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The effect of the aerobic activities on dynamic and static balance in elementary boy students

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ABSTRACT

The main objective of performing this research was studying the effect of execution a period of aerobic activities program upon dynamic and static balance in nonathletic elementary male students. 30 elementary students enjoyed general healthiness who participated in the research, have been classified to control and experimental group. (Age = 12/3± 0/46)(Weight = 53/8 ± 6/413kg)(Length = 152 /26 ± 5/930). A pretest of Sharpened Romberg Test¹ (static balance with open and close eye) and SEBT² (dynamic balance) was been carried out on 2 groups, a day before start trainings. Experimental group get involved in performing a period of aerobic exercise program on treadmill for six weeks (3 sessions in every week). During this period the control group was asked to keep their daily activities. After completion the exercises, after test was carried out on experimental and control group in the same environment. Descriptive statistics were applied for calculation the mean and standard deviation of the data and orderly, independent t and dependent t were applied for determining the difference between pretest, after test and intergroup activities in the significant level P≤0.05.The results showed that there is no significant difference between experimental group and control group in static and dynamic balance's triple tests. But in after test, experimental group had a better performance than control group. t exam results always showed the significant difference between experimental group's pretest and after test in every 3 balance test, while no significant difference were observed between the control group's pretest and posttest. Balance improvement which has been obtained from aerobic exercise program can be ascribed to impact of the mentioned activities in improvement of muscle endurance, range of joints motion, neural control of movements and psychological factors of students. Nevertheless, long term studies is required for studying effects persistence and long term consequences of this activities.

Key words: aerobic exercises program, static balance, dynamic balance, elementary boy students.

INTRODUCTION

Balance is thought to be of great significance as it is an integral part of all movements (Westcott, Lowes & Richardson, 1997). It can be defined as the ability to maintain or recover the body's centre of mass within the body's base of support to prevent falling and complete the required movements (Shumway-Cook & McCollum, 1991) and it is usually divided into two basic components: the static and dynamic. Static balance is the ability to maintain a posture in a resting position, while dynamic balance is the ability to maintain postural control during the performance of functional tasks (Westcott et al., 1997).

Elementary age is a very important period for human motor behavior because it is critical in the development of fundamental motor skills (Gallahue & Donnely, 2003). The mastery of certain fundamental motor skills is a prerequisite if we are to function on a daily basis and participate in later physical or sport-specific activities. As it has been proved that, especially at the elementary age, balance plays a significant role in the performance of several fundamental motor skills (De Oreo & Keogh, 1980; Shumway-Cook & McCollum, 1991; Ulrich & Ulrich, 1985), its importance for motor performance at that particular age is obvious. During the elementary years, balance reaches an adequate level, while its development is completed in later childhood (Scheid, 1994). Among the variables which influence the level of balance skills we include age and gender. The significant effect of age on static and dynamic balance tests has been revealed in previous studies (see: Beitel & Mead, 1980; Fjørtoft, 2000; Lam, Ip, Lui, & Koong, 2003; Morris, Williams, Atwater & Wilmore, 1982; Toriola & Igbokwe, 1986; Ulrich & Ulrich, 1985).

Apart from the close association between balance skills and young children's motor performance, a dysfunction in postural control may be used as an indication of various types of developmental deficits. Children with disabilities, ranging from mild to severe ones, have a poor performance on balance tests (see: Cinelli & De Paepe, 1984; Gagnon, Friedman, Swaine, & Forget, 2004; 2001; Visscher, Houwen, Scherder, Moolenaar, & Hartman, 2007; Wright, Galea, & Barr, 2005). Physical therapists and occupational therapists have historically placed high priority on the treatment of patients with postural control problems because this control appears to be an integral part of all motor abilities (Westcott et al., 1997). Additionally, the examination of postural stability and motor control is essential to the vestibular evaluation of infants and children as bilateral vestibular failure may manifest itself as a deterioration or delay in motor milestones (Snashall, 2007). Due to the importance of the evaluation of balance skills in children, developmental assessment instruments include various balance tasks such as one-foot balance, walking on a balance beam, or walking heel-to-toe. By focusing on specific items within the subtests, these tests can be used as both discriminative tools to document general postural stability problems and evaluative measures to document movement changes related to the treatment of postural stability (Westcott et al., 1997).

However, studies investigating elementary' motor performance do not provide a clear picture of children's balance skills. In the cases when an assessment tool with an adequate number of balance items is used, a total subtest score is reported (see: Butterfield, 1990; 1989; Butterfield & Loovis, 1994; 1993; Kourtessis et al., 2008; Ulrich & Ulrich, 1985). In that way a general balance index is given, while educationally valuable information about children's deficits or superiorities in specific balance skills is masked.

On the other hand, in several studies one or two balance items are included (see: Du Toit & Pienaar, 2002; Lam, et al., 2003; Oja & Jürimäe, 2001). However, it is well known that balance is task-specific (Ulrich & Ulrich, 1985) and as a result, a high score on one balance task does not necessarily correlate with a high score on another one (Drowatzky & Zuccato, 1967; Shimada et al., 2003; Tsigilis, Zachopoulou & Mavridis, 2001). Consequently, it is obvious that the performance on a couple of items cannot provide a sufficient overall picture of balance.

As a result, an information deficiency regarding balance skills in elementary aged children exists. Taking into consideration that such information will contribute to both the planning of developmentally adequate movement programs (Zimmer & Cicurs, 1993) and the study of developmental specificities during such critical years as the elementary age, the aim of the present research was to effect of the aerobic activities on dynamic and static balance in elementary boy students.

MATERIALS AND METHODS

Materials and methods research was carried out and the quasi-experimental designs pre-test and post -test. Statistical society research included all students-elementary fifth athletes Qazvin Province. The sample was analyzed in this study's 35 elementary non-athlete students of Qazvin in the fifth academic year 2010-2011 are studying, were randomly selected and no lower limb injuries and disorders of the accompanying that leads to lack of ability, they do not have the balance test.

Medical history questionnaire at the beginning and two and readiness for physical activity should start the student's responses to both groups the subjects. 20 experimental and control group 15 persons were equal. Sharpand-Romberg test and all those stars are pre-test. Group had 6 week aerobic training program on the Treadmill and then Sharpand-Romberg test of both groups and the stars do to the effect of aerobic static balance on the Treadmill and dynamic students study.

Test the research performed under the:
1. Height and weight of each Problem behaviors with the use of the height standard cymbal metal scales measured.

2. Static balance with eyes open and closed: for static balance measurement using Sharpand-Romberg test. The implementation of this method is that if the test subjects with bare feet, so one of the legs (top pay) ahead of the other foot and arms to be multiplied on the chest. The duration of each of these subjects is able to open and maintain with the eye mode to his score. For introduction to testing, subjects, a few times it training. Then each comprised three times with open eyes and three times with eyes closed, run the test. And the mean of the three tests shall be recorded as his record.
3-dynamic balance: Measuring dynamic balance of Star test is used. In this test the eight to a star on earth the custom will be 45 degree to each other. The implementation of this test requires that the length of thorns-Upper anterior hip to ankle is to internal measurement.

After the explanation on how the implementation of the test by the examiner, each comprised six times the test can run up the learning effect of the modification. Also, before the Premier's test subjects to be determined if the right superior extremity is a self-test on the counterclockwise is done in hours, and if the left foot clockwise in the direction of the premier test hours. The subjects in the center of stars on the top and the bottom with the other hand placement action intact and without error (errors: moving the foot from the center of stars, rely on the point of contact on the other foot and falling star line by someone), in eight directions to star randomly determined, by the examiner.

The distance to the Star Center's free call location distance shall be achieved. the subjects of each of the three times to do and finally the mean foot length calculation, based on the size of them according to the CM Division and then in the 100 will be minted until the distance achieved in the whole of the size of the leg length is obtained.

The length of the foot of the upper anterior iliac real spur to the normal direction of ankle foot internal data was measured. The Premier's subjects are also in this way that the subjects with which a higher tendency for extremity is shoot football bash. Then warm up phase (5-10 minutes of practice draft and Athletics soft) subjects were administered. First test stars were taken and then Sharpand-Romberg test with eyes open and closed. The next day, the experimental group subjects related to exercise (exercise Terdemil), start this group in a six-week training program with the company that the subjects in this group Terdemil training program that was designed to run them.

At the time of the control group were asked to maintain their daily activities.
Exercise protocol as three meeting in the week and six weeks being implemented duration of each exercise session about forty five minutes in every exercise session with ten minute movements of extensional and the walking calm to warm start problem behaviors. In practice protocol continued with regard to the table 1-1. The final ten minutes to the movements of the extensional for cold will be allocated. Exercise protocol in the (7, 8, 10) is written.

Table 1-1: aerobic Terdemil training program for people due to (the fifth primary school students)

level	week	Training sessions (weeks)	Exercise intensity (percent)	Exercise duration (minutes)
Elementary	1	3	60	10
Elementary	2	3	65	12
Elementary	3	3	70	14
Elementary	4	3	75	16
Elementary	5	3	80	18
Elementary	6	3	85	20

The intensity of training to direct and indirect methods are determined. In the direct method the specific equipment's and tools is required, but indirect methods are based on formulas using heart rate to determine the index of the simplest aerobic intensity is calculated. One of these methods is using the maximum heart rate that its formula is as follows.

Maximum heart rate = 220 – age

For people less than 20 years is better than 10 percent of the formula is high (Rahimi, 2003).

The maximum heart rate heart rate range determined by the percent calculation. Maximal aerobic power and maximum heart rate in normal and healthy people, very close to each other. In fact the effect of stage (60 to 80 percent of maximal aerobic power) is approximately equal to 70 to 85 percent of your maximum heart rate (Rahimi, 2003). Students in the age range of 11 to 12 years.

Maximum heart rate = 220-12=208 208×%10=20.8 208-20.8=187

Low effect of phase domain investment=187×%70 =130

High effect of phase domain investment =187×%85=160

After completing the course, all of the subjects of the training all the variables in the study, the same way as pre-test and post-test.

To calculate the mean and standard deviation of the age, height and weight were measured, the results of reports comprised both the Venice Group descriptive statistics for determining the difference between pre-test and post-test t dependent on each of the categories for comparing two groups of independent t-test, $p \leq 0.05$ significant level.

RESULTS

Table 1-2: descriptive methods indicators

	Index	Testing	Control
Leg length (cm)	Mean	82.73	80.73
	Median	82.00	81.00
	standard deviation	4.291	2.333
height(cm)	Mean	150.89	153.63
	Median	149.47	153.54
	standard deviation	6.031	5.830
weight(kg)	Mean	52.82	54.79
	Median	52.19	56.54
	standard deviation	6.330	6.496
age(year)	Mean	12.4	12.17
	Median	12	12
	standard deviation	0.498	0.699

The results of the test, the t- student is in the following table.

Table 1-3: the results of the static balance training effectiveness evaluation with eyes closed

t-test	Test groups	T-statistics	Degrees of freedom	significant level
Dependent-t for Pre-test Post- test	The control group	.508	14	.619
	The experimental group	5.062	14	.000**
Independent-t for Group	Pre-test	.271	28	.788
	Post- test	-1.587	28	.124

Dependent t-test results for the experimental and control groups, suggesting that in the control group differences in scores of static balance with eyes closed the pre-test and post-test turn differences were not significant, but the difference for experimental statistics with examination 5.062 and 14 degrees of freedom is equal to two times the level before the test and then test the first type error is 0.05. The results of the test to turn independent t-test shows a significant level at the turn before the test is equal to 0.788, which is larger than the first type of error is 0.05 significant differences between scores of static equilibrium, with eyes closed and control groups was not present. Turn on so the pre-test according to the test statistics, as well as equal to the larger of a significant level of -1.587 and a significant level of 0.05, which is larger than the amount of the estimated 0.124 view a significant difference between the scores of the two groups is not available.

These results represent the difference between pre-test and post-test scores the experimental group compared to the lack of difference in the scores of the control group and pre-test. As a result of the study on static balance training students with eyes closed at the level of 0.05 has been effective.

(B).with eyes open
The results of the test, the t- student test is in the following table.

Table 1-4: the results of the static balance training effectiveness evaluation with eyes open

t-test	Test groups	T-statistics	Degrees of freedom	significant level
Dependent-t for Pre-test Post- test	The control group	1.080	14	.299
	The experimental group	8.067	14	.000**
Independent-t for Group	Pre-test	1.631	28	.114
	Post- test	-1.164	28	.254

Dependent t-test results for the test and control groups, suggesting that the differences in the control group scores with open eyes turn on static balance of significant difference between pre-test and post-test have not but this difference to the experimental group and pre-test in two tests at the level of the first type of error is 0.05, and therefore assume that the non-zero meaningful statistical differences between the scores of the two groups in this level of error The first type of rejection. The results of the test to turn independent t-test shows that in turn a significant level before the test according to 0.114 significant difference between scores of static balance with eyes open between experimental and control groups.

Turn on so the test can be observed due to the significant level of 0.254 that is larger than the type 1 error is a significant difference between p-scores between the two groups is not available, and therefore the assumption of statistical zero in this test based on the lack of significant differences between the two groups in the scores. These results represent the difference between pre-test and post-test scores the experimental group compared to the lack of difference in the scores of the control group and pre-test. As a result of the study on balance training Static students with open eyes at the level of p transition effects.

The results of the test, the t- a student dependent and independent, in the following table.

Table 1-5: the results of the dynamic balance training effectiveness evaluation

	t-test	Test groups	T-statistics	Degrees of freedom	significant level
Anterior	Dependent-t for Pre-test Post- test	The control group	-1.037	14	.317
		The experimental group	7.168	14	.000**
	Independent-t for Group	Pre-test	.954	28	.348
		Post- test	-3.032	28	.005**
Lateral	Dependent-t for Pre-test Post- test	The control group	3.584	14	.003**
		The experimental group	4.574	14	.000**
	Independent-t for Group	Pre-test	-1.424	28	.166
		Post- test	-2.291	28	.030*
Posterior	Dependent-t for Pre-test Post- test	The control group	.186	14	.855
		The experimental group	3.471	14	.004**
	Independent-t for Group	Pre-test	-3.140	28	.004**
		Post- test	-4.590	28	.000**

DISCUSSION AND CONCLUSION

The main objective of this study was to evaluate the effect of aerobic exercise on the program six weeks Treadmill on static balance and dynamics of male students were non-athletes. The results of the study, the first to fifth based on the effect of aerobic exercise on balance significant program Static subjects with open eyes, eyes closed with the balance comprised the Static and dynamic balance of the approved subjects.

Before the results of interpretation, it is necessary to have a reference of some metabolic points. First, the fact that a number of the subjects we were low (15 out of every group), so we cautiously interpret the results. Another limitation of the study subjects, sex. In fact, the only male subjects in this study were given the company that makes the results of this study will not be in any Community (consisting of men and women) generalization.

In the case of the first specific hypothesis that aerobic activity to evaluate the effect of the program on Treadmill on static balance with eyes open was concerned, the results showed that doing aerobic exercise program six weeks by static balance test time students with open eyes significantly. Since this person's test with the help of the three Visual

system, sensory and physical-San, your balance shall maintain, can be concluded that aerobic activity probably do on Treadmill program improves and facilitate the input of each transfer of two or all three of these senses, the sense of balance in order to maintain simultaneously, and also improve muscle coordination and balance in neuron-muscle groups.

The results of the second hypothesis related to the specific effect of aerobic activity program on Treadmill on static balance with eyes closed was concerned, the six-week program showed that the aerobic activity done by static balance test time students with eyes closed to significantly increase. In this test by closing the eyes, Visual sense of disconnect input and input in order to maintain the balance to the party system, physical and sensory-San is connected (29). Due to the increasing time maintain balance during the six weeks that was statistically significant, moreover, that the program can be picked up on Treadmill aerobic activity to facilitate in the transfer of message because one of the above sense of the leasing or both to higher neural centers in order to maintain the balance, and the strengthening of proprioception.

The results related to the third test targeted specific related hypothesis that aerobic activity to the effect of the program on dynamic balance test associated SEBT indicated that doing aerobic activity for six weeks by students, the size of the dynamic balance test SEBT to significantly increase healing and balance data for static people. Possible causes that improve muscle coordination improve proprioception and improve coordination of neuron-muscle.

The fourth hypothesis based on the results of research that the aerobic activity on the program six weeks Treadmill on static balance with eyes open and closed in the experimental group control group difference was confirmed there. The fifth on the hypothesis that aerobic activity on the program six weeks Treadmill on dynamic balance with eyes open in the experimental group control group difference was confirmed there. Evaluation of functional Sharpand-Romberg test in the meantime of static balance test and functional test of dynamic balance in size in the control group showed that, measured before and after the test control group was conducted in six-week interval, there was no significant difference in all three tests. Since the balance control system in control group exposed to not overload and none of the components of this system are subject to change, training, recovery and were not supposed to overload, lack of view logical changes at the time of the experimental tests, it seems. Possible interpretation of this is that if the subjects under specific training in this study (aerobic activity), not to the increase in the average of the experimental test is not expected to triple. This confirms the findings of Anderson (1994), which believes that everyday activities or reducing the effect of increase does not balance.

The results obtained from this study with the results of researches and Kharrazi (2010), Eftekhari and et al.(2008), jaj (1992), Angastal (1998), Maheu and et al (2006), poll and et al (2003), Zherankoej and et al (2008), Scidmor and et al (2008) effect of aerobic activity in the investment program for the static and dynamic balance was consistent. But with the results, Wetizakeh and et al (2000), Vilmor and et al (2007), Yen and et al (2008), both sides disappointed. That is possible because it can be used in training to research done with related research.

The expression of the causes and mechanisms of variation in improvement of balance requires that various components of the sensory system to motor-is responsible for the balance point. This system consists of sensory, motor parts and components central processing involved. The performance of the system resulting from the integration of information obtained from various senses, which is associated with various motor tasks, flexible behavior and can match their. Therefore a balance based on functional motor skills that are flexible, and the functional motor skills can be improved by training and experience in Afghanistan (Kavonoodias, 1999). Central nervous system in order to have knowledge of the status and position of the body in space and sensory information must be obtained from recipients of the evaluation throughout the body. In normal mode, this information is through the senses of vision, physical and sensory-San in the central nervous system to the up position and the position of the body and its movement in space due to gravity and the surrounding environment evaluation. In the central areas of processing, data integration and the value of investment. To be determined and the importance and relevance of the appropriate motor response including the experimental reaction speed and proper selection intensity and executed (29). Information collected by Visual systems, physical San and sensory-motor control in three levels of processing are isolated in brain stem and spinal cord, are the higher levels such as the cerebellum, basal ganglia and cortex, brain (29).

In addition to the cases mentioned, we can improve the balance in aerobic activity program effect on possible causes of the effects of Terdemil training to improve muscle endurance, muscle strength, joint range of neuron-motor coordination, improved muscle, improve the overall function of the muscles, improve the proprioception due to all of Terdemil involvement, repeating the movements (movements in the low range) and match it with the type of test

being that the people of the non-athletes, balance background provides improved, released today Type of training and mental factors are the subjects. Since this study was a quasi-experimental design, may have some behavioral and environmental factors that were not measured in this study, the results of research on transition effects. For example, psychiatric problems people can play an important role in the results.

According to the results of research, it seems that aerobic exercise increases the activity of the program Treadmill on static balance with eyes open and closed and the balance of the non-athletes, students, active virtue. That is according to the lack of improvement in the balance of control group, subjects may be recovered as a result of this exercise, the experimental group. In fact, aerobic activity program with the information overload on sensory systems of the three branches of the central nervous system (Visual systems, physical and sensory-San) and motor systems, as well as to maintain the balance, improves the balance, but due to the short training period (six weeks) Supplemental long-term studies for evaluation of the long term consequences of these effects and survival training is essential.

Significant improvement in static balance with eyes closed, indicated that the removal of the input information is one of the system controlling the balance of Visual system by other systems such as remedy.

Therefore, teachers and parents in school sport students are recommended according to the needs of its students, and also to consider the potential of injury in sport activities of the design (for static and dynamic balance improvement) of the benefits of aerobic exercise program.

REFERENCES

[1] Aach and Vilmor, Jack Wal. Castil, (**2007**), *Physical activities and sports Physiology*, 6th Edition, the translators: M. Moeini; F. Rahmaniniya; H. Rajabi; H Ali Nejad and F. Pishrovan, publishing innovators. P. 241-242.
[2] Taadibi. V., Yousefi. Bahram. Taheri, h., 95. J., (**2008**), *Journal of research in sports sciences*, no. 18, and pp. 157-169.
[3] Kharrazinia, Mahsa, (2010), the effects of an incremental session on dynamic balance instrument activity and time to recover a balance in female recreational athletes, senior thesis, Faculty of physical education and Sport Sciences, Tarbiat Moallem University.
[4] Dr. Hamid Rajabi, a. Gaeini, (**2007**), physical readiness, publishing the Fourth Edition.
[5] Rahimi, a., (**2003**), exercise science and physical readiness, publishing Abed, p. 174-180.
[6] Chalmiz, (**2004**), the nature of science, ZibaKalam, Saeed publishing Semmat.
[7] Gelsari, z., (**2008**), the effect of a combined training course on motor and physical readiness in MS, senior thesis, Faculty of physical education and Sport Sciences, University of Tehran, p. 2.
[8] Hinkell, Karlazzed, Anatomy, and practices (**1997**), move, switched. Wali Allah Taadibi Roshan translation (2006), Tehran: Semmat.
[9] Blackburn T, Guskewicz KM, Petschaur MA, Preritice WE. **2000**. *J Sport Rehabil*. 9:315-28.
[10] Boden BP, Dean GS, Feagin JA, Garret WE.**2000**. *Orthopedics*.23:573-78.
[11] Dodd K, Taylor N, Bradley S. Strength training for older people. In:2 Morris M & Schoo A. Editors. Optimizing exercise and physical activity in older people. Sydney: Butterworth Heinemann; **2004**.
[12] Earl JE, Hertel J.**2001**. *J sport Rebabil*.10:93-104.
[13] Eftekhari A, Nikbakht H, Etemadi Far M, Rabiei K. *J Olympic acad IR* **2008**; 16(1):37-46.
[14] Gribble,P.**2003**. *Athl Ther Today*.8(2),46-47.
[15] Gribble P, Hertel J.2003. *Measurements phys Edus Exer Sci*. 7,89-100.
[16] Herdman, SJ.(**2000**).*Vestibular rehabilitation*. 2nd ed. Philadelphia. chap 1,2.
[17] Hertel J, Miller SJ, Denegar CR.**2000**. *J sports Rehbil*.9:104-16.
[18] Howard, D.S.et al.(**2004**). *Journal of the American Association*.292:1180-1194.
[19] Marsh DW, Richard La, Williams LA, Linch Kj.**2004**. *J Strength Con Res.*18(4):441-56.
[20] Nagy A, Feher Kiss, Ma ria B, Andrea D, Preszner L. *J Appl Physiol* **2007**; 100: 97–104.
[21] Pohl M, Rockstroh G, Ruckriem S, Mrass G, Mehrholz J. *Arch Phys Med Rehabil* **2003**; 84(12): 1760-1766.
[22] Puankallio A. **2005**, *J Sports Sci & Med.* 4:7-14.
[23] Olmsted LC, Garcia CR, Hertel J, Shultz SJ.**2003**. *J Ath Train.*37:501_506.
[24] Olmsted L. Hertel J.**2004**. *J sport Rehabil.*13:54-66.
[25] Raty HP, Impivaara O, Karppi Sl.**2002**. *J Med Sci Sport.*12:111_17.
[26] Riemann BL, Myerse JB, Lephart SM.(**2002**). *J Athl Train*.37(1):78-85.
[27] Rinne MB, Pasanen ME, Milunpalo SI,Oja P.**2001**. *International J Sports Med* 22;192-200.
[28] Robert W, Aron J, Mark L.**2003**. *Eur J Appl physiol.* 89:1-7.

[29] Shumway-Cook A, Woollacott MH. (**1995**). Motor control: Theory and practical Applications.lst ed. Baltimore, MD: Williams & Wilkins.119-142.
[30] Tsigilis N, Zachopoulou E, Marridis TH.**2001**.*Percepyual and Motor Skills*.92:827-33.
[31] Weinstein, D. (**2008**). *Arch Intern Med.*168:884-890.
[32] Wikstrom EA, Powers ME, Tillmann MD.**2004**.*J Athl Train*.39(3):247-53.
[33] Wikstrom EA, Tillman MD, Smith AN, Borsa PA. **2005**. *J Athl Train*.40(4):305-309.
[34] Witzke KA, Snow CM.**2000**. *Mes and Scien in sports and Exer*.32(6):1051-1057.
[35] Yen CL, Wang RY, Liao KK, Huang CC, Yang YR, *Neuro rehabilitation and Neural Repair* **2008**;22(1):22-30.