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Journal of Social Sciences and Humanities

Special Issue: Vol. 18. No.8 (2021). 213-219. ISSN: 1823-884x
Theme: Social Issues and Challenges of The Covid Pandemic 19

VIRTUAL PHYSICAL EXERCISE INFLUENCES ON MENTAL HEALTH STATUS DURING COVID-19 OUTBREAK: CROSS-SECTIONAL SURVEY STUDY

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ABSTRACT

The severity of Covid-19 outbreak caused it to be declared a pandemic and the Malaysian government had to implement movement control order (MCO). MCO includes restriction on outdoor activities and temporary shutdown of fitness centres. Sports enthusiasts among community may experience uneasy phenomenon as this order affecting their exercises routines. To some extent, it does affect them physically, mentally, and emotionally. Various efforts were made to allow these group to engage in physical exercise. One of the efforts is engaging in live virtual physical exercise (VPE) through social media or recorded videos. Therefore, this study aims to analyse the relationship between VPE and mental health status during COVID-19 pandemic lockdown situation. In this quantitative designed study, 84 participants were recruited randomly within Johor community using snowball effect strategy. DASS-21 questionnaire was used to measure mental health status and administered online for data collection. SPSS software was used for descriptive statistic and SmartPLS software was used to test the structural equation model between the variables. Findings showed significant decreases in the level of stress, anxiety, and depression after joining the VPE programme during MCO. The depression scale was significantly corelated to stress and anxiety before and after involvement with VPE programme. Overall, participants has improved mental health status by engaging with the VPE programme during the lockdown order. This study is expected to shed some light on the future of physical activities via technology and online platform, their influence towards healthy lifestyle and the mental status of the community.

Keywords: COVID-19 pandemic, virtual physical exercise, DASS-21, MCO, mental health.

INTRODUCTION

The Covid-19 pandemic is spreading throughout the world started in December 2019. In March 2020, the Malaysian government had to declare lockdown orders and implement movement control orders (MCO) to prevent the further spreading of the Covid-19 virus (New Strait Times, 2020; Tang, 2020). MCO implementation forced individual to stay quarantine at home and reduce any insignificant movement out of their home which, heavily affected one's daily routine. Social distancing could affect various mental health such as anxiety, stress and depression (Shanmugam et al., 2020).

Fear and concern towards the Covid-19 virus could affect individual psychological. According to the American Psychiatric Association (APA), 62% of American citizens are worried

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of getting affected by Covid-19 virus and 38% have a severe impact on the mental health (American Psychological Association, 2020). Mental disorder in Malaysia has shown increasing trend starting from 2019 (Saharudin et al., 2020) thus, highlighted that the mental health status is heavily influenced by the pandemic and the quarantine orders to prevent the spreading of the virus. Previous studies have stated that due to this COVID-19 outbreak, mental health cases such as depression, anxiety, insomnia, fear and suicidal increases among society especially healthcare workers(Bao et al., 2020; Pappa et al., 2020). According to the Qiu et al. (2020), individual between 18 to 30 years old and above 60 years old have a high score of Peritraumatic Distress Index (CPDI) and more vulnerable to psychological disorder such as anxiety, depression and stress. In this situation, the World Health Organisation (WHO) encourage people to exercise and enhance mental and physical activities at home.

Due to the MCO implementation, individuals are encouraged to stay at home and all outdoor activities are banned especially those involving mass gatherings (Joseph, 2020). Following this, home-based activities are most recommended and suitable to maintain healthy lifestyle following the lockdown orders and according to the Ghram et al. (2021), home-based physical exercises could significantly enhance psychological and physical health. However, exercising alone can also be boring and eventually individual could felt demotivated especially for individual that used to do those activities in groups. According to the Carnes (2014) and Murcia et al. (2008), support from friends could motivate individual to perform during exercising and also increase enjoyment. Thus, virtual physical exercise (VPE) is one of the new approaches to practice active lifestyle using the online technology. VPE also help people to interact with each other and stay connected while doing physical activity.

Several individuals or fitness organisation has taken initiatives to set up activities and exercises using technology to connect everyone remotely in order to overcome movement restriction problems due to the quarantine order. However, studies related to this new norm approach of physical exercise are still lacking especially its influence towards the mental health. This study was conducted to fill this gap and measure the relationship of VPE towards mental health status during this COVID-19 pandemic lockdown situation.

REVIEW OF LITERATURE

Mental health conditions involve many different aspects related to the emotion, thinking and behaviour or combination of mental illnesses (World Health Organization, 2003). Anxiety is a mental disorder symptom shown through disturbed thinking, agitation and changes in physical such as increased blood pressure, sweating, trembling, dizziness or a rapid heartbeat (Anxiety & Depression Association of America, 2021). According to the National Institute of Mental Health (2017), 19.1% of American adults had any types of anxiety disorder and 31.1% experience any anxiety disorder at some time in their lives. On the other hand, stress is closely related to the anxiety where once stress mechanism triggered due to the certain situation, anxiety will react to that stress and it could cause several symptoms such as headaches, high blood pressure, chest pain, rashes, and loss of sleep (American Psychological Association, 2019, 2020, 2021).

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In the meantime, depression is a mental disorder with more than 264 million people were affected globally (World Health Organization, 2020). Individuals with depression will show severe mood fluctuation and disturbed sleep or appetite, also significant changes in the physical appearances and behaviour and worst, it could lead to the suicidal thought. World Health Organization (2020) stated that depression could influenced by social interaction, psychological and physiological factors. It been stated that there are correlation between mental health (anxiety, stress and depression) and physical health and physical activity has proven effective in reducing many mental disorder symptoms (Sharma et al., 2006). Previous studies also reported that vigorous physical activity could lead to the lower mental health and depressive symptoms (Feng et al., 2014; Guo et al., 2020; Harbour et al., 2008). Therefore, lack of physical activity could become major contributor to the mental health deterioration status.

Findings from previous studies had discussed the relationship between physical activity and psychological disorder symptom especially depression and anxiety (Bell et al., 2019; Deng et al., 2020; Dogra et al., 2018; Feng et al., 2014; Grasdalsmoen et al., 2020; Guo et al., 2020; Quintas et al., 2020; Sivaramakrishnan et al., 2019). Aerobic exercises are proven to be effective as treatment approaches to prevent and reduce mental health. Physical activity also could aids in reducing stress, strengthen the mental well-being and avoid job burnout (Gao & Yin, 2020). According to the Bell et al. (2019), the higher physical activity rate, the lower percentage of emotional issues. Individuals that suffered from mental illnesses and poor physical condition have high tendency to commit self-harm and suicidal attempt (Grasdalsmoen et al., 2020) thus, physical exercise could act as alternative getaways for mental disorders symptoms among adolescents.

Covid-19 pandemic situation has affected the implementation of active lifesytle either indoor or outdoor. According to the Tajudin et al. (2021), 90% of the community had limit their social activities and 87.2% had limit their sports activities during the MCO implementation. In addition, the closure of the sports facilities (such as football fields, swimming pools, gymnasiums, fitness clubs) and recreational parks has been greatly reduced the participation in physical activities (Piotrowski & Piotrowska, 2021) . The orders of restriction on outdoor activities and temporary shutdown of fitness centres during MCO implementation negatively influenced the social lifestyles and exercise routine of active community (Raiola & Domenico, 2021). Sports enthusiasts among community may experience uneasy phenomenon as this order effecting their daily exercise routine. Physically active communities used to form groups to endure into group exercises conducted either indoors or outdoors can no longer enjoy the environment due to this MCO. To some extent it does affect them mentally and emotionally.

Various efforts were made to allow these group to engage in physical exercise. One of the efforts is engaging into physical exercise virtually live through social media or recorded videos. The modernisation of technology in the sports industry provided the virtual space to the unlimited sources to sustain healthy lifestyle. Previous studies found that guided exercise during home-based or self-isolated exercise could improve mental health (Ghram et al., 2021; Mittaz Hager et al., 2019). This scenario highly reflected current scenario where individual have to quarantine and stay inside of their house. However, self-exercise alone has its limitation especially on the duration of motivation and enjoyable moment (Gillespie et al., 2015; Murcia et al., 2008). The support from others is important as a catalyst to maintain exercise habits (Carnes, 2014) thus, VPE could help individuals to stay connected with others and sustain active lifestyle.

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Therefore, the aim of this study is to analyse the relationship of VPE towards mental health. The objective is to measure the mental health status through the level of stress, anxiety, and depression during the MCO implementation due to the Covid-19 pandemic outbreak before and after involvement with the VPE programme. This study also intends to determine whether depression, anxiety and stress correlate with each other and can be reduced through the exercise virtually.

RESEARCH METHODOLOGY

Study Design and Sampling

This quantitative cross-sectional study used snowball strategy for data collection. It was employed among communities in Johor. 84 participants were selected randomly among fitness centre located in Johor Bahru, especially those who were actively involved with physical activities before the MCO implementation.

Procedure

Due to the MCO implementation, data collection for this study was conducted using online medium through google form survey platform. The survey was distributed among community through social media and online messenger application such as WhatsApp, Telegram and Signal. As starter for the first layer of the snowball strategy for participation, it was distributed to the known community registered with sport and fitness organisation and actively involved with regular organised activities. Then, for second layer, the first layer participants were encouraged to spread the survey randomly to other individuals relevant to this study.

Instruments

A Depression Anxiety Stress Scales-21 items (DASS-21) structured questionnaire was used to evaluate the mental health status. All 21 items in the questionnaire consisted of 7 items for each depression, anxiety and stress subscales (Lovibond & Lovibond, 1995). Approximately 5 minutes were required to complete it. Demographic data including age, roles during virtual physical exercises (either as a coach, instructor or participant), employment status and marital status, were added. Participants were asked to answer each item on a scale from 0 (did not apply to me at all) to 3 (applied to me very much). The scores of the three subscales were calculated according to Beaufort et al., (2017) and Lovibond & Lovibond (1995) as follows:

i. The depression subscale consisted of questions 3, 5, 10, 13, 16, 17, and 21; classified into normal (0-9), mild depression (10-12), moderate depression (13-20), severe depression (21-27), and extremely severe depression (28-42).
ii. The anxiety subscale consisted of questions 2, 4, 7, 9, 15, 19, and 20; classified into normal (0-6), mild anxiety (7-9), moderate anxiety (10-14), severe anxiety (15-19), and extremely severe anxiety (20-42)

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iii. The stress subscale consisted of questions 1, 6, 8, 11, 12, 14, and 18; classified into normal (0-10), mild stress (11-18), moderate stress (19-26), severe stress (27-34), and extremely severe stress (35-42).

Cronbach's coefficient α was used to calculate the internal consistency coefficients of the items included in the questionnaire through a pilot study and resulted in the value of more than 0.7 for each subscale (depression =0.87, anxiety = 0.86 and stress = 0.85), indicating good to be distributed among participants (Ab Hamid et al., 2017).

Data Analysis

Descriptive statistics were employed for demographic data, and each categorical variable was presented as the percentage of responses to the corresponding item in the questionnaire. The overall scores of the DASS-21 scales were expressed as mean (SD) and statistical analysis was performed using SPSS software. Model of Depression-Anxiety-Stress was analysed using Smart PLS-SEM software to investigate the effect of VPE towards each subscale for mental health status.

RESEARCH FINDINGS

The study has included 84 respondents from Johor community in the southeast Malaysia.

Demographic Data

The majority of the participants aged 20 to 29 years old (68/84, 77.3%) and most of them are participants in the VPE programme (71/84, 80%) compared to the instructor of the programme (8/84, 9%) and coaches (6/84, 6.8%). 84.1% of the participants are students who follow the online programmes instructed by their respective teacher or lecturer or part of their assignments.

Mental Health Status

The first subscale for DASS-21 was depression. Figure 1 shows the score percentage and there was significant differences in the scores before and after involvement with VPE programme.

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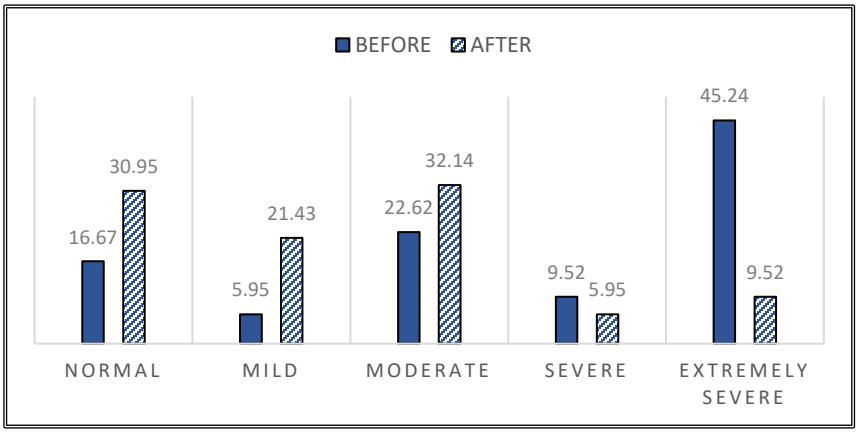
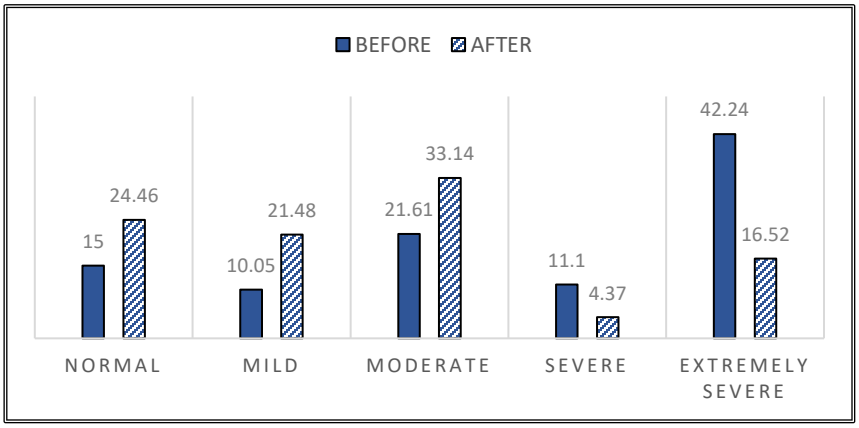
Figure 1: Percentage of Depression score according to the participant responses



It can be seen that before joining the VPE programme, the status of extremely severe and severe score for depression is high (45.24% and 9.52% respectively) and it reduced significantly after joining the VPE programme (9.52% and 5.95%). As for the moderate, mild and normal scores for depression, it increased significantly thus indicated positive effect towards depression level. Figure 2 illustrates the anxiety's score status before and after involvement with VPE programme.

Figure 2: Percentage of Anxiety score according to the participant responses



Similarly with depression score, results for anxiety also show significant decreasing for extremely severe and severe status whilst, for normal, mild and moderate score status it increased after joining the VPE programme thus indicated positive impact towards anxiety level. Figure 3 displays score for stress subscale and the findings is aligned with depression and anxiety where it shows significantly dropped in extremely severe and severe score. Normal score has increased tremendously after joining the VPE program thus emphasized the positive impact of VPE towards stress level.

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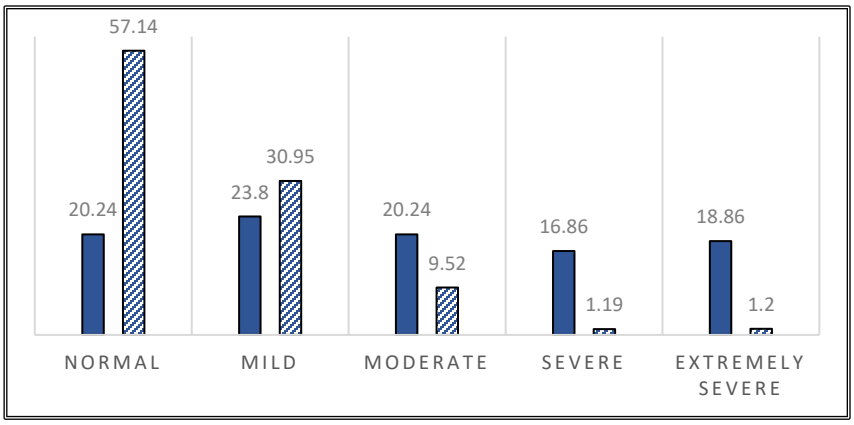
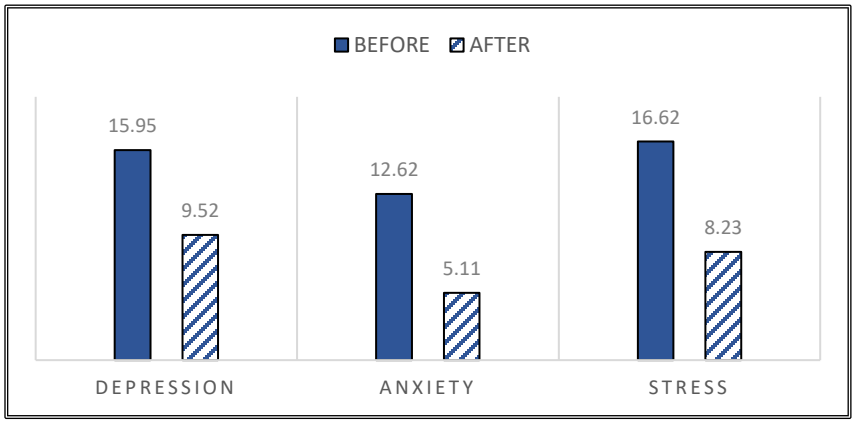
Figure 3: Percentage of Stress according to the participant responses



Overall, depression, anxiety and stress subscales has shown similar pattern where before involving with the VPE programme, all scores are high especially for extremely severe status and after involving with the VPE programme, all scores have reduced significantly.

Figure 4 illustrates the mean score of DASS-21. The mean scores for all subscales after the VPE programme (9.52 for depression, 5.11 for anxiety and 8.23 for stress) were significantly lower than before joining the VPE programme (15.95 for depression, 12.62 for anxiety and 16.62 for stress).

Figure 4: Mean score of DASS-21



The mean scores for DASS-21 subscales after involving with the VPE programme (8.2 for depression, 5.1 for anxiety, and 9.5 for stress) were significantly lower compared to the before joining the VPE (16.6 for depression, 12.6 for anxiety, and 15.9 for stress). This results indicated that the VPE program has successfully reduce the level of depression, anxiety and stress of the participants.

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(i) Paired t-test before and after involvement with VPE programme

Paired t-test analysis was conducted to compare the level of mental health status before and after involvement with the VPE programme. The corresponding results for the t-test analysis as shown in Table 1.

Table 1: Paired T-test analysis results

Mental health status	Involvement with VPE programme	Mean	t	p
Stress	Before	16.61	7.3	.000
	After	8.23		
Anxiety	Before	12.61	8.6	.000
	After	5.11		
Depression	Before	15.95	5.60	.000
	After	9.52		
Overall	Before	45.19	7.51	.000
	After	22.88		

Table 1 shows that there are significant differences before and after involving with the VPE programme, with mental health results of stress (t=-7.3, p=0.000), anxiety (t=8.6, p=0.000) and depression (t=5.6, p=0.000) and overall (t=7.51, p=0.000) for mental health status. The results indicated that the mean value for participants after involvement with VPE programme is lower compared to before VPE programme. The overall mean scores after the VPE programme were 22.88. It is significantly lower than before involvement with the VPE programme (45.19) thus shows the positive impacts of the VPE programme and the improvement of the participant's mental health status.

Model of Depression-Anxiety-Stress using Smart PLS-SEM

The Depression-Anxiety-Stress model using Smart PLS-SEM was analysed before and after the participant had involved with the VPE programme.

i) Measurement Model

The measurement model was assessed by examining the loadings, average variance extracted (AVE) and composite reliability (CR) as suggested by Hair et al. (2019) and Ramayah et al. (2018). More specifically, the fulfillment of following three criteria was assessed: all indicator loadings should exceed 0.5, the AVE for each construct should be greater than 0.5 and the CR should exceed 0.7. Findings of this study shows that all the indicator loadings are above 0. 5 (0.585 to 0.88), the CA value range above 0.7 from 0.839 to 0.866 (*high reliability*);CR values range above 0.7 from 0.80 to 0.90 (*high reliability)*, and the AVE value ranges above 0.5, from 0.544 to 0.694 (*high reliability)*.All three conditions for reliability and convergent validity of the measures thus hold.

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Figure 5: Path coefficient loading for Depression, Anxiety and Stress subscales Before and After Virtual Physical Exercise programme

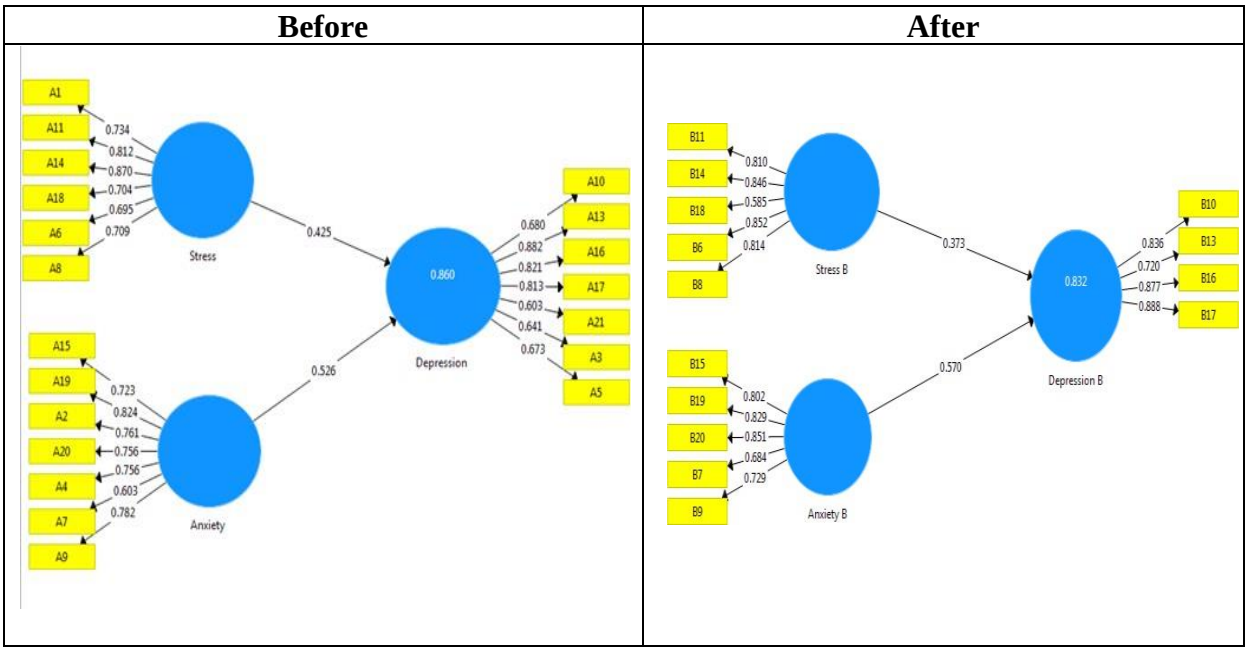

Figure 5 illustrates factor loadings for depression, anxiety, and stress before and after engaging with VPE programme. It can be summarized that before involvement with VPE programme, the correlation between each scale is weak ($p>0.05$) and it significantly correlated after involvement with VPE programme ($p<0.05$).

Table 2: Discriminant validity

Before VPE				After VPE			
	Anxiety	Depression	Stress		Anxiety	Depression	Stress
Anxiety	0.747			Anxiety	0.782		
Depression	0.909	0.737		Depression	0.893	0.833	
Stress	0.902	0.899	0.757	Stress	0.865	0.866	0.788

In addition, to assess the discriminant validity, a more recent criterion called Heterotrait-monotrait ratio (HTM) suggested by Henseler et al. (2015) was used, instead of the Fornell & Larcker (1981) criterion. If the HTMT ration is less than 0.85, then the constructs are distinct. As shown in Table 2, almost all the ratios are less than 0.85 and together with the CA value, it can be considered as high reliability, thus, discriminant validity was also confirmed. Overall, discriminant validity value for this model was greater than 0.7 and can be accepted to supports the discriminant validity between the constructs.

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ii) Structural Model

The structural model has analysed the path coefficients, standard errors, *t*-values and *p*-values using a 5,000-sample re- sample bootstrapping procedure. As shown in Table 3, t-value ranges above 1.96 from 2.734 to 4.444 and p-value ranges lower 0.05 from 0.006 to 0.000. According to the Hahn & Ang (2017), t-value more than 1.96 together with *p*-values less than 0.05, the structure model validity can be confirmed. Thus, the structural model obtained from this study has confirmed all the items are significantly correlated.

Table 3: Path Coefficients

Before			After		
	T- value	P-value		T- value	P-value
Anxiety→Depression	4.182	0.000	Anxiety→ Depression	4.444	0.000
Stress→Depression	3.367	0.001	Stress →Depression	2.734	0.006

Path coefficient value after engaging with VPE programme is lesser than 0.05 which indicated good, and each item were correlated to each other. Through these findings, it can be concluded that depression, anxiety, and stress are significantly correlated to each other after involvement with the VPE programme, thus summarized the virtual physical activities has impacted and improved the mental health positively.

DISCUSSIONS

Findings has shown that exercise virtually was significantly correlated with mental health status. These findings also supported by Zeng et al. (2018) stated that exercising using virtual reality technology could have positive effects on mental disorder especially on anxiety and depression. Grasdalsmoen et al. (2020) also mentioned that physical activity and exercise could treat the psychological disorder and improve lifestyle.

The Covid-19 pandemic had lots of negative impact and Deng et al. (2020) has found that community were forced to change and adapt with new norm of lifestyle to prevent the spreading of the virus. Well-being is crucial for individual to have good physical & mental health. During MCO, most people get a high level in stress, anxiety and depression due to the quarantine situation and social distancing. Thus, the VPE programme, it somehow gives alternative way of these people to escape boredom and restriction by engaging with others using technology.

The VPE is significantly affected by improving the spirituality inside each individual through physical exercise and interaction online. This led to the reduction of stress and anxiety. Stress and anxiety significantly correlated with the depression as the finding shown thus, people could avoid dropping into depression when they are less stressed and less anxious.

Findings have shown that variables related to the home-based environment has significant changes before and after the VPE programme and these can be supported by previous studies (Ghram et al., 2021; Mittaz Hager et al., 2019) that explained through home-based exercises, it

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can improve individual's well-being psychologically and physically. While exercising at home, individual could control their own exercise duration, surrounding's condition (if they prefer to have cooling sensation, they could turn on their air conditioning or if they prefer natural warm and nice breeze environment, they could just open their windows to let the natural air come in and etc.) and also they have unlimited access to the drinks and snacks as interval rest between the exercises. These factors undoubtedly have indirect contribution to enhance the quality of mental health status during this difficult time of the COVID-19 pandemic.

CONCLUSION

It can be concluded that during the MCO, all participants have higher rate of extremely severe for mental health status. After engaging with the VPE programme, the mental health status reduced tremendously and significantly. The level for mental status was Normal for most participants indicated that the VPE programme could improve psychological well-being. Thus, it can also be summarized that the VPE programme was significantly influenced and correlated with mental health status in the aspect of depression, anxiety, and stress.

Therefore, considering the restrictions on outdoor activities, sports facilities and fitness centres will be prolonged, especially if it involves mass physical activities such as aerobic. It could be suggested that exercise using modern technology via online platform and application could help the community maintain a healthy lifestyle in the future.

The limitation of this study was the participants only involved the Johor community in the southeast Malaysia. It would be great for future study to include overall population in Malaysia to grasp the overall picture regarding these mental health issues and the implementation of the VPE programme among Malaysian during this COVID-19 pandemic and MCO situation. According to the Pendit & Choo (2020), the awareness and perception of the society towards psychological disorder should be more widespread, open and acceptive thus, future study could help in providing supportive, healthier and better environment.

ACKNOWLEDGEMENT

The paper was funded by Fundamental Research Grant Scheme (FRGS); FRGS/1/2020/SSI0/UTM/02/1 (R.J130000.7853.5F312) under the Ministry of Education (MOE).

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Journal of Social Sciences and Humanities

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