36 - THE EFFECTIVENESS OF TAI CHI CHUAN IN THE IMPROVEMENT OF THE BALANCE, PROPRIOCEPTION AND IN REDUCTION OF THE RISK OF FALLS IN ELDERLY

FÁTIMA DE LIMA PAULA,
GRUPO DE PESQUISA ATIVIDADE FíSICA E ENVELHECIMENTO, UFF, NITERóI, BRASIL
FATIMA.LIMA@EMAIL.COM.BR
EDMUNDO DE DRUMMOND ALVES JUNIOR
GRUPO DE PESQUISA ATIVIDADE FíSICA E ENVELHECIMENTO, UFF, NITERóI, BRASIL
DRUMMOND@BIGHOST.COM.BR

INTRODUCTION

The aging of the world population is a reality that developed in the twentieth century. Now in the twenty-first it is worrying to know that the aging process is not only a characteristic of the high developed countries. According to the latest researches made in Brazil, (BRASIL, 2001) the population aged 60 and older are 14,5 million. It is estimated that in 2025 this number will be 30 million. This actual growth surprises more when we observe that prospective data shows that in 2050 there will be more people 60 and older than children and teenagers (ALVES JUNIOR, 2004).

Lenoir (1998) considered that the aging process was converted into a social problem. It can be noted when we verify the social system which includes social welfare, jobs, leisure, different ways of attending frail elderly, institutionalization, family relationship and also the discussion of strategies to reduce time spent in public hospital . According to Ramos (2003:797) the big challenge of this century will be “take care of an old population of more than 32 million people, the majority belonging to a low socio-economical and educational level and with a high prevalence of chronic and disabling diseases”. There is still an important problem that occurs with old persons which makes their quality of life worse. It is the fall. “If we still don't consider the problem of falls alarming, the fact that falls cause reduction of quality of life for the elderly should at least be a good reason for worrying” (ALVES JUNIOR, 2001:2).

Aging makes problems such as falls be present in the elderly lives and affect them not only physically and psychologically but also socially. We decided to investigate about this subject because we feel it is one of the problems which significantly affect the life of old persons. Falls among elderly may result in fractures, limitation of activities, health decay and they also may signify decadence and failure because of the loss of body's function. Besides the physical and psychological impairment there is the problem of reduction of self-care capabilities and independence and of the social cost (FABRICIO, RODRIGUES e COSTA, 2004; PERRACINI e RAMOS, 2002). Matsudo, Matsudo e Barros Neto (2000) suggest that the aging process is associated with a decrease in total muscle area, in the number and size of muscle fibers and in a gradual loss of muscle strength. These characteristics among others interfere in the joint mobility, balance, posture, reaction time and proprioceptive system (SHEPHARD, 2003).

Among the predictor of falls in the elderly is the proprioception impairment (PEREIRA et al, 2001; BARBOSA, 2001; TINETTI, 2003). The stability of the body depends on the appropriate reception of the sensory, cognitive, central integrative and musculoskeleton information. Impairment of this communication may cause a fall since the awareness of the body and its relationship with the surrounding environment is mediated by sensation and sensation is fundamental for the proprioceptive mechanism. A functional decline of the proprioceptive mechanism may cause a fall because of disability to correct the posture when there is a change in the body mass center or when there is a joint instability for example (UMPHRED et al, 1994).

The vestibular and visual systems are also considered responsible for the balance maintenance, postural control and for the falls prevention. Impairment of these systems also disturbs the sequence of movements increasing the reaction time during specific functional activities (LIN e WOOLLACOTT, 2002; FURMAN e REDFERN, 2001). As we can see, falls prevention programs target to the development of muscle strength, motor coordination and body awareness. Tai Chi Chuan is one of the activities frequently pointed out as effective for prevention of falls (ALVES JUNIOR, 2001). Many falls prevention programs suggest that Tai Chi is a good strategy for the improvement of balance (WOLF et al, 2003).

Xu et al (2004) afirm that there is a great number of reports which recommend Tai Chi as a physical activity important for the reduction of risk factors for falls. Originary of the martial arts, in China, this physical activity consists of exercises in which the practitioner must concentrate and know exactly the position and the movement of the joint.

As Tai Chi exercises have the same characteristics of the proprioception training, this report will investigate and make considerations about the relationship between Tai Chi Chuan and proprioception as falls prevention strategies.

LITERATURE REVIEW

According to Pereira et al (2001), considering a variety of situations, when there is a loss of stability and a person has his body moved to a lower level we say that a fall has occurred. A fall always happens after instability. When the body mass center is likely to move out of the projection of the support base, the body loses its stability and if the person is not capable of correcting this instability he will fall. Thirty per cent of American people 65 and older fall at least once a year. Ten per cent of them are more than 80 years old. 2/3 of the elderly who falls will fall again in six months (PARRA e STEVENS, 2000). In the USA elderly falls cost 20,2 billion dollars (AAOS, 1997). The main cost is for hip fractures which is 35 thousand dollars per patient. 90% of all the fractures are fall-related injuries. It is supposed that in 2000 there will be 350 thousand hip fractures, i.e., about 1000 hip fractures a day. One out of four patients who suffered a hip fracture will be totally recovered, 40% will need special home care, 50% will depend on a walking stick and 20% will die in one year. In Canada 1/3 of people aged 65 and older had at least a fall in 1989 (GALLAGHER, 1995) and this was the main cause of accidental death among adults aged 65 and older. In European Community more than 2 million people fall each year because of either extrinsic or intrinsic causes (LASCAUX. PERDRIZET, 1995).

According to the 'Guideline for the prevention of falls in older persons' (2001), while accidental injuries are the fifth cause of death among the elderly, falls are responsible for 2/3 of the deaths caused by accidental injuries.

The risk factors correlated with falls among elderly are classified in extrinsic and intrinsic. The extrinsic factors are related to the environmental such as, inadequate illumination, slippery floors, carpets/mats, narrow or high steps, obstacles, inadequate footwear and clothes, abuse, holes and irregular surfaces. The intrinsic factors are correlated with age-related alterations and some types of diseases (PEREIRA et al, 2001; ALVES JUNIOR, 2001).

The natural aging process is correlated with alteration of the number and the sensibility of the receptors and the appropriate afferent and efferent input (PAPALEO NETTO et al, 2002; BALOH, YING e JACOBSON, 2003). Verschueren et al (2002) investigated the age-related decline in dynamic position sense and they correlated this decline to the decline in the functioning of the muscle spindle. The authors consider that the position sense of the knee and the ankle declines with aging.

1- According to IBGE (Brasil, 2001), although the percentage of children and young people is 29,6% to 8,5% of the elderly, the costs with hospital among the elderly is 60% higher. In Rio de Janeiro and the Federal District it is the double. The average time of permanence in the hospital is 7,6 days for the elderly and 4,8 for children and young people. In Rio de Janeiro the national average is 13,6 days for the elderly. This cost is likely to rise since the old population rate is growing.
2- The authors of this report work in a prevention of falls program in Rio de Janeiro and Niterói. In Universidade Federal Fluminense (Niterói), the program 'PREV-QUEDAS: Falls prevention today will avoid you to be next to fall ' began in 2001 and attends retired community-dwelling old persons. They try to adapt an appropriate methodology to the project so that the interventions concentrate on physical qualities correlated to the risk factors using the body culture elements.

Lord et al (1999) afirm that the deterioration of the sensorial system affects postural stability and it promotes a decreasing in the capacity of recovering the initial position after a loss of balance. The authors observed that the older people who had already fallen showed reduced proprioception integration of the lower limbs as well as an increasing in the threshold for detecting the movement of the knee when compared with young adults. Since the proprioceptive mechanisms deteriorate during the aging process and so does the ability of maintaining the posture and balance, it is necessary to search for strategies which will improve this mechanism among the elderly (GARDNER, ROBERTSON e CAMPBELL, 2000).

Tai Chi Chuan was originated of the martial arts and it consists of practice of volunteer and gentle movements, meditation and deep breath. It is based on spiritual and philosophical ideas and it requires body, mental and spiritual balance. Tai Chi movements require all muscle groups' activity smoothly and slowly (MARYLAND, 2002). The sequence of slow, continuous and rhythmic movements is correlated with improvement of functional balance in old persons (WU et al, 2002). Tai Chi exercises improve the balance, motor coordination and postural control among old adults (WONG et al, 2001; TAGGART, 2002; LI, HONG e CHAN, 2001). Some authors suggest that the repetition of the movements promotes a better performance of the conscious proprioceptive mechanisms (TSANG, e HUI-CHAN 2004; XU et al, 2004).

Taggart (2002) investigated the influence of Tai Chi in the elderly functions focusing the balance, functional mobility and fear of falling. Forty-five women aged 65 and older took part in the experiment. According to the author a 30-minute training, twice a week during 3 months was associated with a significant improvement of balance and functional mobility and a reduction in the fear of falling. Tsang et al (2004) assessed the effects of Tai Chi on the balance control by measuring the anteroposterior body sway under reduction or conflicting of the somatosensory, visual or vestibular systems. There were 20 young people and 40 old people (20 Tai Chi practitioners, and 20 nonpractitioners). A dynamic posturograpy was used and there were six combinations: fixed platform with eyes opened, eyes closed and sway referenced visual surround, and sway-referenced platform also with eyes open, eyes closed and a sway referenced visual surround. The pressure center and the anteroposterior sway were registered. The authors concluded that Tai Chi practitioners showed a better postural control in the sensorial reduced or conflicting conditions when compared with Tai Chi non-practitioners. The level of balance control of the Tai Chi practitioners was equivalent to the young participants' results.

Fuzhong et al (2004) comment that because there was not significant evidence of a correlation between exercise, improvement of balance and subsequent reduction in falls among elderly persons they decided to conduct an experimental study with old people 70 and older. The participants were divided into two groups: one group was assigned to an intervention of Tai Chi Chuan practice, the other group was assigned to an exercise stretching control. The authors assessed the scores for balance and the number of falls was also registered. There was a six-month postintervention follow-up when they assessed the same measures. According to the authors Tai Chi improved significantly functional balance and this could be correlated with the reduction of falls registered during the follow-up.

Li et al (2005) assessed the efficacy of a six-month intervention of Tai Chi Chuan related to the reduction of the number and the risk of falls among old person aged 70 to 92. There were 256 sedentary old persons who were divided into two groups: 125 Tai Chi Chuan practitioners and 131 who undertook stretching exercise classes. The authors registered the number of falls and assessed the balance and the fear of fall. There was a six-month follow-up after the intervention. The Tai Chi group showed the best outcomes. The authors concluded that a six-month Tai Chi program, three times a week reduced the number and the risk of falls, reduced the fear of falling and improved the balance of sedentary old people.

Li, Hong e Chan (2001) studied the effects of Tai Chi exercises in relation to several factors, including elderly falls prevention. They declare that Tai Chi practitioners had significant improvement in the scores of single leg stances with eyes open when compared to nonpratictioners and that Tai Chi exercise reduced the number of falls by 47,5% and attenuated the fear of falling. The authors comment that Tai Chi increases strength and balance among elderly people and that since Tai Chi exercises allow practitioners to control their centre of gravity and remain stable it can be said that Tai Chi may train proprioception. On the other hand the authors concluded that the mechanism for improving balance capacity, and subsequently preventing falls, is still unclear. Further investigation is required into the scientific basis to prove that the practice of Tai Chi improves the physical deficits due to aging.

DISCUSSION

One of the risk factors for falls is balance impairment caused by the neural and muculoeskeleton disorders (LI, HONG e CHAN, 2001). Certainly proprioception decline is correlated with protective response, balance and postural control. As knee and ankle proprioception is important to the maintenance of postural control it is suggested that exercises which use the movement of these joints will improve proprioception and will prevent falls. Many studies have assessed the strategies which can interfere in the risk factors. Tai Chi intervention has been pointed as one of the activities that improve balance and reduce the risk of falls among elderly (WONG et al, 2001; TAGGART, 2002; LI et al, 2005; XU et al, 2004, HASS et al, 2004). One thing that is not clear yet is how Tai Chi intervention improves balance and if we can say there is really improvement of proprioception? (LIMA PAULA, 2005).

CONCLUSION

As falls are multifactorial it is very difficult to assess which components are responsible for a favorable outcome in preventing falls. Tai Chi Chuan shows good results in the improvement of balance and in reduction of risks factors for falls, but the literature is not consistent in declaring that the improvement of balance and the reduction of falls observed in researches are caused by the improvement of proprioception.

To assess proprioception isolated is very difficult since it is linked with strength training. Assuming that the methods of proprioception assessment were not established carefully we suggest the conduction of further studies to create a balance and a proprioception assessment pattern so that the researches will be standardized and the outcomes more reliable.

Tai Chi Chuan requires a precise static and dynamic position sense of the body. It demands active movements of the knee and the ankle and twisting of the trunk. These movements are likely to become limited among the elderly. So it is believed that exercises which requires these movements contribute with the improvement of proprioception and maintenance of postural control and balance. It can be observed that Tai Chi practitioners show better outcome scores in balance assessment. They are more secure and show faster motor responses than non practitioners. The problem is to correlate these good outcomes score to the improvement of proprioception and to the reduction of falls. Further studies are required.

Endereço dos autores:
Estrada Francisco da Cruz Nunes 777, casa 109, Piratininga, Niterói, Brasil, 24350370, e-mail: fátima.lima@email.com.br tel: 26194647, Fátima de Lima Paula, Universidade Federal Fluminense

Rua Assunção 162 apt 203, Botafogo, Rio de Janeiro, Brasil, 22251030, email: Drummond@bighost.com.br, Tel: 21 25375804, Edmundo de Drummond Alves Junior, Universidade Federal Fluminense

THE EFFECTIVENESS OF TAI CHI CHUAN IN THE IMPROVEMENT OF THE BALANCE, PROPRIOCEPTION AND IN REDUCTION OF THE RISK OF FALLS IN ELDERLY

Abstract

The aging of the population already encloses the developing countries. Investment in studies that promote better quality of life for these individuals is important. The fall is one of the problems that affect negatively the quality of life of old people. Loss of the balance is considered to be one of the important causes of the falls among the elderly. Many studies have been carried through to identify which falls prevention strategies are efficient to improve balance. Tai Chi Chuan exercises bring good results in relation to the improvement of balance and reduction of the risks of falls. We made a bibliographical review to verify the relation between the exercises of Tai Chi and the improvement of the balance, the proprioception and reduction of the risks of falls in the elderly. According to the research Tai Chi practitioners show good results in balance and proprioception tests and in the reduction of the number of falls. Tai Chi shows significant benefits in relation to the postural control. The literature is still inconsistent in relation to the assessment of the factors that are responsible for the improvement of the balance and also in relation to the how the proprioception is improved. Further studies are required to obtain a more precise assessment of the effectiveness of the exercises of Tai Chi Chuan

Key words: aging, falls, tai chi chuan.

L´EFFICACITÉ DU TAI CHI CHUAN DANS L'AMÉLIORATION DE L'ÉQUILIBRE, DE LA SENSIBILITé PROPRIOCEPTIVE ET LA DIMINUTION DU RISQUE DE CHUTES DES PERSONNES ÂGÉES.

Resumé

Le vieillissement de la population est présent dans les pays en développement. Il est important que s'investisse en études qui ont comme but une amélioration de la qualité de vie des personnes qui vieillissent. Les chutes sont un des problèmes des personnes âgées et qui interviennent négativement dans leur façon de vivre. La perte de l'équilibre est considérée une des grandes causes des chutes des personnes âgées. On a disposition plusieurs études qui ont été réalisées pour identifier les activités qui sont les plus capables d'améliorer l'équilibre et comme conséquence, influencer sur la prévention de chutes. La pratique du Tai Chi Chuan nous donne bonnes résultats concernant l'amélioration de l'équilibre et une possible diminution des risques de chutes. Nous avons fait une révision bibliographique pour vérifier la relation entre la pratique des exercices de Tai Chi et l'amélioration de l'équilibre, de la sensibilité proprioceptive et la diminution des risques de chutes des personnes âgées. Selon quelques recherches, les pratiquants de Tai Chi présentent de bons résultats dans les essais d'équilibre, de la sensibilité propriocepctive et la réduction des épisodes de chutes. Il est observé que le Tai Chi apporte bénéfices significatifs concernant le contrôle de la posture. Par contre, se perçoit encore une inconsistance dans la littérature en ce qui concerne l'évaluation des facteurs qui sont intervenus dans cette amélioration de l'équilibre et de quelle façon la propriocepcion va améliorer. On conclue avec une suggestion: il est besoin d´autres études qui puissent réaliser une évaluation plus précise des effets des exercices du Tai Chi Chuan.

Mots-clés: vieillissement, chutes, tai chi chuan.

LA EFICACIA DEL TAI CHI CHUAN EN LA MEJORíA DEL EQUILIBRIO, DE LA SENSIBILIDAD PROPRIOCEPTIVA Y EN LA DISMINUCIÓN DEL RIESGO DE CAÍDAS DE ADULTOS MAYORES.

Resumen

El envejecimiento de la población es notable en los países en desarrollo. Asi, es importante que se realizen estudios que tengan el objetivo de búsqueda de una mejoría de la calidad de vida de las personas que envejecen. Las caídas son uno de los mayores problemas de los ancianos, interferindo negativamente en su manera de vivir. La pérdida del equilibrio es una de las grandes causas de las caídas de los adultos mayores. Varias investigaciones buscan definir las actividades que son las más capaces de mejorar el equilibrio y contribuir para la prevención de caídas. La revisión bibliográfica comproba la relación entre la práctica de los ejercicios de Tai Chi Chuan y la mejoría del equilibrio, de la sensibilidad proprioceptiva y tambíen la disminución de los riesgos de caídas de los adultos mayores. Las personas que hacen esta prática presentan buenos resultados en las pruebas de equilibrio, asi como la reducción de los episodios de caídas. El Tai Chi ayuda, por ejemplo, en el control de la postura. Por el contrario, se percibe aún una inconsistencia en la literatura por lo que se refiere a la evaluación de los reales factores que produjen estos resultados. Asi sugerimos la realización de mas investigaciones para que sea posible entender adecuadamente los efectos de los ejercicios de Tai Chi Chuan.

Palabras clave: envejecimiento, caídas, Tai chi chuan.

A EFICÁCIA DO TAI CHI CHUAN NA MELHORA DO EQUILÍBRIO, DA PROPRIOCEPÇÃO E NA DIMINUIÇÃO DO RISCO DE QUEDAS EM IDOSOS.

Resumo

O envelhecimento da população já abrange os países em desenvolvimento. É importante que se invista em estudos que promovam uma melhor qualidade de vida para estes indivíduos. A queda é um dos problemas que acometem os idosos e que interferem negativamente na qualidade de vida. A perda do equilíbrio é considerada uma das grandes causas das quedas em idosos. Diversos estudos têm sido realizados para identificar as atividades que sejam eficazes na melhora do equilíbrio visando à prevenção de quedas. A prática do Tai Chi Chuan vem trazendo bons resultados em relação à melhora do equilíbrio e na diminuição dos riscos de quedas. Fizemos uma revisão bibliográfica para verificar a relação entre a prática dos exercícios de Tai Chi e a melhora do equilíbrio, da propriocepção e da diminuição dos riscos de quedas em idosos. Segundo as pesquisas os praticantes de Tai Chi apresentam bons resultados nos testes de equilíbrio, de propriocepção e apresentam redução dos episódios de quedas. Observa-se que o Tai Chi traz benefícios significativos em relação ao controle postural. Ainda percebe-se uma inconsistência na literatura no que se refere à avaliação de quais os fatores que estão intervindo nesta melhora do equilíbrio e de que forma a propriocepção está melhorando. Sugerem-se estudos que possam realizar uma avaliação mais precisa dos efeitos dos exercícios do Tai Chi Chuan.

Palavras chave: envelhecimento, quedas, tai chi chuan.