

## **The Effect of Diaphragmatic Breathing Technique on Stress And Memory Performance of Tahfiz Students**

**Nur Syahirunisa Binti Hassan**

Department of Psychology

Kulliyah Of Islamic Revealed Knowledge And Human Sciences

International Islamic University Malaysia

Email: nur.syahirunisa@gmail.com

**Mariam Adawiah Dzul kifli**

Department of Psychology

Kulliyah Of Islamic Revealed Knowledge And Human Sciences

International Islamic University Malaysia

Email: m.adawiah@iium.edu.my

### **ABSTRACT**

Diaphragmatic breathing technique has been known for its beneficial effects on physical and psychological health. This technique has been used widely as an intervention for people with some psychological problems such as Alzheimer and ADHD. There is still very limited research conducted on the use of the technique on normal population. Hence, this paper reports a research that aim to examine the effect of diaphragmatic breathing technique on stress and memory performance of *Tahfiz* students or students who memorizes Quran. It was hypothesized that practicing diaphragmatic breathing technique would reduce the stress level and increase the memory performance of the students who memorize the Quran. The research methodology involves the use of a within-group experimental design on 50 IIUM undergraduate *Tahfiz* students. Students' stress level is measured using Perceived Stress Scale while the memory performance is measured using Words Recall Test. Based on the analysis using paired-sample t-test, it has been found that practicing diaphragmatic breathing technique give positive impact on students' stress level and memory performance. The findings from this research provides some evidences on the effects of using diaphragmatic breathing techniques for improving the psychological well-being of students who memorize the Quran.

**Keywords:** Diaphragmatic breathing, *Tahfiz* students, stress, memory performance

## **INTRODUCTION**

In this era of technology, stress is part of daily human experience in which no one can escape from dealing with stressful situation. McEwen (2007) refers stress as experiences that are challenging emotionally and physiologically. The Yerkes-Dodson (1908) law of stress and productivity indicates that the optimum level of stress is needed in order to enhance and facilitate performance. Too little or too much stress can affect performance in general.

As regard to students, academic performance is of a priority. Learning rely a lot on memory ability. Memory is one of the core cognitive process that involved in retaining, retrieving, and using information about stimuli, images, events, ideas, and skills after the original information is no longer present (Goldstein, 2014). Studies have found that long term stress or big stressors can greatly affect the sympathetic nervous system which disrupts the function of the hippocampus which is responsible for retaining and retrieving memories (Kim, Song, Kim, Song and Kosten, 2006).

Various techniques have been found to deal with stressful events such as meditation, breathing exercises, muscle relaxation, yoga, music relaxation and others. These techniques were widely practiced as interventions that result in the positive effect of reducing stress and improving memory performance. In this study the relationship between stress and memory performance will be investigated further. We would like to examine the effect of a type of breathing technique known as Diaphragmatic Breathing (DB) on stress and memory performance of Tahfiz students. Ma et al. (2017) reported that a growing number of empirical studies have discovered that DB technique can trigger body relaxation responses and benefit both physical and psychological well-being. DB which is also known as deep breathing involves contraction of the diaphragm, expansion of the belly, and deepening of inhalation and exhalation, which consequently decreases the respiration frequency and maximizes the amount of blood gases (Ma et al., 2017). Hence, during practicing DB, the use of main muscles of breathing and the diaphragm is optimized as much as possible to ensure constant oxygen supply to our body.

There are numerous studies on the benefits of DB on psychological well-being and physical health. A study conducted by Varvogli and Darviri (2011) focused on using DB as a stress management technique that can reduce stress and promote health. They stated that DB is natural act of breathing that has been used as a means of relaxation intuitively, has been traditionally part of different yoga traditions and has been incorporated in many relaxation programs. Based on their systematic literature review, Varvogli and Darviri (2011) reported that DB involved manipulation of breath movement that contribute to physiological responses characterized by the presence of decreased oxygen consumption, decreased heart rate and blood pressure, increased theta wave amplitude in EEG recordings, and increased parasympathetic activity which accompanied by the experience of alertness and invigorating. Thus, researchers recommended that people need to practice DB several times a day, for a few minutes to see immediate benefits.

Another research conducted by Chen, Huang, Chien, and Cheng (2016) aimed to evaluate the effectiveness of DB relaxation training program in reducing anxiety among the outpatients at the psychiatry department of a medical center in central Taiwan. In their randomized controlled

trials, the participants were assigned randomly to either the intervention group or the control group. In order to increase the effectiveness of the DB training, participants in the experimental group were required to practice at least twice a day at home and to execute at least 10 DBR exercises per session. They were also required to keep a DB training diary, in which they recorded the difficulties faced during their exercise sessions. It was found that participants in the experimental group achieved significant reductions anxiety level measured using Beck Anxiety Inventor, peripheral temperature, heart rate, and breathing rate over the 8-week training period. The study by Chen et al (2016) added to the positive effect provided by DB to effectively reduce the anxiety level of care recipients in clinical and community settings.

Using sample of 38 undergraduate psychology students at University of Catania, a study conducted by Perciavalle et al. (2017) aimed to examine whether a relaxing technique called DB is capable to improve the mood and reduce the levels of stress among university students. It was found that the use of deep breathing techniques has led to an effective improvement in the management of stress in daily life, and therefore, could exert positive influences on the stress conditions that students must face during the course of their studies.

In addition to the studies on the benefits of DB on psychological well-being and physical health, some studies have been found to examine DB in relation to cognitive processes. Using 63 participants of University of North Carolina, Charlotte students, a study conducted by Zeidan, Johnson, Diamond, David, and Goolkasian, (2010) aimed to examine whether brief meditation training affects cognition and mood when compared to an active control group. The result of this study found that brief mindfulness training, which include the use of DB, significantly improved visuo-spatial processing, working memory, and executive functioning. Zeidan, Johnson, Diamond, David, and Goolkasian, (2010) suggested that 4 days of meditation training can enhance the ability to sustain attention among university students. Another study by Flor, Monir, Bitar and Shahnaz (2013) examine the effect of relaxation training on working memory capacity and academic achievement in adolescents. Upon completion of educational sessions, both experimental and control groups were assessed again with the working memory capacity test and academic performance was measured through students' GPA of first and second semester. The result of this study showed that relaxation training increase working memory capacity and its components (storage and processing) and students' academic achievement (Flor, Monir, Bitar & Shahnaz, 2013). Chinagudi et al. (2014) study the effects of slow deep breathing for short duration (5 min) on the cognitive levels. Participants were asked to solve the Revan's Standard Progressive Matrices before deep breathing take place. Then they were instructed to practice slow deep breathing (six seconds of inhalation and six seconds of exhalation) for five minutes and were again asked to solve the same matrices after practicing slow deep breathing. The findings showed that there was significant improvement in the time students took to solve the matrices after the exposure of slow deep breathing. Chinagudi et al. (2014) concluded that DB, meditation and yoga have produced positive effects on memory, attention span, cognitive levels and concentration. They suggested students to practice slow deep breathing for five minutes before starting any class for their better academic performance (Chinagudi et al., 2014).

In relation to the above review of literatures, the present study seeks to examine whether DB technique can also be exposed to Tahfiz students as a mechanism to improve their academic and memorization performance as well as to decrease their stress level. This study is significant because it can help to identify how breathing technique would give an impact on the students' stress level and memory performance. In particular, the finding from this study can facilitate students in their study especially to those who memorize the Quran. It can benefit Tahfiz students who might experience stress in the process of memorizing the Quran. Besides, the findings can also be generalised to other students to assist them in practicing deep breathing technique to deal with stressful situations. For example, those students who are late and rushing to examination, they can practice this breathing technique first in order to make them in the state of relaxation before answering the question. This will increase their concentration level, make them more rational and aware of the present moment. In addition, students can practice diaphragmatic breathing technique in order to facilitate them in reciting Quran fluently. Those who have a short breath may experience difficulty in reciting Quran especially when it comes to long verses. Subsequently, by regularly practicing deep breathing day by day, it indirectly enable us in reciting Quran more fluently compared to before practicing it. Therefore, a better understanding of the effects of diaphragmatic breathing technique may provide novel and practical approaches in treating stress level and improving memory performance among students.

## **Methodology**

### *Research Design*

A within-group experimental design was used in this study in which the stress level and memory performance of all participants were measured before and after intervention used i.e. DB. The independent variable is the breathing technique (DB) while the dependent variables are stress and memory performance. The stress level is measured using Perceived Stress Scale (PSS-10) while the memory performance is measured based on the number of words correctly recalled in word recall test.

### *Participants*

The sample consisted of 50 ( $n=50$ ) undergraduate students of International Islamic University Malaysia (IIUM). There are 25 males and 25 females with the age range from 22 to 26 years old. Purposive sampling was used as the main inclusion criteria is those who are formally attending course in memorizing Al-Qur'an for at least 10juzs and above.

### *Research Instrument*

Perceived Stress Scale (PSS-10): A shorter version of Perceived Stress Scale (PSS-10) which consist of 10 items was used to measure stress level. There are 10 item (6 positive and 4 negative items) rated based on 5 points Likert scale ranging from "never" to "very often". For each item participants were asked to indicate how they felt about the event. The score was summed up and the total of the score ranging from 0-13 indicates a low level of stress, while 14-26 and 27-40 indicate a

moderate stress level and high- stress level respectively. From the previous studies it has reported that PSS-10 have good psychometric properties (Civitci, 2015). The Cronbach's alpha showed that the questionnaire reach a very good internal consistency reliability, ( $\alpha = .80$ ) and the value of inter-item correlations was ( $r = 1$ ).

**Word Recall test:** To measure memory performance, a word recall test was adapted based on word recall test widely used in neuropsychological assessment such as California Verbal Learning Test (CVLT-II) (Thompson et al., 2011). Participants were required to recall two sets of words list. Each word list consists of 20 words. The correct recall of words measured via correct spelling of each word. The memory performance score was counted based on the number of words that have been correctly recalled.

### *Procedure*

The first part of the experiment started after getting the participants' consent. All participants were asked to complete the Perceived Stress Scale. Then they sit for the first word recall test. In this test, they were given 2 minutes to remember the 20 words in the list. After a 2 minutes break, they were asked to recall the words by writing down those words on a piece of paper.

In the second part of the experiment, all participants were taught with DB. Researcher taught and assisted them with the diaphragmatic breathing technique until they were able to practice this breathing technique on their own. This technique involves contraction of the diaphragm, expansion of the belly, and deepening of inhalation and exhalation, which consequently decreases the respiration frequency and maximizes the amount of blood gases (Ma et al., 2017). During practicing DB, the use of main muscles of breathing and the diaphragm is optimized as much as possible to ensure constant oxygen supply to the body. Each participant was asked to practice the breathing technique for three minutes. In the last part of the experiment, all participants were asked to complete the Perceived Stress Scale for the second time, and followed by the second set of word recall test.

### *Ethical Consideration*

Ethical approval was obtained from IIUM Research Ethic Committee (IREC). All participants were briefed on the task that need to be completed throughout the experiment. An informed consent was obtained from all participants prior to the experiment. To ensure confidentiality, only the researcher has access to the data and the participant's identity will remain anonymous. The responses will not be disclosed to anyone and only be used for research purposes.

## **Result**

### *Demographic Analysis*

The demographic showed that 50% ( $n= 25$ ) were males and 50% ( $n= 25$ ) were females with age range from 22 to 26 years old. Besides, the result also showed 20% ( $n=10$ ) of participants were

from first year students; 18% (n=19) of participants were second year students; 24% (n=12) of participants were third year students; and 38% (n=19) of participants were fourth year students (Table 1).

*Analysis on the effect of Diaphragmatic Breathing on Stress Level*

A paired-sample t-test was used to evaluate the effect of diaphragmatic breathing technique on stress level. The analysis showed that mean score of Perceived Stress Scale before the exposure of diaphragmatic breathing technique was (M= 28.64, SD= 4.29) while the mean score of Perceived Stress Scale after the exposure of diaphragmatic breathing technique was (M= 25.48, SD= 5.32). The paired-sample t-test is significant  $t(49) = 4.20, p = .001$ , which means the stress level of students before and after the exposure to the breathing technique is different. The mean score of stress level is significantly reduced after the exposure of breathing technique. The mean decrease in the Perceived Stress Scale scores was 3.16 with a 95% confidence interval ranging from 1.65 to 4.67. The eta squared statistic (0.25) indicated a large effect size, which means there was a substantial difference in the Perceived Stress Scale scores obtained before and after the intervention (Table 1).

*Analysis on the effect of Diaphragmatic Breathing and Memory Performance*

The mean score of words correctly recalled before the exposure of diaphragmatic breathing technique was (M= 8.0, SD= 2.66) while the mean score of words correctly recalled after the exposure of diaphragmatic breathing technique was (M= 12.92, SD= 3.94). A paired-sample t-test indicated that there is a statistically significant increase in the number of words recall after the exposure of breathing technique  $t(49) = -11.46, p = .001$ . The mean increase in the number of words correctly recalled was -4.92 with a 95% confidence interval ranging from -5.78 to -4.06. The eta squared statistic (0.73) indicated a large effect size, which means there was a substantial difference in the number of words correctly recalled before and after the exposure of the breathing technique (Table 1).

Table 1

*Descriptive Statistics and Paired Sample t-test Results for Stress and Memory Performance*

Variable	Pretest		Posttest		n	95% CI for Mean Difference	r	t	df
	M	SD	M	SD					
Stress	28.6	4.29	25.5	5.32	50	1.65, 4.67	.40*	4.20*	49
Memory	8.0	2.66	12.92	3.94	50	-5.78, 14.06	.64*	-11.46*	49

\*  $p < .05$ , two-tailed

## **Discussion**

DB has been found to provide positive benefits to enhance physical and psychological performance. It can reduce stress, increase relaxation and improve the overall quality of life (Chandwani et al., 2010). The present study would like to extend the findings from the previous study but the focus is on using DB to reduce stress and increase memory performance of Tahfiz students. We hope to provide a stress reduction mechanism for Tahfiz students so as to enable them to focus on their memorization and academic performance. The findings in the present study supported the hypothesis that exposure to DB did reduce the stress level of the students as well as increase their memory performance. This findings are consistent with the previous research conducted by Busch et al. (2012) that also found that there is a significant reduction of tension, anger, and depressive feelings after breathing interventions. Similarly, a study conducted by Paul, Elam and Verhulst (2007) found that the use of deep breathing is capable to reduce stress which indirectly allowing an improvement in academic performance among students. Stress levels among students might be expected to rise significantly due to examinations pressure and increase in academic deadlines. Thus, maintaining optimal stress for good academic performance is challenging for college students today, and many have identified stress as a major health concern in their lives (Sarvela, Huetteman, & Bajracharya, 1990). However, a growing number of research studies revealed that diaphragmatic breathing exercise can trigger the relaxation response in our body which indirectly give benefit in physical and our mental health. Ma et al. (2017) described that psychological studies have revealed breathing practice as an effective non-pharmacological intervention for emotion enhancement including a reduction in anxiety, depression, and stress. Deep breathing (DB) is an effective immediate response in dealing with stress (Zucker, Samuelson, Muench, Greenberg, & Gevirtz (2009). Hence, the use of deep breathing techniques has led to an effective improvement in the management of stress in our daily life. Some limitations of the present study should be acknowledged. The small sample size involving only undergraduate Tahfiz students of IIUM Gombak campus does not allow for the findings to be generalized to other population. Besides, the questionnaires are self-administered, hence, there is a possibility of self-report bias and future studies may conduct an experiment with a double-blinded condition in order to avoid potential rater bias. Apart from that, future study may take into account on the frequency and duration of diaphragmatic breathing exercise as participants in the present study practiced the breathing technique only until they master it and reach in the state of relaxation.

To summarize, in the present study, DB has been shown to be effective in reducing stress level and increase memory performance. It is simple and quick to learn and it can be done during a stressful situation. It is recommended to be used as a component in any stress management modules and programmes promoting well-being and positive lifestyle among students.

## **Conclusion**

The result of present study has demonstrated the effect of diaphragmatic breathing technique on stress and memory performance of Tahfiz students. This shows that diaphragmatic breathing technique can be part of stress management as it has positive effect to relieve the emotional

exhaustion among students. This is because students who are in stressful situation tend to take shallow breaths and using their upper chest instead of their diaphragm to inhale and exhale the air. Thus, practicing diaphragmatic breathing technique will help students controlling their breathing. Besides, the use of diaphragmatic breathing techniques has led to an effective improvement in students' memory, attention span, cognitive levels and concentrating capacity especially during the course of their studies. Hence, by practicing diaphragmatic breathing technique, it does not only aid in reducing students' stress levels, but it also can increase students' performance as it improve students' ability to concentrate.

### References

- Busch, V., Magerl, W., Kern, U., Haas, J., Hajak, G., & Eichhammer, P. (2012). The effect of deep and slow breathing on pain perception, autonomic activity, and mood processing—an experimental study. *Pain Medicine*, 13(2), 215-228.
- Chandwani, K. D., Thornton, B., Perkins, G. H., Arun, B., Raghuram, N. V., Nagendra, H. R., ... & Cohen, L. (2010). Yoga improves quality of life and benefit finding in women undergoing radiotherapy for breast cancer. *Journal of the Society for Integrative Oncology*, 8(2).
- Chen, Y. F., Huang, X. Y., Chien, C. H., & Cheng, J. F. (2017). The effectiveness of diaphragmatic breathing relaxation training for reducing anxiety. *Perspectives in Psychiatric Care*, 53(4), 329-336.
- Chinagudi, S., Patted, S., Herur, A., Patil, S., Shashikala, G. V., & Ankad, R. (2014). Assessment of cognitive levels after short duration of slow deep breathing by Raven's Standard Progressive Matrices. *International Journal of Medical Science and Public Health*, 3(7), 842-845.
- Çivitci, A. (2015). Perceived stress and life satisfaction in college students: Belonging and extracurricular participation as moderators. *Procedia-Social and Behavioral Sciences*, 205, 271-281.
- Flor, R. K., Monir, K. C., Bitar, A., & Shahnaz, N. (2013). Effect of relaxation training on working memory capacity and academic achievement in adolescents. *Procedia-Social and Behavioral Sciences*, 1(82), 608-613.
- Goldstein, E. B. (2014). *Cognitive psychology: Connecting mind, research and everyday experience*. Nelson Education.
- Kim, J. J., Song, E. Y., Kim, J. J., Song, E. Y., & Kosten, T. A. (2006). Stress effects in the hippocampus: synaptic plasticity and memory. *Stress*, 9(1), 1-11.
- Ma, X., Yue, Z. Q., Gong, Z. Q., Zhang, H., Duan, N. Y., Shi, Y. T., ... & Li, Y. F. (2017). The effect of diaphragmatic breathing on attention, negative affect and stress in healthy adults. *Frontiers in Psychology*, 8(1), 874.
- McEwen, B. S. (2007). Physiology and neurobiology of stress and adaptation: central role of the brain. *Physiological reviews*, 87(3), 873-904.
- Paul, G., Elam, B., & Verhulst, S. J. (2007). A longitudinal study of students' perceptions of using deep breathing meditation to reduce testing stresses. *Teaching and Learning in Medicine*, 19(3), 287-292.

- Perciavalle, V., Blandini, M., Fecarotta, P., Buscemi, A., Di Corrado, D., Bertolo, L., ... & Coco, M. (2017). The role of deep breathing on stress. *Neurological Sciences, 38*(3), 451-458.
- Sarvela, P., Huetteman, J. D., & Bajracharya, S. (1990). Needs assessment for a university wellness center: A strategic planning project. *Health Values, 14*(3), 24-32.
- Thompson, T. A., Wilson, P. H., Snyder, P. J., Pietrzak, R. H., Darby, D., Maruff, P., & Buschke, H. (2011). Sensitivity and test-retest reliability of the international shopping list test in assessing verbal learning and memory in mild Alzheimer's disease. *Archives of clinical Neuropsychology, 26*(5), 412-424.
- Varvogli, L., & Darviri, C. (2011). Stress management techniques: evidence-based procedures that reduce stress and promote health. *Health Science Journal, 5*(2), 74.
- Yerkes, R. M., & Dodson, J. D. (1908). The relation of strength of stimulus to rapidity of habit-formation. *Journal of comparative neurology and psychology, 18*(5), 459-482.
- Zeidan, F., Johnson, S. K., Diamond, B. J., David, Z., & Goolkasian, P. (2010). Mindfulness meditation improves cognition: Evidence of brief mental training. *Consciousness and Cognition, 19*(2), 597-605.
- Zucker, T. L., Samuelson, K. W., Muench, F., Greenberg, M. A., & Gevirtz, R. N. (2009). The effects of respiratory sinus arrhythmia biofeedback on heart rate variability and posttraumatic stress disorder symptoms: A pilot study. *Applied Psychophysiology and Biofeedback, 3*

## Appendix A

### Perceived Stress Scale

#### INSTRUCTIONS:

The questions in this scale ask you about your feelings and thoughts at the **CURRENT MOMENT**. In each case, please indicate your response by placing an "X" over the circle representing **HOW OFTEN** you felt or thought a certain way.

	Never	Almost Never	Sometimes	Fairly Often	Very Often
1. Do you feel upset because of something that happen unexpectedly?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. Do you feel that you were unable to control the important things in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. Do you feel nervous and "stress"?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. Do you feel confident about your ability to handle your personal problems?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. Do you feel that things were going your way?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. Do you find that you could not cope with all the things that you have to do?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. Do you feel that you are able to control irritations in your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. Do you feel that you are on top of things?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. Do you feel angry because of things that are outside your control?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10. Do you feel difficulties are piling up so high that you could not overcome them?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Appendix B

### Words Recall Test

#### PRE-DB TEST

Cancer	Vase	Spoon	Sock
Watch	Grief	Steam	Body
Glue	Chair	Cheetah	Glass
Fridge	Cheese	Bank	House
Curtain	Bell	Coffee	School

#### POST-DB TEST

Parent	Moon	Garden	Hat
Farmer	Nose	Color	River
Bridge	Police	Rose	Chalk
Onion	Key	Smoke	Chess
Snake	Bread	Paper	Guilt