

EFFECTS OF SWIMMING TOWARDS MENTAL HEALTH IN COLLEGIATE MALE ADULTS

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ABSTRACT

Sports can be a non-pharmacological way to improve general human health. This study aimed at evaluating mental health among healthy male adults following swimming intervention as one of the recommended sports in Islam. A total of 28 adults aged 19-33 years old were randomly divided into two groups, swimming group (n=14) and control group (n=14). Two sets of questionnaires were employed, the Depression, Anxiety and Stress Scale (DASS) and the Profile of Mood State (POMS), which examined six domains i.e tension, depression, anger, fatigue, confusion, and vigour pre and post-intervention. The swimming group underwent an exercise program three times per week for eight weeks while the control group maintained their usual daily lifestyle. At baseline, there were significant differences were identified for all parameters measured in DASS and POMS excepts total mood disturbance and vigour domain between the two groups. While at post-intervention, there were significant differences between groups in anxiety and stress in DASS, as well as vigour domain in POMS ($p < 0.05$). After eight weeks of exercise, swimming group showed a significant reduction in all outcomes measured compared to the control group ($p < 0.05$). This study shows that eight weeks of swimming can exert positive effects on mental health in healthy male collegiate adults.

Key words: Spirituality, swimming, mental health, physical activity, intervention

INTRODUCTION

Mental health issue is an important concern among adults. Even though there is increasing recognition of the importance of maintaining and promoting the mental wellbeing of individuals globally (Naci & Ioannidis, 2015), mental health concern among Malaysian population has yet to be established. The issue on mental health has started to gain importance because there is an alarming increase of prevalence individual aged 16 years old and above experiencing problem related to mental health, which is increasing to 29.2% in 2015 from 10.6% in 1996 (NHMS, 2015). Thus, well planned strategies for maintaining and improving wellbeing

are needed as primary prevention (Lovell *et al.*, 2014). Nowadays, swimming or aquatic exercise is one of the most popular modes of exercise among young people since 2015 (Sport England, 2016). As one of the contemporary exercises, swimming also confers significant health benefits for both healthy and unhealthy individuals including better psychological health, improving life satisfaction and self-perception of health as well as reducing level of stress compared to other exercises (Lee & Oh, 2013; Lee & Oh, 2014; Oh & Lee, 2015; Oja *et al.*, 2017). According to Aidar *et al.* (2013), aquatic exercise could reduce levels of depression and anxiety in an unhealthy person. Also, adult people who commonly undergo complex adulthood process would be able to become more optimistic after participating in swimming (Petrescu *et al.*, 2014).

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Other than the adult population, swimming exerted a positive effect in terms of reducing the stress level in adolescents (Koroglu & Yigiter, 2016). In fact, swimming is one of the activities that had been encouraged by Prophet Muhammad (PBUH). He highlighted swimming in a hadith;

الْبَيْنَ الرَّجُلُ مَشْيِي: خَصَالِ أَرْبَعٍ إِلَّا وَسَهْوٌ، لَهْوٌ فَهُوَ اللَّهُ ذَكَرَ مِنْ لَيْسَ شَيْءٌ كُلُّ
السَّبَّاحَةِ وَتَعَلَّمَ أَهْلَهُ، وَمَلَّاعَتَيْهِ فَرَسَهُ، وَتَأْدِيبُهُ غَرَضَيْنِ،

Meaning: “Any action without the remembrance of Allah is either a diversion or heedlessness except four acts: walking from target to target (during archery practice), training a horse, playing with one’s family and learning to swim.” [Refer: Mu’jam al-Awsath (8147)] [Imam al-Haithami in [Majma’ al-Zawaid 269/5]]

Sunnah is defined as the words, acts and approvals of Prophet Muhammad (PBUH) as a role model (Shamsuddin, 2013) and it is recommended for Muslims to follow. In this context, physical activities that have been practiced by Him could be addressed as Sunnah exercise. Practicing Sunnah of Prophet Muhammad (PBUH) in terms of being physically active will definitely help to achieve an optimum and balanced spiritual, mental and physical health in life. Evidencing with this fact, supposedly the Sunnah exercise should be appreciated and practice among the population.

However, the prevalence of Malaysian’s participation in regular exercise is still unfavourable despite several of initiatives have been introduced. Malaysia was ranked as top ten nation within the Asian region with 30.3% adult were categorized as physically inactive in 2016 (WHO, 2018). This inactive lifestyle has been proven to have a negative impact on mental health especially on the quality of life, mood and self-esteem (Mental Health Foundation, 2013). In Malaysia, past studies have reported widely about fitness and mental health among specific population with focused on aerobic exercise intervention such as dance exercise, walking, jogging, aqua zumba or soccer (Mastura *et al.*, 2012; Shahar *et al.*, 2013; Soon *et al.*, 2013; Ahmad & Rosli, 2015; Mastura *et al.*, 2015; Kong *et al.*, 2017; Maisarah *et al.*, 2018; Azman *et al.*, 2018; Yusof *et al.*, 2018) but not swimming. Since swimming offers a unique opportunity to promote, maintain and improve wellbeing, investigation of swimming effects on mental health condition could be relatively important. Therefore, it can be one of the alternatives and effective method for managing mental health issues other than existing methods such as drug-approach (Shilyansky *et al.*, 2016) or spirituality-approach (Forrester-Jones *et al.*, 2018). However, it is not a common practice among

physicians to prescribe exercise as a treatment for mental health especially depression problem (Helgadottir, 2016).

To the best knowledge of the researchers, data on the effect of swimming on mental health among Malaysians adult is still limited. Mental health issue among Malaysian should be addressed immediately, as it is expected to be a major problem by the year 2020 according to the patron on Malaysian Psychiatry Association, Tan Sri Lee Lam Thye (The Star Online, Aug 2018). Thus, this study aims to evaluate the mental health status among adults before and after practicing swimming, which is one of the Sunnah exercises.

MATERIALS AND METHODS

Participants

This randomized control trial was designed to determine the effects of swimming on mental health status. A total of 28 healthy collegiate male adults from University Malaya aged between 19 to 33 years were selected as participants. The selection was based on these criteria, (1) normal BMI (2) no medical problems (3) no physical impairment, which could hinder their ability to involve in physical activity (4) do not regularly participate in any sports or exercise programmes/did not exercise more than three times per week prior to the study/scored metabolic equivalent (MET) in Malay version of International Physical Activity Questionnaire – Short Form (IPAQ-SF) between 1.5 to 3 as well as (5) a non-smoker. Participants were recruited via the distribution of advertisements and flyers at residential colleges, faculties, student centre and via mass email to all students. Students who are interested to join were required to complete an online form that includes their name, background and health information for screening purposes based on inclusion criteria as above. All eligible participants were instructed not to change their usual lifestyle during this study and were informed of the purposes, procedures, benefits and risks of the study before obtaining their consent to participate. Each participant was randomly assigned to either swimming group (n=14) or control group (n=14) after signing an informed consent using a simple randomization technique. Data from Milanovic *et al.* (2015) was used for sample size determination per group and was determined by using the Power and Sample Size Program version 3.1.2 (Dupont & Plummer, 1990). Mental health i.e depression, anxiety and stress level as well as mood states i.e tension, depression, anger, vigour, fatigue and confusion were measured before and after eight (8)

weeks of exercise. This study approximately began in March 2018 until May 2018. The ethics committee of Hospital Canselor Tunku Mukhriz approved this study (UKM PPI/111/8/JEP-2018-141).

Exercise protocol

The swimming intervention was conducted three times weekly for eight weeks. Exercise sessions were divided into a few stages, 10 to 15 mins of warming up including stretching, 40 mins of swimming at a moderate intensity and 5 to 10 mins of cooling down and rest (Table 1). In the first four weeks, participants exercised at 50% HRmax of exercise intensity and increased progressively to 60% to 70% HRmax. The estimated swimming distance was approximately 500 m on the first week and increase progressively to 1000 m on 8th week along with drills and speed and easy pace. The exercise was trained by a certified fitness instructor and supervised by the researcher.

Measurement of mental health

A validated self-administered questionnaire of Depression, Stress, Anxiety Scale (DASS-21) in Malay version was used in this study to measure depression, anxiety and stress symptoms. Participants were required to complete the questionnaire before and after the intervention. DASS-21 (Lovibond & Lovibond's, 1995) is a short version

of the questionnaire used to assess the three negative emotional domains of depression, anxiety and stress. Participants were asked to rate their experience for the past weeks on a 4-scale ranging from 0 (does not apply to me) to 3 (applied to me very much or most of the time). Each item in a domain was summed up to obtain an overall score. The reliability and validity of the Malay version of DASS-21 is acceptable, in the range of 0.837 to 0.863 (Nordin *et al.*, 2017). Also, to measure participant's mood states, we used the Profile of Mood State (POMS) questionnaire in Malay version comprising of 65-items of mood to assess the six main domains: tension – anxiety (POMS-T), depression – dejection (POMS-D), anger – hostility (POMS-A), vigour – activity (POMS-V), fatigue – inertia (POMS-F) and confusion – bewilderment (POMS-C) were employed. Participants were asked to rate their feelings based on “during the past week including today” time frame on a 5-points Likert scale ranging from “not at all” to “extremely”. The Total Mood Disturbance (TMD) score was computed by adding the five negative domains (T, D, A, F and C) and subtracting the positive domain (V). The lower value of negative domains and higher positive domains showed a better mood condition. Also, a higher score of TMD indicated that a greater degree of mood disturbance. POMS (McNair *et al.*, 1992) is a widely used questionnaire to measure mood in sports and

Table 1. Exercise protocol for swimming group for eight weeks

Week	Details
1	Exercise: a. Warm – up exercise (kicking) using kicking board 10 × 50 m for 5 minutes. b. Breaststroke swimming 10 × 50 m for 40 minutes. c. Cooldown exercise (free swim) 100 m for 5 minutes.
2	Exercise: a. Warm – up exercise (free swim) 200 m for 5 minutes. b. Breaststroke swimming 20 × 50 m for 40 minutes. c. Cooldown exercise (free swim) 100 m for 5 minutes.
3	Exercise: a. Warm – up exercise (free swim) 200 m for 5 minutes. b. Breaststroke swimming 10 × 100 m for 40 minutes including introducing front crawl, swim kick and arm pull technique. c. Cooldown exercise (free swim) 100 m for 5 minutes.
4	Exercise: a. Warm – up exercise (free swim) 200 m for 5 minutes. b. Breaststroke and front crawl swim 10 × 50 m for 40 minutes. c. Cooldown exercise (free swim) 100 m for 5 minutes.
5, 6 and 7	Exercise: a. Warm – up exercise (free swim) 200 m for 5 minutes. b. Swim 10 × 100 m, drills 8 × 50 m, speed pace 8 × 50 m for 40 minutes. c. Cooldown exercise (free swim) 100 m for 5 minutes.
8	Exercise: a. Warm – up exercise (free swim) 200 m for 5 minutes. b. Breaststroke and front crawl swim 5 × 100 m for 40 minutes. c. Cooldown exercise (free swim) 100 m for 5 minutes.

exercise psychology (LeUnes & Burger, 1998). The reliability and validity of the Malay version of POMS is acceptable, in the range of 0.783 to 0.936 (Tamrin *et al.*, 2007).

Statistical analysis

Data entry and analysis was completed using SPSS version 24 (SPSS Inc, Chicago, IL, USA). The Kolmogorov-Smirnov test was used to assess the normality of data distribution for each variable. Since the very low value of the sample ($n < 30$) and the data were not normally distributed, non-parametric procedures were adopted. All data presented as the median and interquartile range (IQR). Changes between pre and post intervention were verified by the Wilcoxon test for repeated measures. Mann Whitney was used to comparing between swimming group and control group at baseline and post-intervention. The statistical significance was set up at $p < 0.05$.

RESULTS

Fourteen participants were assigned to swimming and control group separately. The demographic characteristics of the participants are presented in Table 2. The mean age of the participants was 22.00 (2.00). The mean height and body weights were 1.70 (0.07) m and 62.05 (10.25) kg, respectively. There were no significant differences in these parameters between the two groups.

Depression, anxiety and stress

As in Table 3, the results showed a significant reduction for the swimming group in the emotional domains analysed (depression, anxiety and stress) after training. Meanwhile, significant increment was found between pre and post-intervention in the control group ($p < 0.05$). In the comparison between the swimming group and control group, significant differences were found for all domains at baseline and domains of anxiety and stress in the post-intervention ($p < 0.05$).

Profile of mood states

Table 4 shows that the eight weeks of swimming program led to a significant decrease in the total mood disturbance score (TMD) assessed by the POMS questionnaire in swimming group, from 32.50 (66.00) to 9.00 (22.00) compared to control group ($p < 0.05$). Also, after the exercise training, the swimming group showed significant improvement compared with baseline value in the following POMS measures, negative domains which are tension ($p = 0.001$), depression ($p = 0.001$), anger ($p = 0.001$), fatigue ($p = 0.001$) and confusion ($p = 0.001$) as well as positive domain which is vigour ($p = 0.011$). To compare between both groups, the baseline outcome measures did not differ significantly only in the TMD and vigour domain while at post-intervention, only vigour domain indicated a significant difference ($p < 0.05$) whereas no differences were observed for TMD, tension, depression, anger, confusion and fatigue domain.

DISCUSSION

This study determined the effects of swimming on mental health among collegiate male adults. We found that eight weeks supervised swimming exercise program decreased depression, anxiety and stress. The better mental health conditions in participants performing swimming were documented. Most of the previous studies on effectiveness of swimming have focused on special groups, which are with certain health conditions such

Table 2. Characteristics of the participants in swimming group and control group ($n = 28$)

Characteristic	Swimming group $n = 14$	Control group $n = 14$
Age (years)	22.00 (3.00)	22.00 (1.00)
Body weight (kg)	63.00 (11.33)	60.05 (9.95)
Height (m)	1.71 (0.08)	1.68 (0.05)

*Data presented in median (interquartile range).

Table 3. DASS score of participants in swimming group and control group at baseline and post-intervention

Variable DASS	Control Group $N = 14$		Swimming Group $N = 14$	
	Baseline	Post-intervention	Baseline	Post-intervention
Depression	4.00 (1.00) ^{bB}	8.00 (3.00) ^{aA}	11.00 (12.00) ^{aA}	6.00 (9.00) ^{bA}
Anxiety	6.00 (5.00) ^{bB}	12.00 (11.00) ^{aA}	12.00 (6.00) ^{aA}	4.00 (6.00) ^{bB}
Stress	6.00 (7.00) ^{bB}	13.00 (10.00) ^{aA}	15.00 (8.00) ^{aA}	7.00 (7.00) ^{bB}

^{a-b} indicates a significant difference between before and after intervention each group ($p < 0.05$).

^{A-B} indicates a significant difference between swimming group and control group at baseline and post-intervention ($p < 0.05$).

*Data presented in median (interquartile range).

Table 4. POMS score of participants in swimming group and control group at baseline and post-intervention

Variable POMS	Control Group N = 14		Swimming Group N = 14	
	Baseline	Post-intervention	Baseline	Post-intervention
POMS - TMD	11.00 (28.00) ^{aA}	24.00 (48.00) ^{aA}	32.50 (66.00) ^{aA}	9.00 (20.00) ^{bA}
POMS - Tension	8.00 (6.00) ^{aB}	10.00 (10.00) ^{aA}	11.00 (9.00) ^{aA}	7.00 (6.00) ^{bA}
POMS - Depression	6.00 (8.00) ^{aB}	10.00 (17.00) ^{aA}	13.00 (18.00) ^{aA}	6.00 (10.00) ^{bA}
POMS - Anger	4.50 (7.00) ^{bB}	10.50 (10.00) ^{aA}	13.00 (10.00) ^{aA}	6.00 (4.00) ^{bA}
POMS - Vigour	18.00 (6.00) ^{aA}	15.50 (7.00) ^{bA}	17.00 (7.00) ^{bA}	21.00 (5.00) ^{aB}
POMS - Fatigue	5.00 (5.00) ^{aB}	6.00 (10.00) ^{aA}	10.50 (12.00) ^{aA}	4.50 (8.00) ^{bA}
POMS - Confusion	4.50 (3.00) ^{bB}	8.00 (7.00) ^{aA}	9.50 (8.00) ^{aA}	6.00 (3.00) ^{bA}

^{a-b} indicates a significant difference between before and after intervention each group ($p < 0.05$).

^{A-B} indicates a significant difference between swimming group and control group at baseline and post intervention ($p < 0.05$).

*Data presented in median (interquartile range).

as ischemic stroke (Aidar *et al.*, 2013), haemophilia (Boadas *et al.*, 2015), arthritis (Foley *et al.*, 2003), neuromuscular disease (Jentoft *et al.*, 2001), cerebral palsy (Getz *et al.*, 2006) and stroke survivors (Noh *et al.*, 2008) as well as depression (Yavari, 2008). These conditions typically experienced sleep disruption which not relevant to compare with current finding because of the difference in study populations. Noh *et al.* (2008) mentioned that swimming is not only a recreational activity but is also known as an aquatic therapy due to the advantages of the physical characteristic of water and its interaction with the human body. Due to that reason, swimming has become one of the advanced treatments nowadays and has been widely applied more in chronic condition population with disabilities.

The findings indicated that the participants in swimming group had a moderate level of anxiety and a mild level of depression and stress in the pre-intervention unexpectedly but however, it reduced to no evidence of all the negative emotional domains at the end of swimming intervention. Although the participants involved in this study were selected among the healthy population in terms of physical look, subconsciously they experienced problems related to mental health. This issue was proven by Shamsuddin *et al.* (2013) where depression, anxiety and stress levels are prevalent among Malaysian university students, where anxiety recorded the highest percentage. Thereby, continuous swimming learning can exert a positive effect on the reduction of anxiety level (Muhamad *et al.*, 2013). According to a YouGov poll managed by Swim England (2018), 1.4 million adults reported that swimming has had a positive effect on their anxiety and depression and resulted in less frequent visits to a medical professional.

Mike (2017) explained the uniqueness behind swimming through scientific studies in rats that swimming can help in hippocampal neurogenesis process. It helps in generating new brain cells where

cell deterioration might happen due to chronic stress. Other than that, it can increase the supply of oxygen, glucose and nutrients to the brain as well as releasing endorphins hormone that leads to a greater sense of happiness and well-being in individual. The effects of swimming on depression, anxiety and stress of collegiate adults in the present study were similar to the effects reported in studies of younger students (Koroglu & Yigiter, 2016), female collegiate adults (Muhamad *et al.*, 2013) and both male and female collegiate adults (Sawane & Gupta, 2012). Kenari (2014) attempted to compare mental health condition among athletes and non-athletes group found that students who are athletes, participated regularly in exercise have better mental health condition where they have lower symptoms of anxiety, insomnia, social dysfunction as well as depression. Thus, swimming exercise could be an effective way of reducing anxiety and stress symptoms and confirm suggestions provided by clinical guidelines pertaining to the benefits of swimming to improve mental health.

On the other hand, swimming exercise also improved several aspects of mood such as mood disturbance including tension, depression, anger, vigour, fatigue and confusion in collegiate male adults in the present study. The results in this study are consistent with Huttunen *et al.* (2004), Villanueva *et al.* (2013) and Santhiago *et al.* (2011) that show advantages of swimming exercise from a mental health improvement perspective. In another study by Olutende *et al.* (2017), he intervened an aerobic exercise program on 40 students for two weeks and found a reduction in total mood disturbance in the training group. Similar effects can be found in a study of Weinstein *et al.* (2017) who conducted a study to examine the mood alterations after 12 weeks of aerobic exercise program. He found that positive changes in mood alterations can be noticed as early as four weeks and was sustained until 12 weeks. Looking at how exercise affected on mood profile, Leith (1994) introduced distraction

hypothesis in which during exercise, individual's mind was diverted from unpleasant stimuli for example worries and depression thought.

Since mood disturbance become one of the common symptoms experienced by college students especially prior to college entry (Auerbach *et al.*, 2016) as well as individuals who are diagnosed with cancer (Cheng & Yeung, 2012), traumatic brain injury (Driver & Ede, 2009), rheumatic disease (Alpay & Cassem, 2000) and other diseases, swimming or hydrotherapy become an alternative treatment and attaining more intention in research. Based on current finding, regular swimming exercise with appropriate intensity and duration is able to produce a desirable effect on improvement depression, anxiety and stress state as well as mood status among individual, especially collegiate adults. Future research on larger and multisite samples are recommended to confirm the effects on these types of programs on a similar population. It is unknown whether participants continued the exercise after the intervention program. Thus, influences from the previous program on the mental health among collegiate male adults should be clarified. Individuals who are suffering from mental health issues especially collegiate students commonly do not seek help from health care due to several stigmas. Thus, it is suggested that important of regular participation in exercise such as swimming for reducing mental health symptoms should be included in health education.

CONCLUSION

In summary, eight weeks of swimming program is shown to improve the mental health of collegiate male adult in terms of reducing the level of depression, anxiety and stress as well as improving tension, depression, anger, confusion, vigour and fatigue. The concept of physical activity through Sunnah perspective is proven to be beneficial even in aqua-based exercise such as swimming. Also, it strengthens the established message from health care agencies the importance of exercise. The findings of this study can be useful for individuals who are encountered with mental health issues especially adults. Also, it is useful for health agencies in promoting participation in Sunnah exercise to overcome mental related complications among Malaysian populations.

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REFERENCES

- Ahmad, M.F. & Rosli, M.A.A. 2015. Effects of aerobic dance on cardiovascular level and body weight among women. *International Journal of Sport and Health Science*, **9(12)**: 874-882.
- Aidar, F.J., Garrido, N.D., Silva, A.J., Reis, V.M., Marinho, D.A. & Oliveira, D.J. 2013. Effects of aquatic exercise on depression and anxiety in ischemic stroke subjects. *Health*, **5(2)**: 222-228.
- Alpay, M. & Cassem, E.H. 2000. Diagnosis and treatment of mood disorders in patients with rheumatic disease. *Annals of Rheumatic Diseases*, **59(1)**: 2-4.
- Auerbach, R.P., Alonso, J., Axinn, W.G., Cuijpers, P., Ebert, D.D., Green, J.G., Hwang, I., Kessler, R.C., Liu, H., Mortier, P., Nock, M.K., Pinder-Amaker, S., Sampson, N.A., Aguilar-Gaxiola, S., Al-Hamzawi, A., Andrade, L.H., Benjet, C., Caldas-de-Almeida, J.M., Demyttenaere, K., Florescu, S., Girolamo, G., Gureje, O., Haro, J.M., Karam, E.G., Kiejna, A., Kovess-Masfety, V., Lee, S., McGrath, J.J., O'Neill, S., Pennell, B.E., Scott, K., Have, M., Torres, Y., Zaslavsky, A.M., Zarkov, Z. & Bruffaerts, R. 2016. Mental disorders among college students in the WHO World Mental Health Surveys. *Psychology Medicine*, **46(14)**: 2955-2970.
- Azman, N., Mohamed, N.G., Aziz, A.R., Farah, N. & Che Muhamed, A.M. 2018. The effectiveness of futsal as a game-simulated exercise for promoting weight loss and metabolic health in overweight/obese men. *Malaysian Journal of Public Health Medicine*, **1**: 174-182.
- Boadas, A., Osorio, M., Gibraltar, A., Rosas, M.M., Berges, A., Herrera, E., Gadea, S., Gutierrez, M.A., Salazar, F. & Ruiz-Saez, A. 2015. Favourable impact of regular swimming in young people with haemophilia: experience derived from 'Desafio del Caribe' project. *Haemophilia*, **21(1)**: 12-18.
- Cantarero-Villanueva, I., Fernandez-Lao, C., Cuesta-Vargas, A.I., Moral-Avila, R.D., Fernandez-de-las-Penas, C. & Arroyo-Morales, M. 2013. The effectiveness of deep-water aquatic exercise program in cancer-related fatigue in breast cancer survivor: A randomized controlled trial. *Archives of Physical Medicine and Rehabilitation*, **94(2)**: 221-230.

- Cheng, K.K.F. & Yeung, R.M.W. 2013. Impact of mood disturbance, sleep disturbance, fatigue and pain among patients receiving cancer therapy. *European Journal of Cancer Care*, **22(1)**: 70-78.
- Driver, S. & Ede, A. 2009. Impact of physical activity on mood after TBI. *Brain Injury*, **23(3)**: 203-212.
- Dupont, W.D. & Plummer, W.D. 1990. Power and sample size calculations: a review and computer program. *Controlled Clinical Trial*, **11(2)**: 116-128.
- Foley, A., Halbert, J., Hewitt, T. & Crotty, M. 2003. Does hydrotherapy improve strength and physical function in patients with osteoarthritis—a randomized controlled trial comparing a gym based and a hydrotherapy based strengthening programme. *Annals of The Rheumatic Diseases*, **62(12)**: 1162-1167.
- Forrester-Joner, R., Dietzfelbinger, L., Stedman, D. & Richmond, P. 2018. Including the 'spiritual' within mental health care in the UK, from the experiences of people with mental health problems. *Journal of Religion and Health*, **57(1)**: 384-407.
- Getz, M., Hutzler, Y. & Vermeer, A. 2006. Effects of aquatic interventions in children with neuromotor impairments: A systematic review of the literature. *Clinical Rehabilitation*, **20(11)**: 927-936.
- Helgadottir, B. 2016. Exercise as treatment for depression. Thesis for Doctoral Degree. The Department of Public Health Sciences. Karolinska Institute: Stockholm.
- Huttunen, P., Kokko, L. & Ylijokuri, V. 2004. Winter swimming improves general well-being. *International Journal of Circumpolar Health*, **63(2)**: 140-144.
- Institute for Public Health (IPH). 2015. *National Health and Morbidity Survey 2015* (NHMS 2015). Vol. II: Non-Communicable Diseases, Risk Factors & Other Health Problems.
- Jentoft, E.S., Kvalvik, A.G. & Mengshoel, M. 2001. Effects of pool-based and land-based aerobic exercise on women with fibromyalgia/chronic widespread muscle pain. *Arthritis Care Research*, **45(1)**: 42-47.
- Kenari, M.A. 2014. Effect of exercise on mental health in the physical dimension, anxiety and mental disorder, social dysfunction and depression. *Advances in Applied Sociology*, **4**: 63-68.
- Kong, J.P., Jok, L., Ayub, A. & Bau, R.A. 2017. Worksite weight management program: A 3 months intervention study in a primary health care setting. *Nutrition & Food Science*, **47(4)**: 1-30.
- Koroglu, M. & Yigiter, K. 2016. Effects of swimming training on stress levels of the students aged 11-13. *Universal Journal of Educational Research*, **4(8)**: 1881-1884.
- Lee, B.A. & Oh, D.J. 2013. The effects of health perception on living health belief, living satisfaction and wellbeing-oriented activities according to swimming participation with middle-aged women. *Journal of Exercise Rehabilitation*, **9(3)**: 381-388.
- Lee, B.A. & Oh, D.J. 2014. The effects of aquatic exercise on body composition, physical fitness and vascular compliance of obese elementary students. *Journal of Exercise Rehabilitation*, **10(3)**: 184-190.
- Leith, L.M. 1994. Foundations of Exercise and Mental Health. Morgantown: Fitness Information Technology.
- Lovell, R., Wheeler, B.W., Higgins, S.L., Irvine, K.N. & Depledge, M.H. 2014. A systematic review of the health and well-being benefits of biodiverse environments. *Journal of Toxicology and Environmental Health part B Critical Reviews*, **17(1)**: 1-20.
- Lovibond, S.H. & Lovibond, P.F. 1995. Manual for the Depression, Anxiety Stress Scale. 2nd Ed. Sydney: Psychology Foundation.
- Maisarah, S., Sarina, M.Y., Mastura, J., Teh, L.K., Norizzati, M.I. & Raja, N.J.R.H. 2018. 12-weeks of aqua zumba fitness and metabolic syndrome in obese women. *Malaysian Journal of Movement, Health and Exercise*, **7(2)**: 81-91.
- Mastura, J., Omar Fauzee, M.S., Bahaman, A.S., Rashid, S.A. & Somchit, M.N. 2012. Effect of low impact aerobic dance exercise on psychological health (stress) among sedentary women in malaysia. *Biology of Sport*, **29(1)**: 63-69.
- Mastura, J., Shah, M. & Taha, H. 2015. Effect of low intensity dance exercise: Hostility, anxiety and depression among sedentary overweight women in Malaysia. *Universal Journal of Psychology*, **3(3)**: 73-79.
- Mental Health Foundation. 2013. *Let's Get Physical*. United Kingdom: Mental Health Foundation.
- Mike, J. (2017, December 19). 5 ways swimming can boost your mental health [Web log post]. Retrieved January 10, 2019, from anxietyuk.org.uk
- Milanovic, Z., Pantelic, S., Sporis, G., Mohr, M. & Krustup, P. 2015. Health-related physical fitness in healthy untrained men: effects on VO₂max, jump performance and flexibility of soccer and moderate intensity continuous running. *PLoS ONE*, **10(8)**: e0135319.
- Muhamad, T.A., Sattar, H., Abadi, F.H. & Haron, Z. 2013. The effect of swimming ability on the anxiety levels of female college students. *Asian Social Science*, **9(15)**: 108-114.

- al-Mundhir, al-Targhīb Wa al-Tarhīb, Juz 2, page 248.
- Naci, H. & Ionnadis, J.P.A. 2013. Comparative effectiveness of exercise and drug interventions on mortality outcomes: meta-epidemiological study. *British Medical Journal*, **347**: 1-14.
- Noh, D.K., Lim, J.Y., Shin, H.I. & Paik, N.J. 2008. The effect of aquatic therapy on postural balance and muscle strength in stroke survivors—a randomized controlled pilot trial. *Clinical Rehabilitation*, **22(10-11)**: 966-976.
- Nordin, R., Kaur, A., Soni, T., Loh, K.P. & Miranda, S. 2017. Construct validity and internal consistency reliability of the Malay version of the 21-item depression anxiety stress scale (Malay-DASS-21) among male outpatient clinic attendees in Johor. *Medical Journal of Malaysia*, **72(5)**: 264-270.
- Oh, D.J. & Lee, B.A. 2015. Effects of participation in swimming lessons on health perception and belief. *Journal of Exercise Rehabilitation*, **11(1)**: 48-56.
- Oja, P., Kelly, P., Pedisic, Z., Titze, S., Bauman, A., Foster, C., Hamer, M., Hillsdon, M. & Stamatakis, E. 2017. Associations of specific types of sports and exercise with all-cause and cardiovascular-disease mortality: A cohort study of 80 306 British adults. *British Journal of Sports Medicine*, **51**: 812-817.
- Olutunde, O.M., Wekesa, J.S., Mogaka, E.S. & Kweyu, I.W. 2017. Effects of aerobic exercise on mood state of University students: a quasi-experimental approach. *International Journal of Current Research*, **9(11)**: 61107-61112.
- Petrescu, S., Pitigoi, G. & Paunescu, M. 2014. The effects of practicing swimming on psychological tone in adulthood. *Procedia – Social and Behavioral Science*, **159**: 74-77.
- Sawani, M.V. & Gupta, S.S. 2011. Efficacy of yoga and swimming in reducing anxiety: A comparative study. *People's Journal of Scientific Research*, **6(1)**: 20-24.
- Santhiago, V., Da Silva, A.D.R., Papoti, M. & Gobatto, C.A. 2011. Effects of 14-week swimming training program on psychological, hormonal and physiological parameters of elite women athletes. *Journal of Strength and Conditioning Research*, **25(3)**: 825-832.
- Shahar, S., Kamaruddin, N.S., Badrasawi, M., Sakian, N.I.M., Abd Manaf, Z., Yassin, Z. & Joseph, L. 2013. Effectiveness of exercise and protein supplementation intervention on body composition, functional fitness and oxidative stress among elderly Malays with Sarcopenia. *Clinical Interventions in Aging*, **8**: 1365-1375.
- Shamsuddin, K., Fadzil, F., Wan Ismail, W.S., Shah, S.A., Omar, K., Muhammad, N.A., Jaffar, A., Ismail, A. & Mahadevan, R. 2013. Correlates of depression, anxiety and stress among Malaysian university students. *Asian Journal of Psychiatry*, **6(4)**: 318-323.
- Shamsuddin, N., Muslat, M.W., Mohd Noor, F.W., Mohd Noor, N.F., Khusni, H. & Tarimin, M. 2013. Awareness and appreciation of sunnah of the Prophet Muhammad S.A.W. among Muslim adolescents in Selangor. *Journal of Social Science Research*, 354-370.
- Shilyansky, Williams, L.M., Gyurak, A., Harris, A., Usherwood, T. & Etkin, A. 2016. Effect of antidepressant treatment on cognitive impairments associated with depression: a randomized longitudinal study. *Lancet Psychiatry*, **3(5)**: 425-435.
- Soon, H.K., Hazizi, A.S., Mohd Taib, M.N., Abd Rahman, H. & Mun, C.K. 2013. Effects of combined physical activity with dietary intervention on obesity and metabolic parameters in adults with abdominal obesity. *Southeast Asian Journal of Tropical Medicine and Public Health*, **44(2)**: 295-308.
- Sport-England 2016. Once a week participation in funded sports amongst people aged 16 years and over. *Active People Survey*. England: Sport England.
- Swim England (2018, October 8) New study says swimming benefits mental health. Swim England News. Retrieved from swimming.org
- Tamrin, S.B., Yokoyama, K., Jalaludin, J., Aziz, N.A., Jemoin, N., Nordin, R., Li Naing, A., Abdullah, Y. & Abdullah, M. 2007. The Association between risk factors and low back pain among commercial vehicle drivers in peninsular Malaysia: a preliminary result. *Industrial Health*, **45(2)**: 268-278.
- The Star Online. Aug 2018. 29% of Malaysians have mental problems due to stress, say Lam Thye.
- Weinstein, A.A., Chin, L.M.K., Collins, J., Goel, D., Keyser, R.E. & Chan, L. 2017. Effects of aerobic exercise training on mood in people with traumatic brain injury. *Journal of Head Trauma Rehabilitation*, **32(3)**: E49-E56.
- WHO. 2018. Prevalence of insufficient physical activity among adults. Retrieved from <http://apps.who.int/gho/data/node.main.A893?lang=en>
- Yavari, A. 2008. The effect of swimming in reduction of depression in university male students. *Research Journal of Biological Sciences*, **3(6)**: 543-545.
- Yusof, S.M., Shari, M., Kadir, Z., Adam, A., Teh, L.K., Aiman, S., Idris, N.M. & Johar, M. 2018. Aqua zumba versus aqua jogging: Comparative effects on health parameters among obese middle-aged women. *Movement, Health and Science*, **7(2)**: 11-21.