EFFECTS OF SWIMMING TOWARDS MENTAL HEALTH IN COLLEGIATE MALE ADULTS

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Accepted 10 May 2019, Published online 31 May 2019

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).
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:

لَيْسَ مِنْ أَعمالْ أَبِي اوَّلًا وَأَخَوَانِهِ عَلَى مَنْ يَنْزِعُ مِنْ تَأْمُّهُ كَانَ عَلَى عِمَامٍ مُّقْدِشٍ

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

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Swimming group</th>
<th>Control group</th>
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</thead>
<tbody>
<tr>
<td>n = 14</td>
<td>n = 14</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>22.00 (3.00)</td>
<td>22.00 (1.00)</td>
</tr>
<tr>
<td>Body weight (kg)</td>
<td>63.00 (11.33)</td>
<td>60.05 (9.95)</td>
</tr>
<tr>
<td>Height (m)</td>
<td>1.71 (0.08)</td>
<td>1.68 (0.05)</td>
</tr>
</tbody>
</table>

*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 & Yigit, 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 Olutunde 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

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

<table>
<thead>
<tr>
<th>Variable</th>
<th>Control Group</th>
<th>Swimming Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 14</td>
<td>N = 14</td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>Post-intervention</td>
<td>Baseline</td>
</tr>
<tr>
<td>POMS - TMD</td>
<td>11.00 (28.00)</td>
<td>24.00 (48.00)</td>
</tr>
<tr>
<td>POMS - Tension</td>
<td>8.00 (6.00)</td>
<td>10.00 (10.00)</td>
</tr>
<tr>
<td>POMS - Depression</td>
<td>6.00 (8.00)</td>
<td>10.00 (17.00)</td>
</tr>
<tr>
<td>POMS - Anger</td>
<td>4.50 (7.00)</td>
<td>10.50 (10.00)</td>
</tr>
<tr>
<td>POMS - Vigour</td>
<td>18.00 (6.00)</td>
<td>15.50 (7.00)</td>
</tr>
<tr>
<td>POMS - Fatigue</td>
<td>5.00 (5.00)</td>
<td>6.00 (10.00)</td>
</tr>
<tr>
<td>POMS - Confusion</td>
<td>4.50 (3.00)</td>
<td>8.00 (7.00)</td>
</tr>
</tbody>
</table>

*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).
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.

ACKNOWLEDGEMENTS

We want to thank all the participants for their full cooperation throughout this study, Universiti Malaya for the facilities and the fitness instructor for the full commitment given. We also would like to thank Universiti Kebangsaan Malaysia especially Arus Perdana grant (AP-2017-002/1 and AP-2017-002/2) and Galakan Penyelidikan grant (GGP-2017-057) for the full support on this research. The authors report no conflicts of interest.

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