

Integrative Medicine

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COGNITION

ABSTRACT & COMMENTARY

Mahjong and Mild Cognitive Impairment

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Dr. Feldman reports no financial relationships relevant to this field of study.

SYNOPSIS: This randomized, controlled trial notes improvement in measures of executive functioning, such as organization and planning, in elderly Chinese participants with mild cognitive impairment who were selected to play mahjong three times weekly for 12 weeks.

SOURCE: Zhang H, Peng Y, Li C, et al. Playing Mahjong for 12 weeks improved executive function in elderly people with mild cognitive impairment: A study of implications for TBI-induced cognitive deficits. *Front Neurol* 2020;11:178.

Mild cognitive impairment (MCI) refers to a cognitive state, often associated with aging, where a patient demonstrates objective evidence of memory deficits without clear functional impairment. Often conceptualized as a stage between normal aging and dementia, MCI is estimated to occur in 10% to 20% of the population aged at least 65 years. Executive function, mediated by the prefrontal cortex and responsible for planning, working memory, and organization, seems particularly vulnerable in patients with MCI.¹

Research into this condition has identified several subtypes of MCI and clarified that about 10% of patients with MCI will develop Alzheimer's disease annually.²

Cognitive fitness activities in patients with MCI have shown an association with delaying or avoiding progression to a more severe form of neurodegenerative disease.^{1,2} Zhang et al thus designed a randomized, controlled trial involving the mentally challenging game mahjong and patients with MCI.

Mahjong is a four-player game developed in China more than 2,000 years ago. Spreading to the rest of the world during the 20th century, it remains most popular today among the elderly in China. Playing this tile and dice game requires planning, strategy, memorization of patterns, attention, and focus. There is a gambling element to the game as well.³

Financial Disclosure: *Integrative Medicine Alert's* Physician Editor Suhani Bora, MD; Peer Reviewer Eugene Lee, MD; Associate Editor Mike Gates; Editor Jason Schneider; Relias Media Editorial Group Manager Leslie Coplin; and Accreditations Director Amy M. Johnson, MSN, RN, CPN, report no financial relationships relevant to this field of study.

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Integrative Medicine Alert (ISSN 2325-2820) is published monthly by Relias LLC, 1010 Sync St., Ste 100, Morrisville, NC 27560-5468. Periodicals postage paid at Morrisville, NC, and additional mailing offices. POSTMASTER: Send address changes to *Integrative Medicine Alert*, Relias LLC, 1010 Sync St., Ste. 100, Morrisville, NC 27560-5468.

GST Registration Number: R128870672.

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Summary Points

- This randomized, controlled trial involved 56 Nanchong City, China, nursing home residents with a baseline knowledge of mahjong (but no recent playing history) and a diagnosis of mild cognitive impairment.
- Randomized into two groups, half of the participants played one hour/game of mahjong three times daily for 12 weeks. The remaining participants served as a control group.
- Three measures of cognitive functioning, the Montreal Cognitive Assessment – Beijing, the Shape Trail Test, and the Functional Activities Questionnaire, were administered to the group at study start, at six weeks, and after 12 weeks.
- All scores showed significant improvement over the 12 weeks in the intervention group with $P < 0.001$.

Fifty-six patients aged 65 years and older, residents of a local nursing home in Nanchong City, China, were accepted as study participants and randomized into either a control (activity as usual) or mahjong group. All had a diagnosis of MCI and were familiar with playing Mahjong, although they were not current players. Exclusion criteria included both psychiatric and neurologic diagnosis. The intervention arm (mahjong players) played in groups of four persons for one hour, three times weekly at a consistent time, for 12 weeks.

Three scales, described below, measuring cognitive and functional status were administered to the group at the start of the study, at week 6, and at the 12-week conclusion of the study.

- The Montreal Cognitive Assessment-Beijing (MoCA-B) is a screening test for cognitive impairment with scores ranging from 0 to 30 (each correct answer is one point).⁴
- The Shape Trail Test (STT) measures visual attention and the ability to shift attention.⁵
- The Functional Activities Questionnaire (FAQ) is a self-reported measure of the instrumental activities of daily living, such as managing finances and cooking meals. Scores in 10 areas range from 0, representing no impairment, to 3, representing severe impairment.⁶

RESULTS

A comparison between the MoCA-B scores head-to-head between the two arms does not show statistical separation during the study. However, the MoCA-B (scores from 0 to 30

with higher scores representative of less impairment) showed significant improvement from baseline to 12 weeks in the mahjong group and did not significantly change in the control group during this time. (See Tables 1 and 2.)

Looking at the STT (scores reflect time and errors, thus higher scores reflect greater impairment), again, comparing the scores between the two arms of the study reveals no significant difference after 12 weeks. However, in a pattern similar to the results of the MoCA-B test, there is a continual reduction over the 12 weeks in STT scores of the mahjong group, while there is no such reduction in the control group. (See Tables 3 and 4.) The FAQ scores (higher scores reflect greater degree of functional impairment) decreased continuously and with statistical significance in the mahjong group during the 12 weeks. As opposed to the other measures, the FAQ scores in the mahjong group also showed statistical separation from the control group starting at the six-week mark. (See Tables 5 and 6.)

■ COMMENTARY

Zhang et al revealed that patients with MCI directed to play Mahjong three times weekly over 12 weeks showed statistically significant improvement in three different scales measuring executive functioning. The control arm of this study did not demonstrate significant improvement over this time. This is not the first investigation looking at mahjong and cognition. There have been several studies in this area measuring the association of this game with memory and attention in general, but none specifically measuring

Table 1. Mahjong vs. Control (Montreal Cognitive Assessment-Beijing)

Mahjong vs. control (baseline)	Mahjong vs. control (week 6)	Mahjong vs. control (week 12)
21.11 ± 2.22 vs. 22.18 ± 2.39	21.3 ± 1.9 vs. 22.1 ± 2.3	22.8 ± 1.7 vs. 22.0 ± 1.9
P = 0.09	P = 0.15	P = 0.11

Table 2. Mahjong/Control Baseline, Week 6, and Week 12 (Montreal Cognitive Assessment-Beijing)

Mahjong baseline vs. week 6	Control baseline vs. week 6	Mahjong baseline vs. week 12	Control baseline vs. week 12
21.11 ± 2.22 vs. 21.3 ± 1.9	22.18 ± 2.39 vs. 22.1 ± 2.3	21.11 ± 2.22 vs. 22.8 ± 1.7	22.18 ± 2.39 vs. 22.0 ± 1.9
P = 0.326	P = 0.626	P < 0.001*	P = 0.379

*Statistically significant data

Table 3. Mahjong vs. Control (Shape Trail Test)

Mahjong vs. control (baseline)	Mahjong vs. control (week 6)	Mahjong vs. control (week 12)
573.1 ± 113.8 vs. 559.3 ± 95.9	555.1 ± 115.0 vs. 561.4 ± 102	535.7 ± 111.7 vs. 565.5 ± 93.0
P = 0.62	P = 0.83	P = 0.283

Table 4. Mahjong/Control Baseline, Week 6, and Week 12 (Shape Trail Test)

Mahjong baseline vs. week 6	Control baseline vs. week 6	Mahjong baseline vs. week 12	Control baseline vs. week 12
573.1 ± 113.8 vs. 555.1 ± 115.0	559.3 ± 95.9 vs. 561.4 ± 102	573.1 ± 113.8 vs. 535.7 ± 111.7	559.3 ± 95.9 vs. 565.5 ± 93.0
P = 0.001*	P = 0.783	P < 0.001*	P = 0.66

*Statistically significant data

Table 5. Mahjong vs. Control (Functional Activities Questionnaire)

Mahjong vs. control (baseline)	Mahjong vs. control (week 6)	Mahjong vs. control (week 12)
17.89 ± 4.64 vs. 19.36 ± 3.81	16.9 ± 4.5 vs. 19.5 ± 3.3	15.6 ± 4.8 vs. 19.9 ± 3.6
P = 0.20	P = 0.012*	P = 0.00*

*Statistically significant data

Table 6. Mahjong/Control Baseline, Week 6, and Week 12 (Functional Activities Questionnaire)

Mahjong baseline vs. week 6	Control baseline vs. week 6	Mahjong baseline vs. week 12	Control baseline vs. week 12
17.89 ± 4.64 vs. 16.9 ± 4.5	19.36 ± 3.81 vs. 19.5 ± 3.3	17.89 ± 4.64 vs. 15.6 ± 4.8	19.36 ± 3.81 vs. 19.9 ± 3.6
P = 0.001*	P = 0.39	P < 0.001*	P = 0.07

*Statistically significant data

executive functioning. This study brings further clarity and additional information to this field.

Originally defined in the 1980s as “... the ability to maintain an appropriate problem-solving set for attainment of a future goal,” our conceptualization of executive functioning has broadened to include five general domains. These are:

- fluency or the ability to generate more than one solution to a problem;
- planning;
- working memory;
- inhibition (of other impulses and distraction while working on a task); and
- set shifting (the ability to shift attention as needed).⁷

It is interesting and impressive that 12 weeks of playing mahjong was associated with measurements of improvement in these areas. The concept of neural plasticity may have some relevance here; further studies may elucidate the specific mechanisms involved. In some ways, this study brings up more questions than answers. For example, a clear understanding of cause and effect is not established. Comparing mahjong to a “usual activity” control group is a good first step, but leaves knowledge gaps. There is separation between the mahjong and control arms when measuring with the FAQ, but not with the STT or MoCA-B. A better understanding of this relationship could help interpret and apply results.

An active intervention group playing an alternative type of strategy game or having a different focus, such as physical activity, could yield more definitive and clinically relevant results. Additionally, larger numbers of participants and longer follow-up could help generate confidence in generalizing recommendations. However, even with limitations, this study may have particular relevance in our current era of COVID-19. As the result of a vulnerable population, many nursing homes have understandably restricted visitors from the community and reduced internal activities and social gatherings.

When considering the health effect of such policies, the primary care provider (PCP) may want to reflect on the findings from this study. It is unclear whether the social

interactions provided as a “side effect” of meeting three times weekly with a group of peers, the gameplay itself, or a combination of factors were instrumental in improvements in cognition. Regardless of the mechanism, it does appear that regular interaction with gameplay in a small group over three months was associated with an improvement in executive functioning.

When working with elderly patients and their caregivers, the clinical relevance is clear: social and mental stimulation have a potential role in improving executive functioning. It is well within the realm of the PCP to assist patients while caregivers and/or the facility balance the risks and benefits of such interactions. ■

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DIET

ABSTRACT & COMMENTARY

Nuts and Heart Health

By *Ellen Feldman, MD*

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Dr. Feldman reports no financial relationships relevant to this field of study.

SYNOPSIS: This long-term, prospective study looks at changes in quantity of nut consumption and relative risk of cardiovascular disease and finds significantly lower risk when nut consumption increases by > 0.5 servings daily.

SOURCE: Liu X, Guasch-Ferré M, Drouin-Chartier JP, et al. Changes in nut consumption and subsequent cardiovascular disease risk among U.S. men and women: 3 large prospective cohort studies. *J Am Heart Assoc* 2020;9.e013877.

“The doctor of the future will give no medicine, but will instruct his patient in the care of the human frame, in diet, and in the cause and prevention of disease.” — Thomas Edison, 1903

Welcome to “the future.” Although Thomas Edison’s remarks do not fully represent the state of medical practice today, our current emphasis on disease prevention and increased understanding of the central role of diet in such efforts reverberate with the second half of his prediction.¹

According to nationally representative data collected between 1999 and 2015, diets in the United States are trending healthier.² The Healthy Eating Index, an objective measure reflecting a nutritious diet, ticked upward from 55.7 to 57.7 during this time, in large part because of decreased consumption of sugar-sweetened beverages and trans fatty acids, as well in increased intake of whole grains, nuts, and seeds.³

Previous studies have documented a link between the consumption of nuts and a decrease in both the risk of cardiovascular disease (CVD) and coronary heart disease (CHD) mortality.⁴ This Liu et al study attempts to broaden our knowledge of this relationship by looking at

changes in nut consumption over time and whether the specific type of nut is significant. Respondents came from three large-scale U.S. prospective studies: 34,103 men from the Health Professionals Follow-up Study (HPFS),⁵ 77,815 women from the Nurses Health Study (NHS), and 80,737 women from the Nurses Health Study 2 (NHS 2).⁶ These are long-term studies, with the HPFS beginning in 1986, the NHS beginning in 1976, and the NHS 2 beginning in 1989. As part of these studies, questionnaires were sent every two to four years to collect information about health conditions, medications, lifestyle, and diet. The food frequency questionnaires, sent every four years, began in 1986 for the HPFS and a little later for the NHS 1 and 2 — in 1991. Questions about specific nuts — walnuts, other tree nuts, and peanuts (despite peanuts being legumes, they are treated as nuts in the study) — were added in the late 1990s.^{5,6}

For each four-year period, Liu et al analyzed changes in total nut consumption of specific types of nuts and then compared them with the risk of developing CVD,

Summary Points

- This prospective study followed more than 150,000 individuals for up to 26 years to investigate an association of changes in individual consumption of nuts with risk of cardiovascular disease (CVD).
- Evaluation of nut consumption via food frequency questionnaires every four years was paired with health information regarding nonfatal cardiac events; fatal events were evaluated by other means (such as death records).
- Using the first four years as a baseline, examination of changes in nut consumption revealed an association between increased consumption of nuts (walnuts, other tree nuts, peanuts) and decrease in risk of CVD, including coronary heart disease (CHD) and stroke.
- Compared with nonconsumers of nuts, the relative risk for respondents who reported an increase of > 0.5 servings/day was: lowered risk of CVD by 25%, lowered risk of CHD by 20%, and lowered risk of stroke by 32%.

CHD, or stroke in the following four-year period. This continued over 26 years for participants in the HPFS and NHS and for 22 years for NHS 2. The follow-up periods ended between January 2012 and June 2013.

Defining one serving of nuts as one ounce or 28 grams, five categories of nut-eating habits over each four-year period were identified. Categories ranged from “minimal change” from the previous four-year block to increase or decrease of 0.01-0.49 servings/day, respectively, and increase or decrease of 0.5 servings/day, respectively.

Excluded from the study were survey participants who reported CVD, cancer, diabetes, or who did not report body mass index during the baseline collection period (first four years.) Data was progressively adjusted for multiple factors, culminating in “model four,” which adjusted for variables including age, sex, race, family history of CVD, number of teeth, initial and any change in alcohol intake, initial and any change in the Healthy Eating Index score, and activity level.

RESULTS

Independent of initial nut consumption, an increase in nut consumption over four years of > 0.5 daily servings (where one serving = 28 grams) compared to individuals who did not change intake of nuts was associated with:

- lowered risk of CVD with a relative risk (RR) of 0.86 (95% confidence interval [CI], 0.78-0.94); *P* trend < 0.0001;
- lowered risk of CHD: RR 0.88 (95% CI, 0.78-1.00); *P* trend = 0.01;
- lowered risk of stroke: RR 0.82 (95% CI, 0.71-0.96); *P* trend = 0.0004.

Independent of initial nut consumption, a decrease in nut consumption over four years of < 0.5 daily servings (where one serving = 28 grams) compared to individuals who did not change their intake of nuts was associated with:

- Higher risk of CVD: RR 1.14 (95% CI, 0.99-1.32); *P* trend < 0.0001.
- Higher risk of CHD: RR 1.06; *P* trend = 0.01.
- Higher risk of stroke: RR 1.28; *P* trend = 0.0004.

Risk stratified for type of nut:

- Increasing intake of tree nuts, walnuts, and peanuts, per 0.5 serving/day, was associated with a decreased risk of CVD: RR 0.91 (95% CI, 0.88-0.96).
- Increasing intake of tree nuts and peanuts, per 0.5 serving/day, was associated with a decreased risk of CHD: RR 0.90 (CI, 0.83-0.98).
- Increasing intake of walnuts, per 0.5 serving/day, was associated with a decreased risk of stroke: RR 0.80 (95% CI, 0.67-0.95).

Risk for habitually high nut consumers > 0.5 servings/day when compared with nonconsumers:

- Lower risk CVD: RR 0.75 (95% CI, 0.67-0.84)
- Lower risk CHD: RR 0.80 (95% CI, 0.69-0.93)
- Lower risk stroke: RR 0.68 (95% CI, 0.57-0.82)

In further analysis, Liu et al reported that additional lowering of CVD, CHD, and stroke risk is noted among a group of participants reporting simultaneous increase in nut consumption and decrease in intake of red meat.

■ COMMENTARY

Liu et al presented 26 years of follow-up data from three long-term prospective studies. The results add strength to growing evidence that consuming nuts has health benefits, and most likely cardioprotective effects. This study has clear clinical relevance. The results suggest that increasing nut consumption, even after years of less intake, still can lead to significant health benefits.

While the association with decreased risk of CVD was stronger for consistent high volume nut consumers, there still was a significant association with reduced risk in participants who reported recent such dietary changes.

Also suggested by the study is that when nuts replace less healthy dietary components (such as red meat), additional health benefits accrue. More studies should bring more clarity to this aspect of dietary change. Unsaturated fatty acids, fiber, phytochemicals, antioxidants, and vitamins are among the components of nuts; all of these most likely contribute to a role in disease prevention. Other studies have shown decreased cholesterol and triglycerides associated with daily nut intake. Although nuts are relatively high in calories, previous work from Liu et al demonstrated a reduced risk of obesity over time associated with higher nut intake.⁷

Liu et al noted that previous studies looking at nut consumption and CVD and/or CHD have consistently shown an inverse association, but the same does not apply for studies looking at stroke risk and nut consumption. These latter studies have had inconsistent results. Liu et al pointed out that walnuts appear to have a stronger association with lowering risk of stroke in this work than all tree nuts. They wonder if this is because, in part, of a suspected association of walnuts with blood-pressure lowering. This is an area “ripe” for future investigation.

One strength of this Liu et al study lies in the long follow-up period; another strength resides in the number of respondents. The dedication of the staff and participants in the HPFS and NHS 1 and 2 have resulted in invaluable contributions to our knowledge about health habits, prevention, and disease progression. One of the downsides of these efforts, however, is respondent homogeneity. The members of the HPFS and NHS are health professionals, tend to be of European ancestry (although this is changing with the NHS 3) and tend to be healthier than the population at large.^{5,6} These factors make it difficult to confidently generalize the results from these studies.

Another relative weakness of this study is that all consumption data was self-reported, thus subject to recollection errors. Future studies may want to track diet in a more sophisticated manner. Real-time information about diet can add specifics of how the nuts are prepared (raw, roasted, etc.). Additional information about serving size can assist in providing information about any plateau of health benefits in respect to quantity. All of these areas could add to the goal of providing detailed clinical advice regarding this intervention.

Even with limitations, this study strengthens evidence for the health benefits of nuts. Notably, peanuts (a relatively affordable nut) were included among the choices and showed an association with health benefits. When working with patients on prevention, promoting the pivotal role of at least 0.5 servings daily of nuts (or 0.5 ounces) in a healthy diet and wellness plan is backed by solid medical evidence. ■

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AROMATHERAPY

SHORT REPORT

Aromatherapy Reduces Pain and Other Symptoms

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SYNOPSIS: In people with myofascial pain syndrome receiving a trigger point injection, aromatherapy with lavender oil helped to decrease pain and anxiety and improve comfort.

SOURCE: Kasar KS, Yildirim Y, Aykar FS, et al. Effect of inhalation aromatherapy on pain, anxiety, comfort, and cortisol levels during trigger point injection. *Holist Nurs Pract* 2020;34:57-64.

There is no lack to the purported effects of essential oils on human health and disease; analgesic and calming are two that most clinicians would attest are commonly mentioned by patients who are proponents of these plant extracts. Most evidence steers essential oil use to aromatherapy for such diagnoses as insomnia or anxiety,¹ and topically for pain conditions.^{2,3} This study attempted to show multi-symptom benefits from aromatherapy for patients undergoing an otherwise uncomfortable/painful procedure — trigger point injection.

The study took place in Turkey and involved 66 patients receiving trigger point injections for the first time for myofascial pain syndrome. There were exclusion criteria, such as a lavender allergy, “psychiatric disease” (it wasn’t described whether anxiety or insomnia were included), steroid treatments, and pulmonary conditions, among others.

The 66 study participants were randomly divided into three groups with 22 participants in each one: an aromatherapy group, a placebo group, and a control group. For each group, demographic information was collected, as was information about prior pain-related diagnoses and treatments, current symptoms (Visual Analog Scale [VAS] for pain, completed pre-, mid-, and post-trigger point injection), comfort (General Comfort Questionnaire [GCQ], 48-items, 4-point Likert for each), and anxiety (State-Trait Anxiety Index containing 20 items). In addition, saliva was collected before and after each trigger point injection and tested for cortisol. The aromatherapy group had five drops of 100% lavender essential oil placed in a diffuser and run during the trigger point injection; the placebo group also had a diffuser in the room, but only used an organic baby oil, and the control group didn’t use any diffuser device during the trigger point injection.

Between the groups, demographics were statistically similar, and the mean age was 49 years for the entire cohort. With respect to pain, as per the VAS, the three groups started at levels that were statistically similar, whereas only the aromatherapy group showed an improvement in pain around the time of the procedure; the other two groups had worsening pain. (See Table 1.)

Summary Point

- Sixty-six people, in a controlled trial comparing lavender aromatherapy, placebo, and a control group, showed benefits during and after trigger point injection only for the aromatherapy group.

Anxiety also improved in the aromatherapy group to a level below the baseline median scores for the three groups; in the placebo group and control group, anxiety scores actually increased from baseline. With respect to comfort (as per the GCQ), the aromatherapy group improved to 146 from 120, whereas the other two groups worsened pre-injection vs. post-injection (to 112 from 116, and to 104 from 113, in the placebo and control groups, respectively). Salivary cortisol levels were not statistically significantly different among the groups.

The results presented here are striking, seemingly showing a marked effect of lavender aromatherapy on the stress and anxiety that can occur with trigger point injections. This benefit stands out of this study, as does the results on the placebo and control groups; essentially, doing nothing (control) or nothing physiologically (placebo), these first-time recipients of trigger point treatments for myofascial pain syndrome do *worse*. It really makes a compelling case to do *something!*

Cooling our jets a bit, it is important to note that the researchers do not comment on blinding, which would be difficult to do using aromatherapy; nonetheless, it would have been good to document participants’ responses to the query about what group they thought they were in. Also, we should have been given some data about adverse effects, which always happen, even in placebo or control groups. Safety data helps clinicians to make informed decisions about using a treatment in their practice.

It is impressive that all 66 people completed all survey instruments, essentially a 0% dropout rate. It would have been good to learn about their technique for data

Table 1. Changes in Pain as per the VAS

	Aromatherapy group	Placebo group	Control group	Inter-group P value
VAS at baseline	6.05	6.68	6.09	0.926
VAS mid-procedure	5.23	8.05	8.23	0.000
VAS post-procedure	3.86* **	7.41	7.64	0.000

VAS: Visual Analog Scale

* P value post compared to baseline = 0.005

** P value post compared to mid < 0.001

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gathering, which may have included research assistants. Some participants were described as “illiterate,” so somebody was needed to help them with the surveys.

If the researchers used more of a convenience sampling technique, essentially only including the people for whom they had complete data, that also should have been mentioned, as it has its own biases that could affect generalizability of the research findings.

But on face value, this study should offer clinicians an approach to lessening pain and anxiety during difficult procedures, since long as this treatment can be shown to be safe and adverse

effects specified. The next step(s) would be to see if the use of lavender aromatherapy can be applied to other ages, demographics, procedures, and diagnoses. ■

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CME QUESTIONS

1. **In the study using mahjong as an intervention:**
 - a. the observational study showed an association between playing mahjong and improved memory and attention, as measured by three different scales.
 - b. the randomized, controlled trial (RCT) showed an association between playing mahjong and improved executive functioning from the baseline level, as measured by three different scales
 - c. the observational study showed an association between playing mahjong and improved executive functioning, as measured by staff reports and direct observation/evaluation.
 - d. the RCT showed an association between playing mahjong and improved memory and attention, as measured by family reports and direct observation/evaluation.
2. **Which of the following is true regarding the use of aromatherapy during trigger point injection?**
 - a. Pain improved in all three groups when baseline was compared to post-procedure Visual Analog Scale scores.
 - b. Anxiety scores in the aromatherapy group were lower than the baseline median score for the three groups.
 - c. Comfort scores improved marginally for all three groups.
 - d. Salivary cortisol actually increased in the

aromatherapy and placebo groups while holding steady in the control group.

3. **Regarding the study looking at nut consumption and cardiovascular disease (CVD):**
 - a. this randomized, controlled trial showed solid evidence of health benefits of > 0.5 daily servings (or 0.5 ounces) of nuts, with the exception of peanuts — these did not appear to be associated with any health benefits.
 - b. this randomized, controlled trial showed that > 0.5 daily servings (or 0.5 ounces) of tree nuts, peanuts, and walnuts all were significantly associated with a decreased risk of CVD in women; results were less conclusive in men.
 - c. this prospective study showed, when compared to individuals who did not change nut consumption, that an increase of > 0.5 servings (or 0.5 ounces) of tree nuts, walnuts, or peanuts was significantly associated with a decreased risk of CVD, whereas a decrease of > 0.5 daily servings of tree nuts, walnuts, or peanuts was associated with a significant increased risk of CVD.
 - d. this prospective study showed that > 0.5 daily servings (or 0.5 ounce) of tree nuts, peanuts, and walnuts all were significantly associated with a decreased risk of CVD in men; results were less conclusive in women.

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Fruits, Vegetables, and Type 2 Diabetes

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