

<http://www.medicalnewstoday.com/releases/5615.php>

Juggling makes your brain bigger - New Study

Main Category: [Neurology / Neuroscience](#)

Article Date: 01 Feb 2004 - 0:00 PDT

It's no longer just a party trick. Juggling might also enhance your brainpower.

A new study published in the journal Nature finds that learning to juggle may cause certain areas of your brain to grow.

The finding challenges conventional wisdom the structure of the brain cannot change except through aging and disease. Previous studies have shown learning can result in changes in brain activity. But this latest study demonstrates an anatomical change as a result of learning - that is, the brain size actually expands.

German researchers divided 24 non-jugglers into two groups and assigned one group to practice juggling for three months. The scientists performed brain scans on the volunteers using magnetic resonance imaging, or MRI, before and after they learned to juggle.

The type of MRI scans the researchers used allowed them to focus on structural changes rather than changes in brain activity. Using a sophisticated analysis technique called voxel-based morphology, the researchers were then able to investigate changes in brain gray matter, the area of the brain that consists mostly of the cell bodies of neurons rather than the connective fibers.

The study found that volunteers who did not train to juggle showed no difference in their brain scans over the three-month period. However, those who now acquired the skill demonstrated an increase in gray matter in two areas of the brain involved in visual and motor activity, the mid-temporal area and the posterior intraparietal sulcus.


Scientists defined increases as a bigger volume and higher density of gray matter in those areas.

While the increase in brain size appears to be due to an expansion in gray matter area, the nature of this increase is not clear. Since the study focused on gray matter, the researchers were primarily looking at changes in cells rather than their connections.

Use it or Lose it

'It has generally been accepted that new neuron formation in adults is limited to particular areas of the brain. However, this dogma is changing,' according to Dr. George Wittenberg at the Department

of Neurology at Wake Forest University Medical Center in Winston-Salem, N.C.

Dr. Arne May, assistant professor of neurology at the University of Regensburg in Germany and the head researcher of the study, believes, 'The growth of cells could be due to locally new cells, [stem cells](#) invading from somewhere else or local connections between cell,  but we simply do not know.'

Interestingly, increase in brain size does not last. After three months of no practice, the group that learned to juggle lost their gained brain power and the enhanced brain regions decreased in size.

'The brain is like a muscle, we need to exercise it,' says May. While the effects appear to only be transient, the study provides an example of how activity may have growth benefits on the brain.

It is not clear whether increases in brain size would be more permanent if the training time were extended. May and colleagues are interested in examining the timeframe of these alterations and whether the changes are affected by age.

What does this say about our understanding of brain health? In terms of disease, Wittenberg says, 'Many diseases result in loss of gray matter: all the dementing illnesses, [stroke](#), trauma, etc.'

While the current study does not shed any immediate light on such illnesses, experts believe a better understanding of the nature of these structural changes in the brain may contribute to our knowledge of brain diseases.

Written by: Christian Nordqvist Editor: Medical News Today

I am a long time juggler with RSI in my wrists, and believe it or not I use Contact Juggling as physical therapy! (yep, its prescribed). The gentle movements and heavy weight of the ball make for excellent therapy and muscle building. My PT was amazing and stated she would be teaching future wrist patients the art :) Posted by Raven Lockwood

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1876467/>

esteem

Formats:

[Abstract](#)

|

[Full Text](#)

|

[PDF \(219K\)](#)

Biopsychosoc Med. 2007; 1: 10.

PMCID: PMC1876467

Published online 2007 May 1. doi: [10.1186/1751-0759-1-10](https://doi.org/10.1186/1751-0759-1-10)

[Copyright](#)© 2007 Nakahara et al; licensee BioMed Central Ltd.

Effect of juggling therapy on anxiety disorders in female patients

Toshihiro Nakahara,¹ Kazuhiko Nakahara,² Miho Uehara,¹ Ken-ichiro Koyama,¹ Kouha Li,¹ Toshiro Harada,¹ Daisuke Yasuhara,¹ Hikaru Taguchi,¹ Sinya Kojima,¹ Ken-ichiro Sagiyama,¹ and Akio Inui¹

¹Department of Behavioral Medicine, Kagoshima University Graduate School of Medical and Dental Sciences, and Department Psychosomatic Medicine, Respiratory and Stress care Center, Kagoshima University Hospital, Kagoshima City, Japan

²Health Art Clinic Kumamoto, Kumamoto City, Japan

✉Corresponding author.

Toshihiro Nakahara: ayana-n@m3.kufm.kagoshima-u.ac.jp; Kazuhiko Nakahara: kno1@oregano.ocn.ne.jp; Miho Uehara: midget-1789@docomo.ne.jp; Ken-ichiro Koyama: K.Koyama@m5.kufm.kagoshima-u.ac.jp; Kouha Li: Kuoha58@yahoo.co.jp; Toshiro Harada: toshiro@m2.kufm.kagoshima-u.ac.jp; Daisuke Yasuhara: Yasuhara@m3.kufm.kagoshima-u.ac.jp; Hikaru Taguchi: muscovy@f8.dion.ne.jp; Sinya Kojima: skojima@m3.kufm.kagoshima-u.ac.jp; Ken-ichiro Sagiyama: knifeguy@m.kufm.kagoshima-u.ac.jp; Akio Inui: inui@m.kufm.kagoshima-u.ac.jp

Received September 28, 2006; Accepted May 1, 2007.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/2.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Aims

The aim of this study was to investigate the effect of juggling therapy for anxiety disorder patients.

**PubMed articles
by these
authors**

Nakahara, T.
Nakahara, K.

Design and Method

Subjects were 17 female outpatients who met the DSM-IV diagnostic criteria for anxiety disorders. Subjects were treated with standard psychotherapy, medication and counseling for 6 months. For the last 3 months of treatment, subjects were randomized into either a non-juggling group (n = 9) or a juggling therapy group (juggling group: n = 8). The juggling group gradually acquired juggling skills by practicing juggling beanbags (*otedama* in Japan) with both hands. The therapeutic effect was evaluated using scores of psychological testing (STAI: State and Trait Anxiety Inventory, POMS: Profile of Mood Status) and of ADL (FAI: Franchay Activity Index) collected before treatment, 3 months after treatment (before juggling therapy), and at the end of both treatments.

Results

After 6 months, an analysis of variance revealed that scores on the state anxiety, trait anxiety subscales of STAI and tension-anxiety (T-A) score of POMS were significantly lower in the juggling group than in the non-juggling group ($p < 0.01$). Depression, anger-hostility scores of POMS were improved more than non-jugglers. In the juggling group, activity scores on the vigor subscale of POMS and FAI score were significantly higher than those in the non juggling group ($p < 0.01$). Other mood scores of POMS did not differ between the two groups.

Conclusion

These findings suggest that juggling therapy may be effective for the treatment of anxiety disorders.

[Other Sections](#) ▼

[Abstract](#)[Findings](#)[Authors'](#)
[contributions](#)[References](#)[Findings](#)

Several therapies, including anxiolytics, psychotherapy, and cognitive behavioral therapy (CBT), are available for the treatment of anxiety

Uehara, M.
Inui, A.

PubMed related articles

[\[Relations between anxious, depressive and borderline symptomatology and frequency of cannabis use and dependence\].](#)

[Encephale. 2004]

[\[Evaluation of Post-traumatic Stress Disorder: validation of a measure, the PCLS\].](#)

[Encephale. 2003]

[Randomised controlled trial of non-directive counselling, cognitive-behaviour therapy and usual general practitioner care in the management of depression as well as mixed anxiety and depression in primary care.](#)

[Health Technol Assess. 2000]

[Review](#) [\[Antipsychotics in bipolar disorders\].](#)

[Encephale. 2004]

[Review](#) [ECNP consensus meeting. Bipolar depression. Nice, March 2007.](#)

[Eur Neuropsychopharmacol. 2008]

disorders. Although little research on alternative therapy was conducted » [See reviews...](#) | » [See all...](#)
in the past, several recent studies have reported their efficacy in patients with posttraumatic stress disorder (PTSD) [1], general anxiety disorders (GAD) through herbal therapy [2], anxiety and mood disorders through several complementary therapies [3], anxiety disorders through yoga therapy [4], and anxiety disorders through meditation and relaxation [5].

Eye movement desensitization and reprocessing (EMDR) is an integrative psychotherapy approach that has been consistently evaluated as effective for treating several anxiety disorders, including PTSD [6], panic disorders [7], and phobias [8]. Although conflicting data has been reported for the efficacy of EMDR [9], this therapy is considered to be of low to moderate level of efficacy [10]. Originally, research on this therapy found that moving the eyes rapidly in a side-to-side motion reduced disturbing thoughts and related anxiety [11]. Currently rapid eye movement methods are occasionally replaced by smooth pursuit eye movement and bilateral stimulation. Smooth pursuit eye movement, bilateral tapping and bilateral tones have been found to be as effective as rapid eye movement [12].

Juggling (*otedama*) has a 3000-year history in Jaoan [13], first appearing in the Nara and Heian Periods (8th – 9th centuries). To date, such games have continued to grow in popularity. A previous report has indicated that three-ball cascade juggling facilitates the growth of gray matter in the mid-temporal lobe [14]. And a previous report suggested that mid-temporal lobe structures may relate to explicit conditioning tasks [15]. Physical movement via meditation [5], and yoga therapy [4] may reduce anxiety through relaxation. With regards to anxiety disorders, a report suggested the involvement of the temporal lobe in the generation of panic attack [16]. This finding suggests that visual motion information and physical movement might improve the psychoneurological network.

Recent Activity

[Clear](#) [Turn Off](#) [Turn On](#)

[Effect of juggling therapy on anxiety disorders in female patients](#)
Effect of juggling therapy on anxiety disorders in female patients

Your browsing activity is empty.

Activity recording is turned off.

[Turn recording back on](#)

Links

[PubMed](#)

Herein, we present the first trial to investigate the therapeutic effect of juggling on anxiety disorders. We hypothesize that juggling therapy contributes to improvement in patient anxiety through changes in emotional memory processing.

Subjects in this study were 17 female outpatients with anxiety disorders who met the DSM-IV diagnostic criteria for 6 panic disorder (PD), 4 PTSD, 4 obsessive-compulsive disorders (OCD), and 3 GAD. No subjects had substance use, alcohol or other comorbidities. All subjects were treated with standard psychotherapy, medication and counseling. During the 6-month study period, anxiolytics and antidepressants were prescribed; however, the doses were not changed during the study. For the last 3 months of treatment, subjects were randomized into a non-juggling group (n = 9: 3 PD, 2 PTSD, 2 OCD, and 2 GAD) or a juggling therapy group (juggling group; n = 8, 3 PD, 2 PTSD, 2 OCD, and 1 GAD). Individuals in the juggling group were taught classic beanbag juggling and gradually acquired juggling skills by practicing juggling beanbags with both hands (subjects started with 2 bags, then progressed to 3 bags). They routinely exercised about 5 minutes, twice a day.

The difference in the therapeutic effect was estimated using scores on the State-Trait Anxiety Inventory (STAI), Profile of Mood Status (POMS), and Franchay Activity Index (FAI), collected before treatment, after 3 months of treatment (before juggling therapy), and at the end of both treatments (6 months).

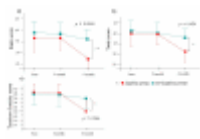
Regarding statistical analysis, psychological test scores were compared using repeated measurement of ANOVA and post-hoc Scheffe's test. All results were considered significant at $p < 0.05$.

In accordance with the principle of the Declaration of Helsinki, we obtained the written informed consent from participants before enrollment.

No differences between the 2 groups were observed in any demographic characteristics. Mean \pm SD age was 32.7 ± 3.2 years in the non-juggling group and 38.5 ± 3.5 in the juggling group. Duration of disease period was 18.4 ± 6.5 months and 17.0 ± 7.8 months, respectively (mean \pm SD).

Regarding anxiety scores (state and trait subscales of the STAI, T-A (tension-anxiety) score of POMS), repeated measurement of ANOVA showed for the group ($p = 0.12$ and $F(1,15) = 2.81$, $p = 0.32$ and $F(1,15) = 1.08$, $p = 0.53$ and $F(1,14) = 0.33$, respectively), time course ($p < 0.0001$ and $F(2,30) = 16.67$, $p = 0.0002$ and $F(2,30) = 11.8$, $p = 0.01$ and $F(2,28) = 6.23$, respectively), and time course \times group ($p = 0.011$ and $F(2,30) = 5.37$, $p = 0.021$ and $F(2,30) = 5.07$, $p < 0.0001$ and $F(2,28) = 17.26$, respectively). Anxiety scores in the juggling group were significantly lower than in the non-juggling group at the end of treatment ($p = 0.0044$, $p = 0.024$, $p = 0.046$, respectively) (Figure 1a,b,c).

Figure 1



Change of anxiety scores (mean \pm SD). a) State of STAI, b) Trait of STAI, c) T-A (Tension-Anxiety) score of POMS, * $p < 0.05$ and ** $p < 0.01$ vs. controls.

According to the activity scores (vigor score of POMS and FAI score), repeated measurement of ANOVA showed for the group ($p = 0.75$ and $F(1,15) = 0.10$, $p = 0.69$ and $F(1,15) = 0.17$, respectively), time course ($p < 0.0001$ and $F(2,30) = 58.40$, $p < 0.0001$ and $F(2,30) = 31.82$, respectively), and time course \times group ($p < 0.0001$ and $F(2,30) = 23.08$, $p = 0.0011$ and $F(2,30) = 8.65$, respectively). The activity scores of the juggling group were significantly improved in comparison with the non-juggling group.

Scores on the depression, anger-hostility, subscales of POMS, repeated measurement of ANOVA showed for the group ($p = 0.33$ and $F(1,15) =$

1.07, $p = 0.53$ and $F(1,15) = 0.41$, respectively), time course ($p < 0.0001$ and $F(2,30) = 72.86$, $p < 0.0001$ and $F(2,30) = 24.76$, respectively), and time course \times group ($p < 0.0001$ and $F(2,30) = 40.26$, $p = 0.023$ and $F(2,30) = 4.27$, respectively). Depression and anger-hostility scores were significantly lower in the juggling group than in the non-juggling group at the end of the treatment ($p = 0.0074$, $p = 0.026$, respectively).

In contrast, scores on the confusion and fatigue subscales of the POMS, repeated measurement of ANOVA showed for the group ($p = 0.31$ and $F(1,15) = 1.11$, $p = 0.79$ and $F(1,15) = 0.07$, respectively), time course ($p < 0.0001$ and $F(2,30) = 33.67$, $p < 0.0001$ and $F(2,30) = 94.84$, respectively), and time course \times group ($p = 0.80$ and $F(1,15) = 0.22$, $p = 0.80$ and $F(1,15) = 0.23$, respectively). At the end point these scores did not significantly differ between the groups ($p = 0.213$, $p = 0.813$, respectively).

In the present study, we found that anxiety scores in the juggling group were reduced more significantly than those in the non-juggling group. This finding suggested that juggling therapy may reduce anxiety through a visual motion information processing network such as EMDR. Eye movement was reported to reduce anxiety-causing memories or reduce the vividness of such memories [17], and faster resolution may have been obtained with regards to anxiety and emotional distress in the juggling group than in the non-juggling group. The activity of the ACC and lateral prefrontal cortex (PFC) is changed in individuals with higher anxiety levels [18], and the dorsal region of ACC is related to interoceptive awareness [19]. Thus, improvement on anxiety scores through juggling may have resulted from such changes in emotional memory processing and local brain activation [20].

On the other hand, juggling therapy or similar body work therapy may have facilitated changes in the patient's condition through relaxation. Body work therapy like yoga [4], meditation and relaxation [5] are

reported to be effective in emotional control. Disrupted attentional control over the threat of anxiety was reported [21], therefore the body sensation associated with juggling therapy may have helped attentional focus control and assisted the homeostatic process such as EMDR [20]. Since mood scores such as confusion and fatigue were not improved, juggling therapy may have a specific and limited influence on the activity of the brain, among other alternative therapies.

Several limitations of this study must be identified. Firstly, because the number of participants was small, we used a broad definition of anxiety disorders. But a report indicated that anxiety disorder may have overlapping pathologies [22]. Secondly, as the therapeutic effect was estimated using only psychological testing without assessing brain function. Hypo- rather than hyper-activation of the PFC has been reported in PTSD patients during the verbal fluency test [23]. Therefore, further research using NIRS, fMRI, PET, and/or SPECT is required to examine the brain sites responsible for the therapeutic effect of juggling.

In conclusion, we demonstrated the anxiolytic effect of juggling therapy in patients with anxiety disorders. Juggling therapy could be performed easily in combination with other forms of therapy for patients with increased anxiety levels.

Authors' contributions

KN gave the idea of this study. TH, DY, SK and KS helped to collect participant data. DY, MU, KK, KL and HT helped estimate and analyze the data. AI conceived the study design and coordinated and drafted this manuscript. All authors read and approved the final manuscript.

Acknowledgements

This study was supported by research grants from the Japanese Ministry of Health, Labor and Welfare, the Japanese Ministry of Science, and

Kagoshima University FSRC project. We extend our appreciation to the staff and patients of Yoshimura Hospital for their support.

[Other Sections](#) ▼

[Abstract](#)[Findings](#)[Authors'](#)

[contributions](#)[References](#)[References](#)

1. Bradley R, Greene J, Russ E, Dutra L, Westen D. A multidimensional meta-analysis of psychotherapy for PTSD. *American Journal of Psychiatry*. 2005;**2**:214–227. doi: 10.1176/appi.ajp.162.2.214. [[PubMed](#)] [[Cross Ref](#)]
2. Miyasaka LS, Atallah AN, Soares BG. Valerian for anxiety disorders. *Cochrane Database Syst Rev*. 2006;**4**:CD004515. [[PubMed](#)]
3. Deng G, Cassileth BR. Integrative Oncology: Complementary Therapies for pain, Anxiety, and Mood Disturbance. *CA Cancer J for Clinicians*. 2005;**55**:109–116.
4. Gupta N, Khera S, Vempati RP, Sharma R, Bijlani RL. Effect of yoga based lifestyle intervention on state and trait anxiety. *Indian J Physiol Pharmacol*. 2006;**50**:41–47. [[PubMed](#)]
5. Krisanaprakornkit T, Krisanaprakornkit W, Piyavhatkul N, Laopaiboon M. Meditation therapy for anxiety disorders. *Cochrane Database Syst Rev*. 2006;**1**:CD004998. [[PubMed](#)]
6. Shapiro F, Vogelmann-Sine S, Sine LF. Eye movement Desensitization and reprocessing: treating trauma and substance abuse. *Journal of Psychoactive drugs*. 1994;**4**:379–391. [[PubMed](#)]
7. Goldstein AJ, de Beurs E, Chambless DL, Wilson KA. EMDR for panic disorder with agoraphobia: Comparison with waiting list and credible attention-placebo control conditions. *J of Counseling and Clinical Psychology*. 2000;**68**:947–956. doi: 10.1037/0022-006X.68.6.947. [[Cross Ref](#)]
8. De Jough A, Ten Broeke E, Renson MR. Treatment of specific phobias with eye movement desensitization and reprocessing (EMDR): Protocol,

empirical status, and conceptional issues. *J Anxiety Disorders*. 1999;**13**:69–85. doi: 10.1016/S0887-6185(98)00040-1. [[Cross Ref](#)]

9. Katon WJ. Panic disorder. *New Engl J Med*. 2006;**354**:2360–2367. doi: 10.1056/NEJMcp052466.[[PubMed](#)] [[Cross Ref](#)]
10. McCabe S. EMDR: Implication of the use of reprocessing therapy in nurcing practice. *Perspectives in psychiatry care*. 2004;**3**:104–114. doi: 10.1111/j.1744-6163.2004.tb00003.x. [[Cross Ref](#)]
11. Shapiro F. Eye movement desensitization: A new treatment for post-traumatic stress disorder. *Journal of Behavior Research and Experimental Psychiatry*. 1989;**20**:211–217. doi: 10.1016/0005-7916(89)90025-6. [[Cross Ref](#)]
12. Shapiro F. *Eye movement desensitization and reprocessing: Basic principles, protocols, and procedures*. New York: Guilford; 1995.
13. Gillen B. "Remember the Force Hassan! Delving Deeper into Juggling Hieroglyphics" Juggling in ancient Egyptian carvings. Includes some references to anthropologists who have written generally about ball play in Ancient Egypt. *Juggler's World*. 1986;**Summer**:9–10.
14. Dragansky B, Gaser C, Busch V, Schuierer G, Bogdahn U, May A. Changes in gray matter induced by training. *Nature*. 2004;**22**:311–312. doi: 10.1038/427311a. [[Cross Ref](#)]
15. Morris JS, Ohman A, Dolan RJ. Conscious and unconscious emotional learning in human amygdala. *Nature*. 1998;**393**:467–470. doi: 10.1038/30976.[[PubMed](#)] [[Cross Ref](#)]
16. Sazar M, Carlen PL, Wennberg R. Panic attack semiology in right temporal lobe epilepsy. *Epileptic Disord*. 2003;**2**:93–100.
17. Ohtani T, Matsuo K, Kato T, Kato N. Hemodynamic response to emotional memory recall with eye movement. *Neurosci Lett*. 2005;**380**:75–9. doi: 10.1016/j.neulet.2005.01.020.[[PubMed](#)] [[Cross Ref](#)]

18. Bishop S, Duncan J, Brett M, Lawrence AD. Prefrontal cortical function and anxiety: controlling attention to threat-related stimuli. *Nature neuroscience*. 2004;**7**:184–188. doi: 10.1038/nn1173.[PubMed] [Cross Ref]
19. Critchley HD, Wiens S, Rotshtein P, Ohman A, Dolan RJ. Neural systems supporting interoceptive awareness. *Nature neuroscience*. 2004;**7**:189–195. doi: 10.1038/nn1176.[PubMed] [Cross Ref]
20. Corrigan FM. Psychotherapy as assisted homeostasis: activation of emotional processing mediated by the anterior cingulate cortex. *Medical Hypotheses*. 2004;**6**:968–973. doi: 10.1016/j.mehy.2004.06.009.[PubMed] [Cross Ref]
21. Mathews A, Mackintosh B. A cognitive model of selective processing in anxiety. *Cognit Ther Res*. 1998;**22**:539–560. doi: 10.1023/A:1018738019346. [Cross Ref]
22. Paul AC, Scott LR. Neural circuitry of Anxiety: Evidence from Structural and Functional Neuroimaging Studies. *Psychopharmacology Bulletin*. 2003;**4**:8–25.
23. Matsuo K, Taneichi K, Matsumoto A, Ohtani T, Yamasue H, Sakano Y, Sakaki T, Sadamatsu M, Kasai K, Iwanami A, Asukai N, Kato N, Kato T. Hypoactivation of the prefrontal cortex during verbal fluency test in PTSD: a near-infrared spectroscopy study. *Psychiatry Research*. 2003;**1**:1–10. doi: 10.1016/S0925-4927(03)00093-3.[PubMed] [Cross Ref]

Articles from Biopsychosocial Medicine are provided here courtesy of
BioMed Central

Appreciate behaved articles

<http://news.bbc.co.uk/2/hi/health/3417045.stm>

Juggling 'can boost brain power'

The skills we learn may shape the structure of our brains

Learning to juggle can cause changes in the brain, scientists have found.

Using brain scans, the researchers showed that in 12 people who had learnt to juggle, certain brain areas had grown. But three months later, during which time people stopped juggling, the brain had gone back to its normal size. Writing in *Nature*, the researchers from the University of Regensburg, Germany, say their findings challenge the view that experiences do not affect the brain. Grey matter

The team studied 24 people who had no juggling ability. What we do in everyday life might have an impact not just on how our brains function but on the structure. Dr Vanessa Slumming, University of Liverpool. They were scanned using voxel-based morphometry, a technique which measures concentrations of brain tissue. Half were then asked to teach themselves to juggle for at least 60 seconds using the traditional three-ball cascade routine, and given three months to practice.

All 24 were then scanned again. There was no change in the brains of the non-juggling group.

But brain scans of those who had learnt to juggle showed two areas had increased in size.

Jugglers had more grey matter - which consists largely of the nerve cells - in the mid-temporal area and the left posterior intraparietal sulcus, which both process visual motion information.

But after a further three months, in the people who had stopped juggling, the increase in grey matter had reduced. The scientists, led by Dr Arne May, said the changes could have been caused by an increase in cell production or by changes in the connections between cells.

Dr May told Reuters news agency: "I believe the challenge we face is... to be able to adapt and modulate this knowledge into disease management." Everyday impact

Dr Vanessa Slumming, a senior lecturer in medical imaging at the University of Liverpool, UK, has previously studied musicians and found they retain more brain cells than non-players.

She told BBC News Online the juggling research was interesting because it had been carried out amongst adults learning a new skill, rather than looking at people who had learnt a skill as a child.

"However, they have only shown a temporary increase. It would be interesting to know at what point this acquired grey matter can be retained.

"Does it mean you need to continuously practise the acquired skill to retain it, or at some point have you done enough to retain it?"

"It shows that what we do in everyday life might have an impact not just on how our brains function but on the structure at a macroscopic level."

http://www.educationworld.com/a_curr/curr393.shtml

Mention juggling in schools, and most people probably think of balancing tasks and commitments, not of tossing balls and scarves into the air. Some school districts, however, have found that teaching students to juggle real objects improves not only their coordination but their academic performance and behavior as well. In fact, several teachers recently told Education World, juggling increases students' ability to concentrate, enhances their eye-hand coordination, and builds self-confidence.



Fifth graders Brittany, 11, (left) and Jeremy, 11 (right) at Nowlin Elementary School in Blue Springs, Missouri, show off their juggling skills. Students juggle in physical classes and in after-school juggling and circus skills classes.

(Photo courtesy of Nowlin Elementary School)

"They don't just perform better, they have a desire to perform better," says Debbie Curtis of students who participate in her school's juggling club. Curtis, the principal of Nowlin Elementary School in Blue Springs, Missouri, added, "They seem to try harder in class and have fewer discipline problems."

JUGGLING BREAKS

At Nowlin, students learn to juggle in kindergarten during physical education classes; they practice during classroom juggling breaks. Students in grades three through five are eligible to join the juggling and circus skills clubs.

Greg Goodman, the school's physical education teacher and advisor for the circus skills and juggling clubs, says he started the juggling program seven years ago to appeal to children not interested in team sports. Goodman explains that the kids start by juggling scarves, then move on to such "stuff" as beanbags, balls, small plungers, rubber chickens, and rubber fish. Some students in the circus skills class

even learn to ride unicycles while juggling. The students perform at an annual assembly at their school and at other schools as well.

Classroom teachers have reported seeing improvement in students' academic work and focus after they start juggling, Goodman tells Education World. "You look at how they use both sides

of the brain [while juggling]," he says. "Juggling gives students a lot of confidence, and it's something they can practice without a coach."

Juggling also is good for developing eye-hand coordination and learning to store memories. "Kids learn the easy stuff and then move on," Goodman says. "They can do literally hundreds of thousands of [juggling] patterns with just three objects."

Students who juggle also get a physical workout. After wearing heart rate monitors to measure their exertion level while juggling, the students realized they had to be in good physical shape if they wanted to do complicated routines, according to Goodman.

THE WHOLE SCHOOL JUGGLES

Schools in Jacksonville, Florida, have experienced similar success with their juggling programs.

"The whole school juggles," says Alice Daugherty, a first-grade special education teacher at Alimacani Elementary School in Jacksonville, which has pre-K through fifth graders. "We use it to improve eye-hand coordination, concentration, and confidence."

Teachers at Alimacani are provided with a video about juggling, and students, who have about 15 to 20 minutes juggling time three days a week, start by juggling scarves, Daugherty says. She too has observed children's reading skills improve after kids learn to juggle. In fact, that was one reason for launching the program.

"We started a juggling program in 1994-1995 to help prepare the kids for reading," Jan Tipton, Alimacani's physical education teacher tells Education World. Some teachers observed, moreover, that children who had trouble learning to juggle also had trouble learning to read. "We find that if we give kids extra practice juggling, their reading improves as well. It's my way of helping in an academic area," Tipton notes.

Juggling also provides other benefits. "It levels the playing field. Some kids don't excel in other areas of athletics, but they *can* juggle well," Tipton says. Juggling is a good way for kids to burn off steam, adds third-grade teacher Catrina Perkins. Perkins, who is learning to juggle from some of her students, uses juggling to help students practice listening and following directions as well as build teamwork skills as they work on group routines.

First-grade teacher Ellen Langley said that she has seen children apply the concentration they develop from learning to juggle to other activities, including academic activities. "They will pick up a book and read it right through," Langley says.

"I believe that when you learn to focus and pay attention to steps," adds third-grade teacher Terry Brock, "that helps with everything."

JUGGLING FOR SUCCESS

None of the teachers' reports of juggling's benefits are a surprise to David Finnigan. Finnigan has traveled to more than 2,000 U.S. schools to teach students, teachers, and parents how to juggle and to help schools start their own juggling programs. "I wish people would take seriously the effects of juggling that I see in kids," Finnigan tells Education World.

Finnigan, whose Juggling for Success program is based in Celebration, Florida, says that besides providing exercise, juggling builds academic and interpersonal skills. Learning to track objects with the eyes improves students' reading, he explains, and their mathematics and science skills benefit from learning to put objects in logical order. Children's self-esteem also gets a boost from learning a new skill -- one they can teach their parents at the family juggling nights Finnigan hosts.

Juggling employs multiple intelligences, and helping one another helps foster cooperative learning techniques in kids. "It's learning from the outside in," Finnigan says. "While they're learning to juggle, they're using the left side of the brain; when they're juggling, they're using the right side. After they've been juggling for a while, both sides of the brain are active."

For the children, of course, the benefits of juggling probably are not as important as the fun they're having. "The kids enjoy it so much," Goodman says. "They get positive attention for learning a new skill, and it's a good hook to get them involved in exercise."

Here is what I say in my promo for my one day program <http://www.jugglingforsuccess.org>

Juggling for Success™, is a classroom based character education and behavior management program that reinforces academics. It takes practical advantage of the most exciting best practices research and gives classroom teachers tools that work. It is:

- Easy to initiate and administer;
- Supportive of existing curriculum;
- Of low cost to the school;
- Based on the best in educational theory.

Best of all, Juggling for Success™ does not take time since it earns back minutes that are already being spent on behavior management.

My goal is to help classroom teachers in a number of areas, most notably:

- Student behavior - cutting down on interruptions and referrals to the principal;
- Academics – helping the most challenging students to stay on task and do good work;
- Standardized testing – helping with focus, concentration, and stress;
- Student health – Taking juggling breaks helps promote an active lifestyle;
- Self-esteem – Children who participate in this program feel better about themselves.

Posted by Dave Finnigan, CSP

Juggling for Success™, is a classroom based character education and behavior management program that reinforces academics. It takes practical advantage of the most exciting best practices research and gives classroom teachers tools that work. It is:

- Easy to initiate and administer;
- Supportive of existing curriculum;
- Of low cost to the school;
- Based on the best in educational theory.

Best of all, Juggling for Success™ does not take time since it earns back minutes that are already being spent on behavior management.

My goal is to help classroom teachers in a number of areas, most notably:

- Student behavior - cutting down on interruptions and referrals to the principal;
- Academics – helping the most challenging students to stay on task and do good work;
- Standardized testing – helping with focus, concentration, and stress;
- Student health – Taking juggling breaks helps promote an active lifestyle;
- Self-esteem – Children who participate in this program feel better about themselves.

On Thu, Mar 1, 2012

- Juggling between major subject changes helps children concentrate and stay on task;
- Juggling breaks offered as group rewards can help with behavior and academics;
- Juggling with scarves in the classroom is a perfect rainy day recess activity;
- Juggling helps tracking and crossing the midline, important elements in reading;
- Juggling improves sequencing skills that are used in math and science;
- Juggling improves fine motor skills and has been found to improve handwriting;
- Juggling boosts self confidence, because every student can succeed and "show off";
- Juggling improves fitness, and tossing and catching skills;
- Juggling develops eye-hand coordination, stage presence, and self esteem;
- Juggling helps develop balance, rhythm and reflexes;
- Juggling gives kinesthetic learners a way to excel;
- Juggling is an inexpensive hobby which can stimulate imagination and curiosity;
- Juggling gives students a skill they can teach in a classic cooperative learning model;
- Juggling can help to give students the habit of daily physical activity;
- Juggling can help develop patience and persistence;
- Juggling at the elementary level can help prepare students for middle school PE;
- Juggling equipment is inexpensive enough that each student can own their own set;
- Juggling is a life-long skill that can be practiced at any age;
- Juggling is an activity that students and teachers can share;
- Juggling helps you use the logical and linear left brain and the creative right brain;
- Juggling helps you become ambidextrous;
- Juggling does not discriminate by sex, athletic ability or any other characteristic;
- Juggling is challenging and FUN!