

## ORIGINAL ARTICLE

# Effectiveness of Online Health Education on Healthy Diets and Regular Exercises in Achieving a Health Related Quality of Life During This Pandemic Era

Regidor III Dioso<sup>1</sup>, Sandeep Poddar<sup>1</sup>, Bibi Florina Abdullah<sup>2</sup>, Hafizah Che Hassan<sup>2</sup>

<sup>1</sup> Faculty of Science, Lincoln University College, Wisma Lincoln, No. 12-18, SS6/12 Off Jalan Perbandaran, 47301 Petaling Jaya, Selangor D. E. Malaysia

<sup>2</sup> Faculty of Nursing, Lincoln University College, Wisma Lincoln, No. 12-18, SS6/12, Off Jalan Perbandaran, 47301 Petaling Jaya, Selangor D. E. Malaysia

## ABSTRACT

**Introduction:** Online health education was the norm to maintain physical distancing during this pandemic era (2020-2021). Furthermore, the generation 5.0 in this era prefers online communication since they needed to stay at home. On account of these issues, this study aimed to investigate an online health education module on healthy diets and regular exercises in achieving a health related quality of life. **Methods:** A total of 301 respondents were enrolled. The RAND SF-36 survey questionnaire was used for pre- and post-testing the eight domains of the health related quality of life. The online health education on healthy diets and regular exercises as the intervention were investigated in three phases where all phases were completed in 12 months minimum. **Results:** The eight domains of the health related quality of life ( $p \leq 0.05$ ) was achieved. Specifically, the general health ( $72.700 \pm 41.1$ ,  $p0.00915$ ), physical functioning ( $82.3200 \pm 51.8$ ,  $p0.0015$ ), role physical ( $92.02 \pm 41.06$ ,  $p0.001$ ), role emotional ( $72.706 \pm 21.12$ ,  $p0.00$ ), social functioning ( $96.09 \pm 48.727$ ,  $p0.0012$ ), bodily pain ( $99.3 \pm 69.128$ ,  $p0.015$ ), vitality ( $62.7 \pm 31.08$ ,  $p0.0104$ ), and mental health ( $72.35 \pm 41.18$ ,  $p0.00455$ ) were achieved. **Conclusion:** Using an online module for healthy diets ( $70.56 \pm 20.93391$ , 210%) and regular exercises ( $78.44 \pm 18.85421$ , 188%) as a strategic intervention was effective ( $p \leq 0.05$ ) during this pandemic era.

**Keywords:** Health belief model, Psychosocial functioning, Digital technology, Compulsive exercise, Sustenance

## Corresponding Author:

Regidor III Dioso, PhD

Email: duke@lincoln.edu.my

Tel: +60192072151

## INTRODUCTION

In this pandemic era, quality of life should be health related. Since December 2019 up until the year 2021, the novel Coronavirus-19 (COVID-19) with its changing epidemiology has taken more than a million lives globally affecting the health related quality of life (HRQOL) (1–4). The constructs of the HRQOL on the eight domains were bodily pain (BP), general health (GH), mental health (MH), physical functioning (PF), role emotion (RE), role physical (RP), social functioning (SF), and vitality (VT) (5,6). These domains came from the original set of the short form-36 (SF36) survey from the Medical Outcome Study (MOS) and it was disseminated by the RAND Corporation (7,8).

Going back to the problem of the pandemic of COVID-19, it gave birth to the new normal of physical

distancing since the world population overwhelms the number of vaccines that needs to be produced to curtail the increasing incidences of this infection (4,9). Due to the insufficient production of the vaccines (10), revolutionized interventions were necessary to be developed in order to achieve significant domains of the HRQOL (11). This came about to the hypothesis that healthy diets and regular exercises can achieve a HRQOL (11–15).

However, from years 2020 to 2021, most of the places globally have not allowed exercises on fitness centers to open and personal diet counselling was to be avoided as physical or close contacts may spread the COVID-19 infection. Online health education on healthy diets and regular exercises hence became a strategic intervention to curtail the increasing outbreak of COVID-19 and achieve a significant HRQOL.

Thus, emphasis on the use of online communication despite the lockdown made everyone only stay at home and avoided close encounters from diet counsellors and physical fitness trainers. Therefore, an online health

education on healthy diets and regular exercises were necessary to be developed.

Thus this study was aimed to investigate the effectiveness of online health education on healthy diets and regular exercises in achieving a HRQOL in this pandemic era.

## MATERIALS AND METHODS

A-301 participants were enrolled using inclusion and exclusion criteria. The inclusion criteria were Malaysian adults ages 21-55 years old, English reading Malaysians, born and residing within the area of Klang Valley. The exclusion criteria were below 21 years of age, more than 55 years old, non-residents of Klang Valley, and Malaysians who were non-English readers.

The online health education on healthy diets and regular exercises was used as an interventional tool for this study. The development of this tool primarily sought the advice of dieticians and physical therapists. Consultations from web designers were also sought for developing the research instrument using the website WordPress.com having a backend and a login interface that enabled us to make changes and/or add more contents. A thorough systematic review of the content was also initiated using the food pyramid guideline of the Malaysian Ministry of Health (16). This online tool was disseminated through snowball sampling technique with a website link sent via WhatsApp, Facebook messenger, Telegram, Instagram, and WeChat social networking applications installed to their Android and/or IOS handheld devices. A thorough selection of participants enrolling who were interested on joining the experiment lasted for 6 months.

Finally, sensitivity test was done on the online health education module before data collection. The data collection was done in 3 phases.

### Phase 1: Initial survey

An online written consent was obtained embedded on the interventional webpage tool that also contains the inclusion and exclusion criteria. The prospective subjects were also instructed to key in their social network identifications such as names, home addresses, email addresses, and their Malaysian identification numbers to confirm the criteria of age and residential inclusions before they could browse further on the online webpage tool. The online webpage tool would not allow the prospective participants to be enrolled if they belong to the exclusion criteria. Participants who instantly passed the inclusion and exclusion criteria in the online webpage tool immediately proceeded to an initial survey using the RAND SF36 as pre-test with the eight domains of the HRQOL (5,17). Once the RAND SF36 survey was completed every participants were telephone called via social networking applications on handheld devices to make them understand more survey terminologies found in the online tool before the healthy

diets and regular exercises as interventions commenced.

Survey terminologies on exercises were explained especially the basal metabolic rate (BMR) found in the online webpage. The Mifflin-St.Jeor formula was used for surveying the BMR (18–21). The BMR in calories calculation was explained for men using the values  $88 + (13.4 \times \text{kilograms of their current weight}) + (4.8 \times \text{centimeters of their current height}) - (5.6 \times \text{age years})$ . The BMR in calories was explained for women using the values  $448 + (9 \times \text{kilograms of their current weight}) + (3 \times \text{centimeters of their current height}) - (4 \times \text{age years})$ . The participants needed to key in their BMR.

Lean body mass (LBM) calculation was also surveyed for diet indicator. Men were essentially about 2-5% while a 10-13% LBM kcals/day were for women; athletic men were about 6-14% LBM kcals/day and women 14-20% LBM kcals/day; men doing fitness were about 14-17% LBM kcals/day and women 21-24% LBM kcals/day; acceptable for ordinary men were about 18-24% LBM kcals/day and women 25-31% LBM kcals/day. The obese men were about 25% LBM kcals/day and women 32% LBM kcals/day. This was further explained that if a male participant in this intervention weighs 200lbs falling in the category of the obese, it was multiplied by 0.25 (25%) = 50lbs, so the initial calculation would be: 200lbs minus 50lbs = 150lbs (68kgs). The final kcals/day that the obese participants in the example needed to key in, was calculated using  $68\text{kgs} \times 0.25$  (25% for male obese) was equal to 17 kcals/kg/day.

Once the initial survey was completed, the enrolled participants browsed further on the online webpage to commence healthy diets and regular exercises modular program as the research intervention tool for this study. Thus began the implementation stage.

### Phase II: Implementation stage

The 301 respondents enrolled on phase II underwent the healthy diets and regular exercises as online programs. The participants on this phase implemented the intervention for 6 months.

The recommended healthy diet regimens were (1) Mediterranean, (2) South beach, (3) Ketogenic, and (4) Vegan diets. The recommended regular exercise regimens were: (1) low, (2) moderate, and (3) high intensities. These recommendations were all in detail with daily menus for healthy diets, and specific regular exercising patterns found in the online webpage as an interventional tool.

The typical standard recommended dietary intake in kcals/kg/day are 25-30 kilocalories per kilograms per day among the healthy and normal individuals; while 30-35 kilocalories per kilograms per day among the moderately ill, injured, or malnutrition; and 35-40 kilocalories per kilograms per day among the critically

ill or injured individuals (18,19,22). Another way is to use the BMR multiplied to specific activity factors to get their daily caloric intake needed per day. For “sedentary (little or no exercise) BMR” (22 p. 208, 23 p. 4), it was multiplied to 1.2 activity factor. For “lightly active (light exercise/sports 1-3 days/week) BMR” (22 p. 208, 23 p. 4), it was multiplied to 1.375 activity factor. For “moderately active (moderate exercise/ sports 6-7 days/week) BMR” (22 p. 208, 23 p. 4), it was multiplied to 1.55 activity factor. For “very active (hard exercise every day, or exercising twice/day) BMR” (22 p. 208, 23 p. 4), it was multiplied to 1.725 activity factor. For “extra active (hard exercise) BMR” (22 p. 208, 23 p. 4), it was multiplied to 1.9 activity factor.

The participants lost kilocalories, burned through regular exercise programs, assessed using their BMRs; and they were also given simple exercise advises using the Harris-Benedict equation estimates (24). For participants with sedentary lifestyle, very lite exercises were advised, enough to burn 500 calories per day. While lite exercises were advised, enough to burn up to 1,500 calories per day. Moderate to heavy exercises were advised, enough to burn up to 2,000-2,500 calories per day. If the participants chose the high-intensity-interval-training option, they were advised to burn up to 3,000 calories per day. Description of the exercises with demonstrations ranging from lite to moderate to high intensity were also found on the interventional webpage tool as an online health education module.

Phase III: HRQOL post-intervention investigation stage  
The 301 participants again answered the RAND SF36 survey questionnaire as the post-test for the HRQOL with eight domains (6,7) sent through social networking after successfully completing the 6 months program. Participants were again followed-up through, to answer the post-test via WhatsApp, Facebook messenger, Telegram, Instagram, and WeChat social networking applications installed to their Android and/or IOS handheld devices for further explanation of the content of the RAND SF36 survey.

### Data analysis

The paired t-test was used to measure the pre- and post-test of the HRQOL. The median differences between healthy diets and regular exercises were shown in a linear quadratic coefficient of concordance test. The constructs in the HRQOL on the eight domains are BP, GH, MH, PF, RE, RP, SF, and VT. A pilot study was conducted to test the outliers for the online module on healthy diets and regular exercises using a sensitivity test.

### Ethical Clearance

The present study has been ethically approved by the institutional Ethics Committee of Lincoln University College with ref number LUC/1510/PhDHS/0131151019604L, dated 10th April 2018. All

participants' identity were kept confidential.

## RESULTS

Specifically, the domains of the HRQOL achieved after 6 months of healthy diets and regular exercises were GH ( $72.700 \pm 41.1$ ,  $p0.00915$ ), PF ( $82.3200 \pm 51.8$ ,  $p0.0015$ ), RP ( $92.02 \pm 41.06$ ,  $p0.001$ ), RE ( $72.706 \pm 21.12$ ,  $p0.00$ ), SF ( $96.09 \pm 48.727$ ,  $p0.0012$ ), BP ( $99.3 \pm 69.128$ ,  $p0.015$ ), VI ( $62.7 \pm 31.08$ ,  $p0.0104$ ), and MH ( $72.35 \pm 41.18$ ,  $p0.00455$ ). The t-test on table I shows the distribution of pre- and post-test of the HRQOL that was same across the categories of healthy diets and regular exercises (sig. 0.00).

Table I: Diet and exercise pre- and post-test

Table 11 Diet and exercise pre- and post-test					
	Paired Differences		t	df	Sig.
	95% C. I.				
	Lower	Upper			
Pre-test	-74.71374	-66.40626	-33.706	99	.000
Post-test	-82.18108	-74.69892	-41.603	99	.000

Using the regression test, the median difference between healthy diets and regular exercises in achieving a HRQOL after 6 months, is significant at  $p \leq 0.05$ . This means that diet is related to exercise and vice versa in achieving a HRQOL. The distribution of healthy diet (fig. 1) and regular exercise (fig. 2) using the linear quadratic coefficient of concordance test shows an acceptable significance of  $p \leq 0.05$ . Table II shows the specified healthy diets and regular exercises of the respondents in a frequency distribution.

Healthy diets improved the participants' overall HRQOL ( $p \leq 0.05$ ) because most of them adhered to a regular exercise. The participants led to a significant VT ( $17.9 \pm 7.3$ ,  $p \leq 0.05$ ) and PF ( $19.9 \pm 6.6$ ,  $p \leq 0.05$ ) domains

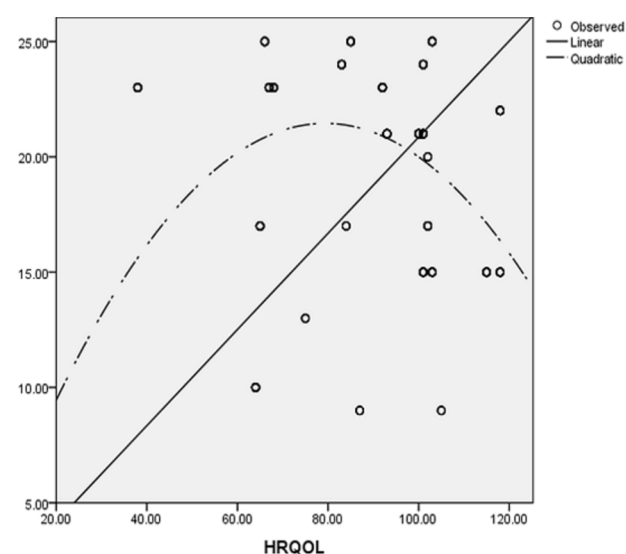
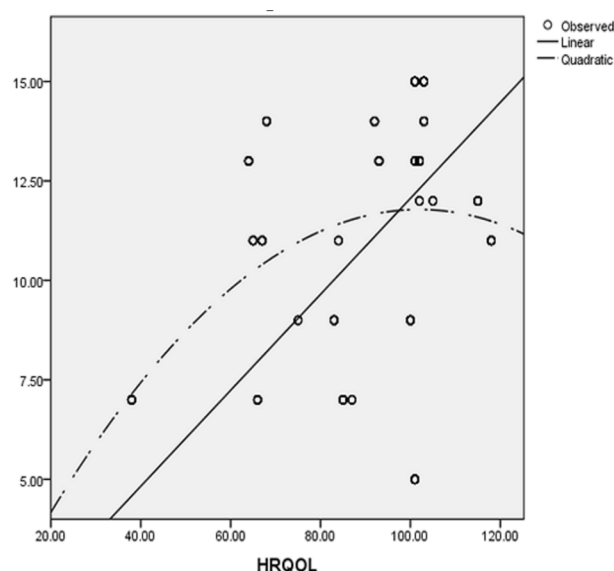


Figure 1: Diet. Acronym HRQOL is defined as the health related quality of life. The quadratic line should regress by falling down on the linear.



**Figure 2: Exercise.** Acronym HRQOL is defined as the health related quality of life. The quadratic line should regress by falling down on the linear.

**Table II: Distribution of participants' healthy diets and regular exercises**

Interventions	Indicators	n	%
Low impact exercises	exercises on mats	33	11.0
	outdoor exercises	60	19.9
	brisk walking and climbing	42	14.0
	all of the above	28	9.3
	none of the above	138	45.8
	Total	301	100.0
Moderate impact exercises	exercises with weight lifting	33	11.0
	exercises with running and jumping	60	19.9
	exercises with use of equipment	42	14.0
	all of the above	28	9.3
	none of the above	138	45.8
	Total	301	100.0
High intensity interval training	every day	18	6.0
	every week	22	7.3
	every month	70	23.3
	all of the above	42	14.0
	none of the above	149	49.5
	Total	301	100.0
Mediterranean diet	daily	8	2.7
	weekly	18	6.0
	monthly	88	29.2
	any of the above	18	6.0
	none of the above	169	56.1
	Total	301	100.0
South beach diet	daily	8	2.7
	weekly	18	6.0
	monthly	88	29.2
	any of the above	18	6.0
	none of the above	169	56.1
	Total	301	100.0
Low fat low salt diet	daily	8	2.7
	weekly	18	6.0
	monthly	88	29.2
	any of the above	18	6.0
	none of the above	169	56.1
	Total	301	100.0
Ketogenic diet	daily	8	2.7
	weekly	18	6.0
	monthly	88	29.2
	any of the above	18	6.0
	none of the above	169	56.1
	Total	301	100.0
Vegan diet	daily	28	9.3
	weekly	28	9.3
	monthly	113	37.5
	any of the above	32	10.6
	none of the above	100	33.2
	Total	301	100.0

by doing regular exercises that strengthened the muscles and body compositions. Furthermore, the participants had a significant control on pain addressing the BP domain ( $4.9 \pm 2.1$ ,  $p \leq 0.05$ ). It maintained a significant health in general and boosted the immune system addressing the domains called GH ( $12.7 \pm 5$ ,  $p \leq 0.05$ ) and RP ( $4.5 \pm 0.6$ ,  $p \leq 0.05$ ). Healthy diets and regular exercises regimes of the participants reduced depression of staying most of the days at home by stabilizing the endorphins achieving the MH ( $22 \pm 9.2$ ,  $p \leq 0.05$ ) and the RE ( $3.1 \pm 0.33$ ,  $p \leq 0.05$ ) domains.

## DISCUSSION

Most of the eight domains of the HRQOL was achieved despite of the COVID-19 pandemic. Some of the domains had higher deviations such as the MH ( $22 \pm 9.2$ ,  $p \leq 0.05$ ) and RE ( $3.1 \pm 0.33$ ,  $p \leq 0.05$ ). However, the study was conducted in Klang Valley, Malaysia being its limitation and therefore should it be generalized in other settings, it should be taken with caution considering the norms that affects the MH and RE domains. The Klang Valley had been in a movement control order and most of the participants were locked down at their homes affecting their SF, MH, and RE addressing the psychological domains (11) which healthy diets and regular exercises can also help improve. That was why an online health education was applicable in Malaysia to avoid physical or close encounters and ensure that everyone stays holistically healthy at home most of the time. Nevertheless, it was acknowledged that mentoring diets and exercises were generally appropriate before and after the pandemic era (2020-2021) even if it was not done online and regardless of settings.

We applied several roles of mentoring (25–28) using the online health education where we found some challenges among the participants as it was not easy to mentor them using social networking software applications. Some of the participants had difficulties understanding the calculations found on phase 1, while others kept changing their body weight every month so we needed to readjust the details. That was why almost 80% of the participants at the year 2018 before the lock down in Klang Valley, who started their phase 1 has ended up commencing with their phase 2 during the pandemic era (year 2020). In addition, our communication when mentoring the participants on their healthy diets and regular exercises regimens was limited to *WhatsApp*, *Facebook messenger*, *Telegram*, *Instagram*, and *WeChat* social networking software applications installed to their Android and/or IOS handheld devices. Some of these software applications would not work in other countries like the mainland China, and most of the participants were travelling during phase 1 before the pandemic (year 2020) started.

The strength however in mentoring healthy diets and regular exercises to our participants online was the



user-friendliness of our selected webpage called the *WordPress.com* and it has interactive demonstrations which were an important aspect in mentoring. In addition, the icons were simple to understand and the process of logging into the webpage was not a hustle for the participants enrolled in this study. The experiences of the participants logging-in online were a lot simpler since the 5-G online connection in Klang Valley during the pandemic era was fast enabling the participants to browse on to the webpage anytime they deemed it necessary to recall their specific healthy diets or regular exercises regimens. However, the *WordPress.com* needed monthly payment to upload personal videos in digital multimedia container formats. Therefore, we converted the interactive mentoring strategy to personalized videos as moving graphic interchange formats or linked the exercise skills demonstration in YouTube channels, as it was a free-of-charge strategy. Nevertheless, we were successful in mentoring healthy diet regimens and specific regular exercise demonstrations to the enrolled participants in an interactive way (using moving graphic interchange formats or linking skills demonstration into YouTube channels).

Generally, the online health education on healthy diets were important but must be combined with regular exercises to strengthen the immune system against any forms of infection (29,30) addressing the GH domain. In vice versa, regular exercises were also as important but must also be combined with a healthy diet following stress (12,31) addressing the VT, PF, and RP domains. It was also noteworthy to ensure a good rest after exercise in order to help the body recover from an injured state (32,33) addressing the BP domain.

Overall, despite the limitations of the socio-demographic inclusion criteria such as the age, and the residential areas of the enrolled participants, this study was still able to investigate the effectiveness of healthy diets and regular exercises with evidences of the achieved eight domains of the HRQOL. However, we did not explore further if all the enrolled participants were truthful in answering the RAND SF36 survey after completing the 6 months diet and exercise regimens (phase 2) addressing the biases of this study. Hence, a mixed method is recommended.

## CONCLUSION

Nevertheless, it was still concluded that healthy diets and regular exercises was investigated to be effective in achieving the eight domains of the HRQOL during this pandemic era ( $p \leq 0.05$ ). Using the linear quadratic coefficient of concordance test, a healthy diet was related to a regular exercise and vice versa. It was also concluded that online interventional strategies on healthy diets and regular exercises were more appropriate in this pandemic era to achieve a significant HRQOL.

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