in university students

(n=25). The Qigong group (n=13) completed a program of 30 minutes of Qigong lessons 5 times a week, and self-practice during the weekends, during 1 month. Measurements were done at the beginning and at the end of the study. Results showed no significant differences between the 2 groups on blood pressure.

There are some studies defending that Qigong can positively influence blood pressure but there are also some studies concluding that Qigong has no influence on blood pressure. According to those findings also shuxinpingxuegong showed significant influence on blood pressure values. According to our data we can conclude that Qigong could help to diminish blood pressure values in transverse flute schoolchildren before auditions, although this change isn't significant.

Surface electromyography

According to our data, muscular tension of trapezius muscle, measured by surface electromyography, increased in both groups. However those changes aren't significant, results showed a higher increase in the Qigong group than in the control group.

According to Lundberg et al. (1994), the psychological stress increases muscular tension of trapezius muscle measured by EMG. In the same way, Krantz, Forsman and Lundberg (2004) affirm that psychological and physical stress increases the muscular tension of the trapezius muscle, measured by SEMG. They also say that there are an association between sympathetic arousal and muscular activity. Borini et al. (2010) concluded that anxiety can influence electromyographic records even in non-experimental situations. Also a review done by Conrad and Roth (2006) concluded that anxiety increases the general muscular activity measured by SEMG.

According to those findings, we expected that muscular tension would be lower after the Qigong program reflecting the decreased anxiety levels. According to Conrad and Roth (2006) review patients suffering from anxiety disorders may have elevated muscular tension, although they refer that the available evidence does not allow to conclude that physiological activation decreases over the course of muscle relaxation therapy, even when patients report becoming less anxious.

Studies of trapezius activity in response to a stressor agent showed that the activity level increases more intensely when extra effort is induced by financial reward or by increased task complexity (Bansevicius, Westgaard, Jesen, 1997). Also the muscular activity is higher when stress situations are combined with some kind of previous physical load (Lundberg et al, 1994). In another way, all those findings are referring to adults and not to children. Those reasons could aid to understand our results since children aren't exposed to the same levels of stress as adults.

After this analysis we can affirm that in this preliminary study, Qigong wasn't effective in the reduction of muscular tension of trapezius muscle in transverse flute schoolchildren before auditions, measured by SEMG.

Time reaction

Results showed that time reaction decreased in both groups, however this non-significant decreasing was higher in the control group.

Anxiety, as a negative emotion, is frequently accompanied by changes in cognitive processing. Attention deficit is often seen when subjects have to deal with threat or stressed situations (Fales et al., 2008). According to those assumptions we expected that Qigong group would have a more decreasing reaction time than the control group, but this didn't happen. After this analyses we can't conclude that Qigong is effective on the reduction of time reaction of transverse flute schoolchildren before auditions.

Cortisol

According to our data, cortisol levels decreased in both groups. This decreasing was higher in the Qigong group, however this difference isn't significant.

In Hong Kong, Jones (2001) has done a study to investigate the changes in blood cortisol level, and other parameters, in healthy subjects (n=19) practicing Guolin Qigong daily over 14 weeks. Measurements were taken before training and after 3, 7 and 14 weeks. This preliminary study indicates that blood levels of cortisol may be

lowered by short-term practice of Qigong, however further studies are needed. In the same way, in 2005, Maldonado et al. have conducted a study, in Spain, to examine the effects of Qigong on the quantity of hormones, anxiety, blood pressure and subjective quality of sleep in university students (n=25). The Qigong group (n=13) completed a program of 30 minutes of Qigong lessons 5 times a week, and self-practice during the weekends, during 1 month. Measurements were done at the beginning and at the end of the study. Results showed that the Qigong group had lower cortisol than control group, however this difference isn't significant.

From an opposing point of view, Lee et al.¹ (2004) have done a study to investigate the effects of Qigong on anxiety and plasma concentrations of cortisol, ACTH and aldosterone. 32 men were divided into 2 equal groups. The Qigong group completed a program of Qigong exercises daily, during 4 weeks. The exercises were directed by a Qigong master during 60 minutes per session. The control group also performed the movements without gathering or moving Qi. Measurements were done at the beginning and at the end of the program using blood sampling. The results showed that blood concentrations of ACTH, cortisol and aldosterone were significantly smaller in the Qigong group than in the control group. In conclusion, those results suggest that Qigong had a significant effect on hypothalamic-pituitary axis, which might reflect stabilization of anxiety level.

All found studies conclude that blood cortisol diminish after Qigong lessons, however just one concluded that this decreasing is significant. Our results showed that cortisol levels could be lower after 7 weeks of Qigong practice, however this difference isn't significant.

The study confirms that Qigong related effects may be conventionally objectified by psychological scores and physiological parameters including cortisol measurements. In addition the study reveals that 2 new parameters can be chosen such as EADS-C and capillary flow as measured by thermography.

Thermography as a real time objective functional assessment showed to be an excellent tool for Qigong studies with highly significant measurability (data presented within the master thesis of the engineer Luis Matos).

7. Conclusion

We can conclude that all the objectives were achieved. Although our data is from a small sample size, the results we obtained are consistent with the hypothesis that Qigong may positively influence anxiety levels of transverse flute schoolchildren, aged 10 to 12, before the auditions. According to our data Qigong reduced subjective perception of anxiety (measured by EADS-C), heart rate, blood pressure and salivary cortisol levels in transverse flute schoolchildren before auditions, however only heart rate decreasing is significant for an $\alpha=0.05$. In contrast, there are no evidences that Qigong is effective in the reduction of muscular tension of trapezius (measured by SEMG) and in the reduction of time reaction.

There are some obvious reasons for explaining those results. As we already documented auditions took place on 17th March and on 6th May. If we analyze those dates 17th March was a complicated date for all students because they were doing tests at school. 6th May was 2 weeks after Easter holidays. It is probable that our participants were under stressed situations at school during the first audition, and those situations were solved during the second audition. This fact could change their anxiety levels and influence the results.

Another reason that could influence our results is that all Qigong group follow the expected program but unfortunately 5 students of the control group couldn't be present on the second audition date. For this reason we were forced to organize a third audition on 19th May. The conditions of the first and of the second audition were the same since the students played in a neutral place. The third audition was in Academia de Música de Paços de Brandão, a familiar place for all students. Another different aspect was the amount of public that attended to the audition since the first and the second auditions had many more people than the third audition. We were conscious that those facts could influence the results but this was the only found solution to solve the problem. Those facts could explain the decrease in time reaction in both groups and the non-significant changes in the other parameters.

Another setback was hour of cortisol collecting. Ideally, the saliva sampling should take place in the morning of the audition's day, before breakfast. Unfortunately in the first audition, 3 students of the control group forgot to do the measurement during

the morning. To solve this problem they did the measurement during the afternoon, at the same hour in the first and in the last audition. In the second audition two of the Qigong students forgot to do the measurement. To solve this problem we canceled the first measurement and for this reason we just have 6 measurements of saliva cortisol in the Qigong group and 8 in the control group.

Doing investigation with children is always a complicated task because some of the children aren't capable to understand the importance of this work. As we presented before the percentage of days that children did the exercises varies between 30.6% and 91.8% and their attendance to the classes varies between 57.1% and 92.9%. Also the concentration and the responsibility during the exercises are very important variables and impossible to measure. Those facts could also influence the results.

As we have already documented, Academia de Música de Paços de Brandão and Academia de Música e Artes de Rio Meão were chosen because they are located near Porto and they are convenient to the investigators. In the same way, children were distributed to either the control group or the study group, according to their interest and schedule to integrate Qigong classes. Because of those facts we can't consider that the sample is random. Our sample is too reduced and it can't represent the population. Those facts don't allow the generalization of our results.

Variability between groups could also influence the results since the Qigong group was composed by 1 boy and 7 girls with a mean of 11.5 (s.d=0.7) years old, and the control group was composed by 2 boys and 6 girls aged 12 years old. It is a principal problem of Qigong research and psychological intervention to choose adequate controls. In this pre-study we focused on measurability of the effects. The control chosen here (waiting list design) may be changed to either another type of Qigong, to another occupation or others. Proper randomization and blinding procedures should be carried out to develop an objective study design.

Qigong effects can be measured properly by psychological scores and physiological parameters such as salivary cortisol. This study shows 2 new objective parameters (EADS-C, thermography) that may be used to a further document, the obvious effects of the white ball Qigong on performance related anxiety and related physical disorders as measured in this study.

8. Final considerations

Preliminary evidences support the hypothesis that Qigong can help to diminish anxiety levels of transverse flute schoolchildren, aged 10 to 12, before the auditions and that Qigong effects can be measured properly by psychological scores and physiological parameters

According to our data Qigong reduced subjective perception of anxiety (measured by EADS-C), heart rate, blood pressure and salivary cortisol levels in transverse flute schoolchildren before auditions, however only heart rate decrease is significant for an $\alpha=0.05$. In contrast, there are no evidences that Qigong is effective in the reduction of muscular tension of trapezius (measured by SEMG) and in the reduction of time reaction.

This is regarded as a first step towards the creation of objective study designs to be systematically planned on the basis of measurability of Qigong related effects. To our knowledge, there are so far no scientific studies on performance related anxiety and Qigong at all.

Qigong is a good alternative to pharmacological treatment to reduce anxiety levels, since it isn't expensive, it is easy to do and can be practiced at all the time. Furthermore, the exercise system of the white ball is effective. The main advantage of this system is the fact that an exercise cycle only takes a few minutes and requires only little movement and space, so it could be integrated in class-teaching without significant loss of teaching time.

As our results can't be generalized further well controlled studies might be needed, with a representative and random sample.

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1st Annex: Schedule

Activity	2010		2011						
	November	December	January	February	March	April	May	June	July
Literature research	[Active]		[Active]						
Development of the project	[Active]		[Active]						
Data collection	[Active]		[Active]		[Active]				
Data analysis	[Active]		[Active]		[Active]				
Writing the thesis	[Active]		[Active]		[Active]				

2nd Annex: Literature review

Authors, year	Title	Experi mental group	Control group	Method / Intervention	Results / Conclusion
AARDAL, E. and HOLM. A. 1995	Cortisol in saliva- references ranges and relation to cortisol in serum	n= 197		The concentrations were determined in matched samples of saliva and serum collected at 8am and 10pm.	Satisfactory precision of the analysis and the simple non-invasive sampling procedure suggest that saliva may be used for cortisol measurements in situations where blood sampling is difficult to perform.
ANDREATI NI, LACERDA and FILHO. 2001	Tratamento farmacológico do tratamento de ansiedade generalizada: perspectivas futuras			Literature review.	In Brazil, just 50% of all patients with anxiety disorders get completely cured with western drugs.
BANSEVICI US, MD, WESTGAA RD, RH, JENSEN C. 1997.	Mental stress of long- duration: EMG activity, perceived tension, fatigue and pain development in pain-free subject	n=36		Participants were exposed to a two- choice reaction-time test for 1 hour. EMG recordings were performed bilaterally over the frontalis, temporalis, splenius, and trapezius muscles. Pain and perceived tension were scored on a visual analogic scale, and fatigue on a Borg scale.	It is concluded that the mean level of the EMG response is of little consequence for pain development during stressful conditions.
BORGES et al.	Ansiedade e coping em crianças e adolescentes: diferenças relacionadas	n=196		Measure anxiety by multidimensional anxiety scale for children and the coping	Children between 10 and 13 years old show more anxiety in some aspects like separation and afraid of being alone in strange situations.

2008	com a idade e género			responses inventory- youth.	On the other hand girls show more anxiety than boys in aspects like tension, somatic symptoms, perfectionism, fear of failing, separation, and anxiety in general.
BORINI et al. 2010	Análise da influência da ansiedade sobre o sinal eletromiográfico.	n=16		Simultaneous bilateral mastication, habitual mastication and voluntary contraction in maximum intercuspation were performed on three different days, with an interval of one week between them. The variables activation time and maximum intensity were calculated to analyze the electrical activity of superficial part of the masseter and anterior part of the temporal muscles.	Anxiety can influence electromyographic records even in non-experimental situations.
CHEN, K., YEUNG, R. 2002 China	Exploratory studies of Qigong therapy for cancer in China			The authors reviewed more than 50 studies about Qigong therapy for cancer in China.	Qigong may improve immune function, increase microcirculation, raise the pain threshold and survival rate; Qigong and its curative effect on cancer have demonstrated consistent results for inhibitory effect on cancer growth and metastasis in clinical observation.
CHOI and OSUNA, 2009	Using heart rate monitors to detect mental stress	n=3		The authors used a non-linear system identification technique, known as principal dynamic modes, to predict the activation level of the two autonomic branches: sympathetic and parasympathetic.	When principal dynamic modes and spectral features are combined, system discriminates stressful events with a success rate of 83% within subjects (69% between subjects).
CHOW, Y., TSANG, H. 2007	Biopsychosocial effects of Qigong as a mindful exercise for people with anxiety disorders - A speculative review			Literature review.	Pharmacological treatment could have side effects such as nausea, vomits and addiction. Qigong could be considered as an alternative therapy for those suffering from anxiety disorders.
COLE et al.,	A Longitudinal Look at	330		3 year longitudinal study and every 6	Results show that high levels of anxiety predict

1998	the Relation Between Depression and Anxiety in Children and Adolescents	students 228 parents		months parents and students completed depression and anxiety questionnaires.	high levels of depression in children and adolescents.
CONRAD and ROTH. 2006	Muscle relaxation therapy for anxiety disorders: it works but how?			Literature review.	Although patients suffering from anxiety and panic disorders may exhibit elevated muscle tension, abnormal autonomic and respiratory measures during laboratory baseline assessments, the available evidence does not allow to conclude that physiological activation decreases over the course of muscle relaxation therapy in those patients, even when patients report becoming less anxious.
DORCAS, A., YOUNG, P. 2003	Qigong: harmonizing the breath, the body and the mind			Literature review.	Qi Gong helps to harmonize the mind, the breath and the body. However from a western point of view, the methodology of the reviewed studies is weak.
FALES et al. 2008	Anxiety and cognitive efficiency: differential modulation of transient and sustained neural activity during a working memory task	n=96		The investigators used a magnetic resonance imaging design to track transient and sustained activity in dorsolateral prefrontal cortex, while high and low anxious participants performed a working memory task.	Results showed that high and low anxious individuals make strikingly different use of cognitive and default-network circuitry during performance of a cognitive task.
HANSSON et al. 2000	Sensitivity of trapezius electromyography to differences between work tasks – influence of gap definition on normalization methods	n=58		Bilateral trapezius EMG was recorded, for a full workday for the participants following both maximal and submaximal reference contractions.	Normalization to submaximal, rather than maximal contractions, improved sensitivity to differences between tasks, and reduced undesirable variability.
JONES, B. M. 2001	Changes in cytokine production in healthy subjects practicing Guolin	n=19	None	2 hours of Guolin Qigong per day during 14 weeks; Blood pressure, pulse rate, blood cortisol level and production of	No significant changes in blood pressure but the pulse rate decreased such as cortisol; results show that Qigong improves the stress-

Hong Kong	Qigong: a pilot study			cytokines were measured before training and after 3, 7 and 14 week.	coping skills of the participants, however further studies are needed.
KESSLER, et al. 2001	The use of complementary and alternative therapies to treat anxiety and depression in the United States	n= 2055		The data came from a nationally representative survey of 2,055 respondents (1997–1998) that obtained information on the use of 24 complementary and alternative therapies for the treatment of specific chronic conditions.	Complementary and alternative therapies are used more than conventional therapies by people with self-defined anxiety attacks and severe depression.
KIESS et al. 1995	Salivary cortisol levels throughout childhood and adolescence: relation with age, pubertal, stage and weight	n=152		The authors measured salivary cortisol in 138 healthy infants, children and adolescents and in 14 adults, at 8.00 am, 1.00 pm and 6.00 pm.	Cortisol levels are age-dependent: after 6 years old the values correlate significantly with pubertal state. Cortisol levels also increase with body weight and body mass index.
KRANTZ, FORSMAN and LUNDBERG 2004	Consistency in physiological stress responses and electromyographic activity during induced stress exposure in women and men	n=21		The aim of this study is to compare the different physiological stress responses and trapezius muscle activity (measured by SEMG) during mental and physical stress.	The association between sympathetic arousal and muscle activity is of importance for understanding the high prevalence of musculoskeletal disorders in mentally stressful but physically light work tasks. Psychological and physical stress increases the muscular tension of trapezius muscle, as well as the incidence of musculoskeletal disorders.
LEAL et al. 2009	Estudo da escala de depressão, ansiedade e stresse para crianças (EADS-C)	n=361		The authors adapted the language of the original EADS, to children giving an example of the respective situation. Children answer to the scale in individual session and Cronbach Alpha was calculated.	The results obtained suggest that this scale might be of importance to this population. Although further studies are needed to evaluate the scale's sensitivity.
LEE, MS, et.al. 2003	Effects of Qigong on blood pressure, blood pressure determinants and ventilatory function in	n=29	n=29	Qigong group did 30 minutes of shuxinpingxuegong per day during 10 weeks; blood pressure, urinary catecholamines, forced vital capacity and	Blood pressure and catecholamines were smaller in the Qigong group than in the control group; lung function improved in the Qigong group. Results indicate that Qigong has

	middle-aged patients with essential hypertension			forced expiratory volume per sec were measured before and after 10 weeks.	relaxation effects and stabilizes the sympathetic nervous system in patients with essential hypertension.
LEE, MS, et al. ¹ 2004	Effects of Qi-training on anxiety and plasma concentration of cortisol, ACTH, and aldosterone: a randomized placebo-controlled pilot study	n=16	n=16	The Qigong group completed a program of exercises daily, during 4 weeks, 60 minutes per session. The control group performed the movements without gathering or moving Qi. Plasma cortisol, ACTH and aldosterone were measured at the beginning and at the end of the study. The participants also asked to the Spielber`s state-trait anxiety to measure the acute level of anxiety.	Results showed that anxiety decreased 26% in the Qigong group and just 9% in the control group.
LEE, MS, et al. ² 2004	Effects of Qigong on blood pressure, high-density lipoprotein cholesterol and other lipid levels in essential hypertension patients	n=17	n=19	The Qigong group completed a program of shuxinpingxuegong during 8 weeks, 30 minutes twice week. Blood pressure and lipid levels were measured at the beginning and at the end of the study.	Results showed a significant decreased of blood pressure, HDL, total cholesterol and apolipoprotein A1 in the Qigong group.
LI, M., CHEN, K., MO, Z. 2002 China	Use of Qigong therapy in the detoxification of heroin addicts	n=34	n=26 (medication group) n=26 (control)	Qigong group: 2 to 2,5 hours of Pan Gu Qigong an received Qi adjustments from a Qigong master during 10 to 15 minutes daily during 10 day. Medication group: detoxification drug during 10 days using gradual reduction method. Control group: received only basic care and medications to treat several symptoms like pain, diarrhea and sleep disorders; urine morphine test, electrocardiogram, withdrawal syndrome	Results suggest that Qigong may be an effective alternative for heroin detoxification without side effects.

				evaluation scale and Hamilton anxiety scale were used before and during the 10 days of intervention.	
LOVIBOND, LOVIBOND. 1995	The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories	n=717		The authors administered the Beck Depression Inventory and the Beck Anxiety Inventory to the participants, and compared the results with the DASS scores.	The DASS was demonstrated satisfactory psychometric proprieties: 0,81 correlation to Beck Anxiety Inventory and 0,74 to Beck Depression Inventory.
LUNDBERG et al. 1994	Psychophysiological stress and EMG activity on the trapezius muscle	n=62		Subjects were individually exposed to mental arithmetic, the stroop color word test, the cold pressor test and standardized test contractions.	Psychological stress plays a role in musculoskeletal disorders by increasing muscular tension in low-load work situations and in the absence of physical load. It is also indicated that the stress-induced increase in muscular tension is accentuated on top of a physical load.
MALDONA DO et al. 2005	Efectos de la práctica de Qigong sobre parâmetros hormonales, sintomas de ansiedad, presión arterial y calidad subjetiva de sueño en estudiantes universitários	n=12	n=13	Qigong group completed a program of 30 minutes of Qigong lessons 5 times a week, and self-practice during the weekends, for 1 month. The evaluation of blood cortisol, ACTH, TSH and PTH, blood pressure, anxiety (Escala de ansiedad de Hamilton and Inventario de ansiedad de Beck) and subjective quality of sleep (Cuestionario de calidad subjetiva de Pittsburg) took place at the beginning and at the end of the study.	Results showed no significant differences between the 2 groups in blood pressure and subjective quality of sleep. However the Qigong group had lower cortisol, ACTH and anxiety levels than the control group which suggests that the regular practice of Qigong may inhibit the hypothalamic-pituitary-adrenal axis.
MENEZES et al, 2007	Resistência ao tratamento nos transtornos de ansiedade: fobia social,			Literature review.	Western medicine can't solve all cases of anxiety disorders since a great number of patients fail to respond or remain with clinically significant residual symptom after the

	transtorno de ansiedade generalizada e transtorno de pânico				treatment: one out of three patients shows insufficient response or does not get better with standardized western treatment.
OH, B. et. al. 2010 Australia	Impact of medical Qigong on quality of life, fatigue, mood and inflammation in cancer patients: a randomized controlled trial	n=83	n=79	Qigong group received usual medical care and attended a Qigong program during 10 weeks, 90 minutes per week; Quality of life, fatigue and mood status were measured at the beginning and at the end of the study.	Results showed that Qigong significantly improve quality of life, fatigue, mood disturbances and inflammation in cancer patients.
RIBEIRO, GARCIA, FIORI. 2007	Determinação da pressão arterial em recém-nascidos			Literature review.	Blood pressure measurement in newborn should be performed preferentially in the right upper arm, with cuff size corresponding to 40% of the circumference of the upper arm and that involves 80% to 100% of the respective extremity.
RIBEIRO, HONRADO and LEAL. 2004	Contribuição para o estudo da adaptação portuguesa das escalas de ansiedade, depressão e stresse (EADS) de 21 itens de Lovibond e Lovibond	n=200		The DASS was firstly translated and then the “cognitive debriefing” was done. The Cronbach Alpha was calculated.	Results show a structure identical to the original Australian version, with the same items in the same scale.
SANCIER, KM. 1996	Medical applications of Qigong			Literature review.	Studies show that Qigong can beneficially affect many functions of the body and improve health.
SANCIER, KM. 1999	Therapeutic benefits of Qigong exercises in combination with drugs			Approximately 1000 references about medical applications of Qigong were reviewed.	Studies suggest that Qigong may affect many functions of the body, permit reduction of the dosage of the drugs required for health maintenance and provide greater health benefits than using drug therapy alone.
SANCIER, KM; HOLE,	Qigong and neurologic			The investigators used 126 references	Qigong can effectively complement western medicine. Studies report that Qigong decreases

L. 2001 USA	illness			about Qigong and its effects.	the drug dosage of asthma and hypertension patients and assists detoxification heroin addicts, beyond other effects.
SKOGLUN D, L., JANSSON, E. 2007 England	Qigong reduces stress in computer operators	n=10	n=10	The Qigong group had daily sessions of 30 minutes, from Monday to Friday, during 5 weeks; Heart rate, blood pressure and finger temperature were measured at the beginning and at the end of the working day as well as the perceived of stress.	Qigong reduces heart rate, finger temperature and noradrenaline in urine. There were no effects on blood pressure and on the level of perceived stress. Results show that Qigong reduces the activity of sympathetic nervous system and may reduce stress in computer operators.
TSANG, HW, et. al. 2003 China	The effects of Qigong on general and psychosocial health of elderly with chronic physical illnesses: a randomized clinical trial	n=25	n=25	1 hour practice of Qigong, twice a week, during 12 weeks; results were measured with different scales and questionnaires to measure: the degree of depression, the state of physical, psychological and social, quality of life and self-concept.	Qigong improves physical health, psychological and social development of elderly people, reducing the degree of depression and increasing their quality of life.
TÜRKER 1993	Electromyography: some methodological problems and issues			Literature review.	SEMG is usually more susceptible to artifacts than IEMG. It is possible, however, to make useful recordings with appropriated surface electrodes and special precautions must be taken. Intramuscular electrodes may be preferred for recording the activity of small peripheral muscles or muscles located deep within the body.
WATSON et al. ¹ , 1995	Testing a Tripartite Model: I, Evaluating the Convergent and Discriminant Validity of Anxiety and Depression Symptom Scales	n=5		The tripartite model was tested by conducting separate factor analyses of the 90 items in the Mood and Anxiety Symptom Questionnaire which was designed to assess the hypothesized symptom groups, together with other symptom and cognition measures.	General distress, anhedonia vs. positive affect, somatic anxiety, emerged in each data set, suggesting that the symptom structure in this domain is highly convergent across diverse samples. These factors broadly corresponded to the symptom groups proposed by the tripartite model.

<p>WATSON et al.², 1995</p>	<p>Testing a Tripartite Model: II. Exploring the Symptom Structure of Anxiety and Depression in Student, Adult, and Patient Samples</p>	<p>n=5</p>		<p>The tripartite model was tested by conducting separate factor analyses of the 90 items in the Mood and Anxiety Symptom Questionnaire.</p>	<p>The same 3 factors (general distress, anhedonia vs. positive affect, somatic anxiety) emerged in each data set, suggesting that the symptom structure in this domain is highly convergent with the proposed model.</p>
<p>WILSON, SMITH and HOLMES. 2007</p>	<p>The role of effort in influencing the effect of anxiety on performance: Testing the conflicting predictions of processing efficiency theory and conscious processing hypothesis</p>	<p>n=18</p>		<p>Mid-handicap golfers made a series of putts to target holes under two counterbalanced conditions designed to manipulate the level of anxiety experienced. The effort exerted on each putting task was assessed through self-report, psychophysiological (heart rate variability) and behavioral (pre-putt time and glances at the target) measures.</p>	<p>Processing efficiency theory and the conscious processing hypothesis offer useful theoretical frameworks for examining the relationship between anxiety and performance in sport.</p>
<p>WITT, CMD, et. al. 2005</p>	<p>Qigong for schoolchildren: a pilot study</p>	<p>n=45</p>	<p>n=45</p>	<p>Qigong group received xiang-gong lessons over 6 months, twice a week, during 15 (Level 1) or 25 minutes (level 2); teachers, parents and children answered standardized questionnaires at the beginning and at the end of the study; the 5 teachers also answered semi-structured in-depth interviews.</p>	<p>Qigong influences positively grades and social behavior of the children; qualitative analysis indicated a relevant decrease in individual complains for some children in the Qigong group; Qigong helps to improve social behavior and grades but further studies are needed to generalize these results.</p>
<p>WITT, CMD, et. al. 2007</p>	<p>Xianggong (‘fragrant’ Qigong) for the health of school children: a qualitative pilot study of feasibility and effects</p>	<p>n=140</p>	<p>None</p>	<p>Xiang-gong lessons, twice a week, during 15 (Level 1) or 25 minutes (level 2) over 6 months; semi-structured in-depth interviews were conducted with the participating teachers at the end of the study.</p>	<p>Results showed that Qigong helps to enhance vitality and community strength and also social, psychological and in some cases medical improvement.</p>

3rd Annex: EADS-C

Escala de ansiedade, depressão e stresse para crianças de 21 itens (Lovibond e Lovibond)

Nome: _____ Data: __/__/__

Por favor lê cada uma das afirmações abaixo e assinala 0, 1, 2, ou 3 para indicar quanto cada afirmação se aplicou a ti **durante a semana passada**. Não há respostas certas ou erradas. Não leves muito tempo a indicar a resposta em cada afirmação.

	Não se aplicou nada a mim	Aplicou-se a mim algumas vezes	Aplicou-se a mim muitas vezes	Aplicou-se a mim a maior parte das vezes
1. Tive dificuldades em acalmar-me	0	1	2	3
2. Senti a boca seca	0	1	2	3
3. Não consegui sentir nenhum sentimento bom. Por ex. Não consegui parar de chorar	0	1	2	3
4. Senti dificuldade em respirar	0	1	2	3
5. Tive dificuldade em tomar iniciativa para fazer coisas. Por ex. Não me apeteceu ver televisão, estudar e nem jogar computador.	0	1	2	3
6. Tive tendência a reagir em demasia em determinadas situações. Por ex. apeteceu-me bater num(a) colega que não se calava na aula.	0	1	2	3
7. Senti tremores. Por ex., nas mãos, nas pernas.	0	1	2	3
8. Senti que estava a utilizar muita energia nervosa.	0	1	2	3
9. Preocupei-me com situações em que podia entrar em pânico e fazer figura ridícula. Por ex. Ter muito medo, ficar muito assustado	0	1	2	3

e, todos os meus amigos perceberem e gozarem comigo.				
10. Senti que não tinha nada a esperar do futuro. Por ex. Que nada do que eu sonho, se podia tornar realidade.	0	1	2	3
11. Dei por mim a ficar agitado	0	1	2	3
12. Senti dificuldade em relaxar. Por ex. Não conseguia estar sentado, parado e quieto.	0	1	2	3
13. Senti-me desanimado/cansado e melancólico/tristonho.	0	1	2	3
14. Estive intolerante em relação a qualquer coisa que me impedisse de terminar aquilo que estava a fazer. Como por ex. Faltar a luz, não conseguir terminar o jogo de computador e, ficar muito irritado e resmungão.	0	1	2	3
15. Senti-me quase a entrar em pânico ou seja, tive medo e fiquei muito assustado.	0	1	2	3
16. Não fui capaz de ter entusiasmo por nada. Por ex. nem jogar computador ou ver televisão eu tinha vontade	0	1	2	3
17. Senti que não tinha muito valor como pessoa ou seja, senti-me pouco importante.	0	1	2	3
18. Senti que, por vezes estava sensível. Por ex. Tive muita vontade de chorar de repente	0	1	2	3
19. Senti alterações no meu coração sem fazer exercício físico. Por ex., o coração começou a bater muito depressa, de repente	0	1	2	3
20. Senti-me assustado sem ter tido uma boa razão para isso. Por ex. Fiquei cheio de medo sem ter acontecido nada.	0	1	2	3
21. Senti que a vida não tinha sentido. Por ex. Parece que de repente, as coisas deixaram de valer a pena.	0	1	2	3

Muito obrigada pela tua participação!

4th Annex: Declaration of Informed consent

DECLARAÇÃO DE CONSENTIMENTO

Designação do estudo

EFFECTS OF QIGONG ON ANXIETY ON PERFORMANCE RELATED ANXIETY AND
PHYSIOLOGICAL STRESS FUNCTIONS IN TRANSVERSE FLUTE MUSIC
SCHOOLCHILDREN – A FEASIBILITY STUDY

Objectivo

Conhecer o efeito do Qigong na ansiedade, performance e funções relacionadas com stresse de alunos de flauta transversal com idades compreendidas entre os 10 e os 12 anos, antes de audições.

Eu, abaixo-assinado,

_____ BI: _____

Representante legal de:

_____ BI: _____

DECLARO:

Que percebi a explicação que me foi fornecida acerca da investigação que se tenciona realizar, bem como do estudo em que serei incluído.

Que me foi dada oportunidade, antes de prestar o meu consentimento assinando no presente documento, de fazer as perguntas que julguei necessárias à investigadora Cláudia Maria Gomes de Sousa, de quem obtive todas as respostas de forma satisfatória.

Que tomei conhecimento de que, de acordo com as recomendações da Declaração de Helsínquia, a informação que me foi prestada versou os objectivos, a metodologia, as intervenções a realizar no estudo de intervenção, os benefícios e

inconvenientes previstos, os riscos potenciais e o eventual desconforto.

Que me foi dada a informação que todas as intervenções são simples de realizar e não produzem efeitos prejudiciais à saúde dos intervenientes.

Que compreendi que a participação é voluntária e que tenho o direito de retirar o meu educando a todo o tempo da investigação, sem ter de prestar explicação e sem que isso possa ter como efeito qualquer prejuízo.

Além disso, que me foi garantido que toda a informação pessoal e todos os dados recolhidos no decorrer do estudo serão mantidos confidenciais.

Por isso, presto meu consentimento livre, informado e esclarecido.

Santa Maria da Feira, ___ de _____ de 20__

Assinatura do representante legal:

Assinatura do participante menor:

Assinatura do investigador:

5th Annex: Ethical permission



COMISSÃO DE ÉTICA

PARECER N.º 14/CEUP/2011

**PARECER DA COMISSÃO DE ÉTICA DA UNIVERSIDADE DO PORTO SOBRE O
PROJECTO INTITULADO:**

**EFFECTS OF QIGONG ON ANXIETY, PERFORMANCE AND PHYSIOLOGICAL
STRESS FUNCTIONS IN TRANSVERSE FLUTE MUSIC SCHOOLCHILDREN**

SUBMETIDO POR: CLÁUDIA MARIA GOMES DE SOUSA

Data de entrada do pedido: 2011.04.20

Relator: Professora Doutora Maria Fernanda Bahia

12 Maio 2011

Objectivo do projecto: realização da tese de mestrado sob o título “**The influence of Qigong on the anxiety of music school children before auditions and concerts**”.

Metodologia: recrutamento de estudantes de flauta transversal, com idades entre 10 e 12 anos, para o estudo do efeito do exercício de Qigong sobre a ansiedade manifestada, antes das audições e concertos. Com base na bibliografia, é dado o conceito de Qigong e indicado o tipo de exercício a efectuar (movimentos físicos, respiratórios, massagem e meditação). É assegurado o ensino do Qigong, bem como as instruções para a prática dos exercícios diários, no domicílio. É especificada a dimensão e são indicados os critérios de inclusão e de exclusão da amostra.

Comentários:

1. Através do plano enviado (anexo 1), o trabalho encontra-se já na fase de recrutamento da amostra (8 estudantes Qigong e 8 estudantes para grupo controlo). Pode inferir-se que esta prática terá a responsabilidade partilhada entre a mestranda (licenciada em fisioterapia pela Universidade de Aveiro) e representantes das escolas de música referidas, no projecto, como parceiras.

2. O estudo de investigação está bem objectivado e definido no que respeita a métodos de trabalho (concretização do tempo, condições e determinações específicas que irão permitir avaliar os efeitos e fundamentar conclusões). No sentido de suporte científico e orientação, conta a declaração do Coordenador do curso de Mestrado em Medicina Tradicional Chinesa, os nomes dos orientadores e o apoio técnico).

3. Preocupações éticas: dada a idade dos estudantes a recrutar, **deve ser sempre considerado simultaneamente no processo de consentimento informado o termo de consentimento informado assinado pelos representantes legais, mas também o assentimento dos participantes**, uma vez que é pressuposto o entendimento do objectivo do estudo, por todos os envolvidos.

4. Deve estar especificada no termo de consentimento informado a garantia de confidencialidade, nomeadamente a destruição dos dados após a conclusão do estudo.

Os representantes legais devem ficar com uma cópia do termo de consentimento, que deve ser assinado por eles e pelo investigador.

Conclusão: A CEUP dá parecer favorável à realização deste estudo, desde que sejam integralmente cumpridas as recomendações acima explicitadas.

Universidade do Porto, 12 de Maio de 2011

O Presidente



Prof. Doutor Jorge Sequeiros

O Relator



Profa. Doutora Maria Fernanda Bahia

6th Annex: Results

First results

Qigong group	EADS-C	HR	BP MAX	BP MIN	BP Mean	EMG	TR 1	TR 2	TR 3	Cortisol
Student 1	5	133	109	80	89.67	0.01401	0.245	0.281	0.274	-
Student 2	1	100	121	84	96.33	0.00678	0.31	0.309	0.232	0.464
Student 3	26	98	135	91	105.67	0.00469	0.312	0.277	0.243	0.55
Student 4	14	95	106	77	86.67	0.00505	0.283	0.256	0.231	0.437
Student 5	17	99	112	77	88.67	0.00823	0.274	0.234	0.245	0.442
Student 6	13	85	99	72	81	0.00663	0.305	0.3	0.234	0.547
Student 7	5	95	115	72	86.33	0.0043	0.288	0.301	0.262	-
Student 8	12	148	134	88	103.33	0.00684	0.273	0.316	0.21	0.836

Control group	EADS-C	HR	BP MAX	BP MIN	BP mean	EMG	TR 1	TR 2	TR 3	Cortisol
Student 9	45	87	105	71	82.33	0.00862	0.298	0.32	0,268	0.147
Student 10	19	80	117	71	86.33	0.00441	0.334	0.45	0,223	0.102
Student 11	10	100	117	79	91.67	0.00712	0.293	0.28	0,233	0.522
Student 12	13	69	117	75	89	0.00576	0.264	0.223	0,215	0.798
Student 13	23	83	123	70	87.67	0.00542	0.371	0.371	0,313	1.53
Student 14	9	80	96	76	82.67	0.00495	0.209	0.196	0,143	0.066
Student 15	5	77	97	68	77.67	0.00408	0.249	0.272	0,27	0.179
Student 16	9	73	107	75	85.67	0.00545	0.224	0.22	0.164	0.303

Second results

Qigong group	EADS-C	HR	BP MAX	BP MIN	BP mean	EMG	TR1	TR2	TR3	Cortisol
Student 1	3	121	94	69	77.33	0.00891	0.247	0.263	0.241	-
Student 2	1	94	124	82	96	0.0094	0.299	0.32	0.259	0.333
Student 3	7	92	118	76	90	0.00703	0.283	0.273	0.247	0.05
Student 4	15	90	100	69	79.33	0.00862	0.297	0.25	0.254	0.126
Student 5	18	96	116	79	91.33	0.01333	0.25	0.243	0.242	0.326
Student 6	10	68	92	76	81.33	0.01071	0.319	0.295	0.306	0.422
Student 7	2	80	112	70	84	0.01081	0.257	0.309	0.238	-
Student 8	6	124	114	72	86	0.0101	0.216	0.225	0.213	0.432

Control group	EADS-C	HR	BP MAX	BP MIN	BP mean	EMG	TR1	TR2	TR3	Cortisol
Student 9	45	94	97	64	75	0.00632	0.299	0.277	0.253	0.502
Student 10	10	87	110	72	84.67	0.00548	0.29	0.246	0.211	0.174
Student 11	7	87	106	71	82.67	0.0089	0.279	0.286	0.194	0.277
Student 12	9	84	105	75	85	0.00712	0.277	0.245	0.221	0.103
Student 13	24	91	107	65	79	0.00873	0.297	0.275	0.196	1,22
Student 14	7	91	101	49	66.33	0.0072	0.232	0.226	0.171	0.041
Student 15	4	72	109	67	81	0.00906	0.3	0.301	0.269	0.091
Student 16	6	79	101	71	81	0.00902	0.245	0.232	0.204	0.159