



A Preliminary Mixed Methods Study of Health-Related Quality-of-Life at Three Regional Universities in Cambodia

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Abstract

The range of outcomes and published record on the Transcendental Meditation technique across 50 years of research in education, business, and government makes its application unique. Its association with health and relation to an individual's quality-of-life have also made the technique useful in some developing countries.

Data related to application of the technique to higher education in Cambodia have been accruing since the early 1990s. The 26-year research program begun by these authors associated with Transcendental Meditation and non-verbal intelligence, post-traumatic stress disorder, anxiety, depression, learning, memory, and personality in university students, as well as its collective effects on economic and social indicators and reductions in socio-political violence and crime, makes for an uncommonly rich body of knowledge in a country where empirical research has been rare.

The present study extends that program to include an investigation of the practice of Transcendental Meditation by faculty in three regional Cambodian universities and examines its impact on health-related quality-of-life. Findings generated by a concurrent, quasi-experimental mixed methods design suggest the practice may be of benefit to university personnel as measured by health, self-esteem, anxiety, and depression, among other quality-of-life variables, thereby adding to previous results associated with higher education in this increasingly important south-east Asian nation. Affirmative quantitative and qualitative results derived from MANOVAs, Hedges' effect sizes and semi-structured interviews related to ten quality-of-life indicators have been reported.

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Introduction

Practice of the Transcendental Meditation technique by students, faculty and staff of colleges and universities has been a feature of the global higher education landscape since the 1970s (e.g., Beaufort, Bonshek, & Fergusson, 1997; Dillbeck, Aron, & Dillbeck, 1979; Jones & Akura, 2017). Indeed, the practice was introduced to Cambodian higher education and society in the early 1990s (Fergusson & Bonshek, 2013, 2017). For example, in January 1993 550+ undergraduate students learned Transcendental Meditation during their inaugural year at Maharishi Vedic University (MVU), with several thousand more learning the practice in subsequent academic years along with hundreds more learning the advanced Transcendental Meditation-Sidhi program (Fergusson & Bonshek, 2017).

As part of that initiative to help reinvigorate Cambodia's higher education and healthcare sectors, officials and ministers of the Cambodian People's Party of the State of Cambodia learned the practice along with 300,000 people over a six-month period benefiting from Ayurvedic medical consultations provided free-of-charge to Phnom Penh residents during 1991-1992 (Australian Aid for Cambodia Fund, 1993). In addition, personnel of all ranks in the United Nations Transitional Authority of Cambodia (UNTAC) during 1992 and 1993 and a number of foreign ambassadors to Cambodia, also learned the practice as an integral part of a larger-scale peace effort.

Literature Review

Prior research conducted since 1970 indicated that Transcendental Meditation has a salutary effect on the mental, physical, and behavioural health of practitioners, and this global research program has been well documented in the published literature (Chalmers, Clements, Schenkluhn, & Weinless, 1989a, 1989b, 1989c; Dillbeck, 2011, 2013; Orme-Johnson & Farrow, 1976; Wallace, Orme-Johnson, & Dillbeck, 1990). Indeed, more than 600 published findings beginning in 1970 suggest the practice contributes to the quality-of-life of individuals, families, schools, workplaces and society more generally, as conceptualised by the mechanisms proposed in Figure 1.

In Figure 1, which highlights examples of research conducted across a 50-year period, we show the relationship between practice of the Transcendental Meditation technique and improved 'quality-of-life' (a construct associated with general 'well-being'

Robinson, 2015), with the shaded boxes representing the key elements of the present study). The practice has previously been associated with quality-of-life indicators. For example, it has been identified with increased brainwave coherence (Arenander & Travis, 2004; Travis, Haaga, Hagelin, Tanner, Nidich, & Gaylord-King, 2009), which has been associated with reduced depression, anxiety, and neuroticism and increased self-esteem and self-actualisation (Dillbeck, 1977; Alexander, Rainforth, & Gelderloos, 1991; Hjelle, 1974; Sakairi, 1992; Seeman, Nidich, & Banta, 1972), which in turn have been causally linked to an overall improvement in mental (i.e., psychological) health. Similarly, since the 1970s, research has shown the practice produces a profound state of physiological rest (Alexander & Sands, 1993; Dillbeck & Orme-Johnson, 1987; Wallace, 1970), along with other biochemical and functional markers of restfulness, and these have been associated with reduced levels of stress and stress reactivity, sickness, and medical and hospital utilisation rates (Barnes, Schneider, Alexander, Rainforth, Staggers, & Salerno, 2005; Gaylord, Orme-Johnson, & Travis, 1989; Herron, 2005; Orme-Johnson & Walton, 1998), decreased pathogenesis and progression of disease (Chhatre, Metzger, Frank, Boyer, Thompson, Nidich, Montaner, & Jayadevappa, 2013) and increased cardiovascular disease prevention and health promotion (Schneider, Walton, Salerno, & Nidich, 2006), which together have resulted in improvements to overall physical health and well-being (Alexander, Swanson, Rainforth, Carlisle, Todd, & Oates, 1993; Carlisle, 2005).

As a consequence of these impacts on mental and physical health, practice of Transcendental Meditation has also been associated with improved attitudes and behaviour, such as an increased capacity for warm relations with others and acceptance of aggression and improved moral reasoning (Barnes, Bauza, & Treiber, 2003; Jones, Clayborne, Grant, & Rutherford, 2003) including in the behaviour of society's most damaged individuals in maximum security prisons (Abrams & Siegel, 1978) and those addicted to non-prescription drugs (Aron & Aron, 1983). Research has thereby found that interpersonal relations at work and in the home (Broome, Orme-Johnson, & Schmidt-Wilk, 2005; Schmidt-Wilk, 2000) and an individual's social health improve as a result of the practice (Camelia & Hawkins, 2005; Hanley & Spates, 1978; Hawkins, Alexander, Travis, Camelia, Walton, & Dorchholz, 2003).

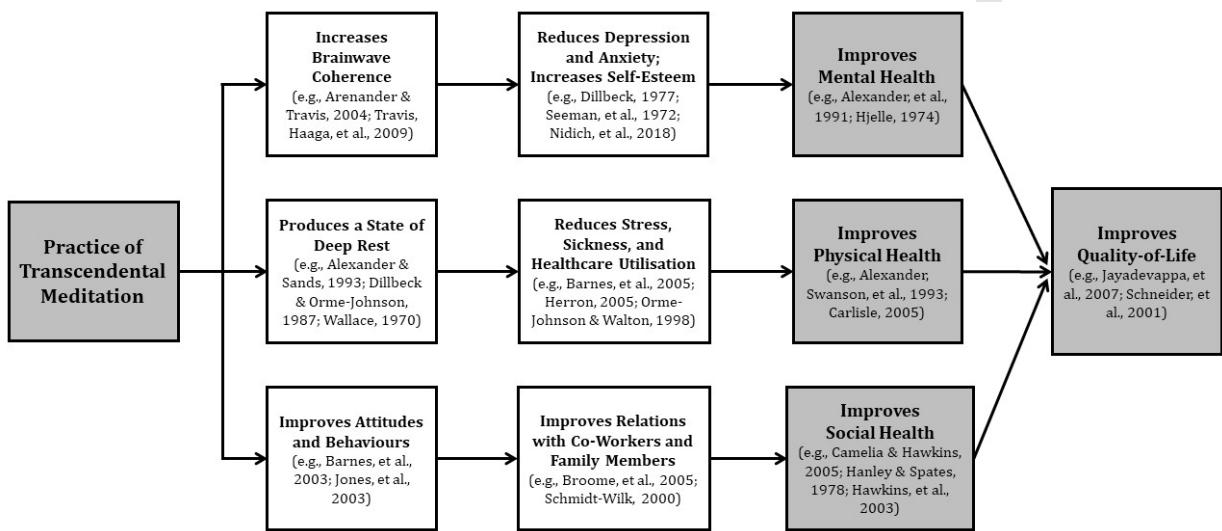


Figure 1 Conceptual model of Transcendental Meditation and its relationship to mental, physical and social health and to quality-of-life.

More recent research has found that practice of Transcendental Meditation is more effective in treating post-traumatic stress disorder (PTSD) than traditional methods of exposure therapy and health education (Nidich, Mills, Rainforth, Heppner, Schneider, Rosenthal *et al.*, 2018). Nidich, Mills, Rainforth, Heppner, Schneider, Rosenthal *et al.* (2018) showed that 61% of a sample of U.S. war veterans diagnosed with symptoms of clinical PTSD experienced improvements in severity of symptoms as a result of 12-weeks practice of Transcendental Meditation, compared to 42% of veterans who received prolonged exposure therapy and 32% who received health education alone. A similar trend in symptoms of clinical depression was also observed in that study. Together, the above studies indicate that Transcendental Meditation improves a person's quality-of-life (Jayadevappa, Johnson, Bloom, Nidich, Desai, & Chhatre, 2007; Schneider, Nidich, & Salerno, 2001).

Figure 1 proposes certain causal links between elements, for example between Transcendental Meditation > brainwave coherence > reduction in depression > improved mental health > improved quality of life. However, it is not within the scope of this paper to explain the theoretical framework for this model nor the causal links it posits, but such theory and supporting research have been presented in more detail elsewhere (e.g., Alexander, Boyer, & Alexander, 1987; Schmidt-Wilk, Orme-Johnson, Alexander, & Schneider, 2005).

Of relevance to this study is the research program conducted by these authors, beginning in 1993 with the advent of Maharishi Vedic University where the practice of Transcendental Meditation was incorporated into the curriculum, which investigated a range of outcomes, including those associated with increased non-verbal intelligence (Fergusson, Bonshek, & Le Masson, 1996), decreased PTSD symptoms and improved health characteristics of Cambodian undergraduates (Fergusson, Bonshek, & Boudigues, 1995), factors of relevance to higher education in Cambodia during the early 1990s (Fergusson, Bonshek, & Boudigues, 1994), and social, socio-political, and economic impacts (Fergusson, 2016a, 2016b; Fergusson & Cavanaugh, 2019). This research program has even been extended to analyses of Cambodia's history of higher education and teacher education and more recently to the role MVU played in revitalising them (Fergusson & Bonshek, 2013, 2017; Fergusson & Le Masson, 1997; Fergusson, Le Masson, & Bonshek, 1996).

However, application of Transcendental Meditation to the health of Cambodian university faculty and staff has not been explored. The primary purpose of this study is therefore to examine this potential impact using ten indicators (i.e., the dependent variables for this study), which have been referred to as measures of 'health-related quality-of-life' (HRQoL). As will be discussed below, six of these indicators are synonymous with 'functional health' and four are synonymous with 'dysfunctional health' according to

Parkerson and others associated with Duke University (Parkerson, 2002, 2014; Parkerson, Broadhead, & Tse, 1990; Parkerson, Wilke, & Hays, 1999). We ask the following research question (RQ): Did practice of the Transcendental Meditation technique have a salutary effect on the HRQoL of Cambodian university faculty and staff as measured by physical health, mental health, social health, general health, perceived health, self-esteem, anxiety, depression, pain and disability?

Research methodology

1. Research design

This study uses a concurrent, quasi-experimental mixed methods research design with a major quantitative (QUAN) strand and minor qualitative (qual) strand applied across a four-month, longitudinal control-treatment period. The pre- and post-test QUAN measure was applied to both the Control Group and Treatment Group, while the minor pre- and post-test qual measure was applied only to a sub-set of the Treatment Group, with a view to converging the Treatment Group QUAN and qual strands, as shown by the double-arrowed dotted line in Figure 2.

2. Participants

Three regional Cambodian universities were selected as investigation sites for this research. In co-operation with the management of 1) Cambodian University of Specialties (CUS) in Kampong Cham city, Kampong Cham, 2) Chea Sim University at Kamcheymear (CSUK) in Kamcheymear, Prey Veng, and 3) University of Management and Economics (UME) in Kampong Cham city, Kampong Cham, 39 faculty and staff members were selected for participation in this study. All participants in the study were native Khmers, and no demand characteristics (e.g., incentives to perform or other expectations) were utilised in the research. Twelve volunteer participants from CUS (Group One: female = 8; male = 4; age $M = 23.5$; $S.D. = 5.0$) and 11 volunteer participants from CSUK (Group Two: female = 4; male = 7; age $M = 26.0$; $S.D. = 7.2$) based on convenience, availability and scheduling. Fourteen participants in the UME group (Group Three: female = 7; male = 7; age $M = 29.8$; $S.D. = 11.3$) represented the faculty cohort who volunteered to learn the Transcendental Meditation technique as part of their employment benefits package. At pre-test, all groups were similar for gender and educational level, and a one-way analysis of variance (ANOVA) for the three groups yielded no significant difference in age ($F = 2.05$, $p = .14$). For this reason,

Groups One and Two were statistically amalgamated to form the Control Group and Group Three became the Treatment Group.

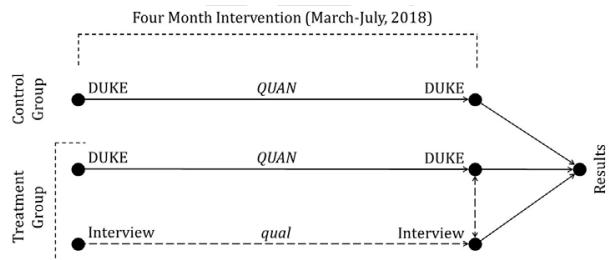


Figure 2 Concurrent, quasi-experimental mixed methods research design showing the relationship of QUAN and qual measures for control and treatment groups

Both the Control and Treatment Groups were pre-tested in March and post-tested in July 2018. All participants were administered the Duke Health Profile (DUKE) in single sessions at each university. Five volunteers from the Treatment Group (female = 2; male = 3; age M = 26.0) were interviewed at the end of each pre- and post-test session to provide qual data on HRQoL. Independent translators were in attendance to provide clarification on the meaning of any terms or phrases used in the DUKE and interviews, but faculty and staff participants, school and research administrators, and translators were blind to the purpose of the study. Attrition was a problem in this study, with approximately 20% of participants unavailable for post-QUAN testing due to scheduling; casewise completion analysis was used to minimise the effect of attrition.

3. Quantitative instrument

To measure the HRQoL construct, the DUKE was chosen for the QUAN strand of the study. The DUKE is a 17-item generic self-report, paper-and-pencil instrument containing ten measures of health function. These include six functional health measures of physical health (five items), mental health (five items), social health (five items), general health (15 items), perceived health (one item), and self-esteem (five items) (note, some of the 17 items in the DUKE are used in more than one measure of HRQoL). The score range for measures of health function are 0-100, with a higher score representing a higher level of health, self-esteem and perceived health.

The DUKE also includes four dysfunctional health measures of anxiety (six items), depression (five items), pain (one item) and disability (one item) (Parkerson, 2002; Parkerson, Broadhead, & Tse, 1990,

1991, 1992, 1996). The score range for measures of health dysfunction are 0-100, with a higher score representing a lower level of anxiety, depression, pain or disability. This study used a Khmer cross-translated version of the DUKE, which was developed and tested with permission in 1993 (Fergusson, Bonshek, & Boudigues, 1995), although the translation has not been validated (for example, by backward translation, per Hanh, Guillemin, Cong, Parkerson, Thu, Quynh, & Briançon, 2005) beyond an expert committee.

The DUKE's authors state the instrument is designed "to measure patient-reported health-related quality-of-life (HRQoL), i.e., functional health status, during a one-week time period" (Parkerson, 2002) and provide the following definitions for the ten variables. According to Parkerson (2002), the physical health scale measures physical capacity for ambulation (i.e., walking and running) and physical symptoms (i.e., sleeping, fatigue, and pain). The mental health scale measures psychological symptoms (i.e., depressed feelings and nervousness), cognition (i.e., concentrating), and personal self-esteem (i.e., like who I am, and give up too easily).

The social health scale measures participation in social activities (i.e., socialise with friends or relatives, and participate in group activities), and social self-esteem (i.e., not easy to get along with, comfortable around people, and happy with family relationships). The general health scale represents combined physical, mental, and social health by averaging the scores for those three scales. The perceived health scale scores the patient's selfassessment of overall health by a response to what extent s/he is "basically a healthy person" (Parkerson, 2002).

The self-esteem scale measures personal self-esteem (i.e., like who I am, and give up too easily) and social self-esteem (i.e., not easy to get along with, comfortable around people, and happy with family relationships). The anxiety scale measures anxiety with social self-esteem items (i.e., not easy to get along with, comfortable around people, and happy with family relationships), psychological symptoms (i.e., nervousness), and somatic symptoms (i.e., sleeping and fatigue). The depression scale measures depression with personal self-esteem items (i.e., like who I am, and give up too easily) and the psychological symptoms (i.e., depressed feelings) and somatic symptoms (i.e., sleeping and fatigue) that are used on the anxiety scale. The pain scale measures pain for "hurting or aching in any part of your

body" (Parkerson, 2002). The disability scale measures confinement to "home, nursing home, or hospital because of sickness, injury, or other health problem" during the preceding week (Parkerson, 2002).

Items used in the DUKE were derived from the 63-item Duke-UNC Health Profile (DUHP) based upon face validity and item-remainder correlations (Parkerson, Gehlbach, Wagner, James, Clapp, & Muhlbaier, 1981). Reliability of the DUKE has been confirmed by Cronbach alphas (0.55 to 0.78) and test-retest correlation coefficients ($r = 0.30-0.78$), and convergent and discriminant validity has been supported by score correlations between the DUKE and three other standardised instruments: (1) Sickness Impact Profile; (2) Tennessee Self-Concept Scale and (3) Zung Self-Rating Depression Scale (Parkerson, 2002, 2014; Parkerson, Wilke, & Hays, 1999).

Moreover, clinical validity has been supported by differences between the health scores of patients with clinically different health problems (Parkerson, 2002). For example, U.S. patients with painful physical problems have a DUKE physical health mean score of $M = 58$, while patients with only health maintenance problems have a mean score of $M = 84$ (scale: 0 = poorest health and 100 = best health). Patients with mental health problems have a DUKE mental health mean score of $M = 49$, in contrast to $M = 76$ for patients with painful physical problems and $M = 79$ for those with only health maintenance problems. A more detailed analysis of the DUKE's psychometric quality is provided by Parkerson (2002). The DUKE's authors have also adapted two of the DUKE's 17 items for use in the Adolescent Duke Health Profile (ADHP) and applied it for reliability and validity testing in 1,816 Vietnamese youths (Hanh, et al., 2005). The ADHP indicated satisfactory internal consistency, construct validity and test-retest reliability. ANOVAs, when tested at the $p \leq .05$ two-tailed level on each of the ten HRQoL measures of the DUKE in this study, showed that excepting mental health and self-esteem (which were borderline significant), there was no significant difference between Control Group and Treatment Group scores at pre-test on these measures: physical health: $F = 0.96$, $p = .39$; mental health: $F = 3.20$, $p = .05$; social health: $F = 1.27$, $p = .29$; general health: $F = 2.73$, $p = .07$; perceived health: $F = 0.71$, $p = .49$; self-esteem: $F = 3.89$, $p = .03$; anxiety: $F = 1.20$, $p = .31$; depression: $F = 2.05$, $p = .14$; pain: $F = 2.25$, $p = .12$; and disability: $F = 0.18$, $p = .82$.

Pearson product-moment correlation coefficient analyses at the $p \leq .05$ level were conducted on the ten pre-test HRQoL variables (e.g., between mental health and anxiety) as an informal check of the DUKE's construct validity.

4. Qualitative interviews

Interviews consisting of a series of nine demographic questions (asked at pre-test) and 12 semi-structured questions related to HRQoL (asked at pre- and post-test) were conducted for the Treatment Group qual strand. The demographic questions asked about place of birth, place of residence, educational background, current level of qualification, hobbies and interests, and current position and responsibilities in the university. The 12 semi-structured questions included: how would you describe your present state of physical health, any specific health problems, how would you describe your present state of mind, any specific mental health problems, are you generally nervous or anxious about life or work, do you participate in social activities outside of work, how frequently do you participate in social activities, are you happy in your home life, do you feel happy going to work each day, and are you happy with your present work circumstances? The following demographic data about the de-identified Treatment Group interviewees were obtained at pre-test:

Participant #1: OP is a 32-year old female born in Koak Kang commune in Kampong Cham province who currently resides in Sanghat Sambour Meas, Kampong Cham city. She has a Masters' degree in management but wishes to gain a Ph.D. and "start my own business". OP is chief quality assurance officer, responsible for registering and archiving student grades, and enjoys singing, sightseeing, and gardening.

Participant #2: BT is a 26-year old female born in Prasat commune in Prey Veng province who currently resides in Sanghat Sambour Meas, Kampong Cham city. She has a Masters' degree in accounting and finance and wishes to learn more about research in accounting and finance as a way of "strengthening my teaching quality". BT is chief financial officer, responsible for managing university cash flow.

Participant #3: TA is a 21-year old male born in Prasat commune in Prey Veng province who currently resides Sanghat Sambour Meas, Kampong Cham city. He has an undergraduate degree in management and currently serves as an administrative assistant responsible for managing students and attendant lists. TA listed "internet searching" as his main hobby but would also

like to pursue a Masters' and Ph.D. degree in the future.

Participant #4: RM is a 29-year old male born in Koyme commune in Bantaey Mean Chey province who currently resides in Snay Sambou Meas commune, Kampong Cham province. RM holds a Masters' degree in law and is the university's administrative deputy director responsible for managing staff, reporting student progress, planning and managing the school property and physical plant. He enjoys playing football and sightseeing while not at work; RM stated that he is not "seeking to expand my qualifications".

Participant #5: LN is a 22-year old male born in Prasat commune in Prey Veng province who currently resides in Sanghat Sambour Meas, Kampong Cham city. He is a student and part-time staff member who is working toward a degree in management and economics. LN is the university's cashier and helps with "cash management" at the university; he plays volleyball and enjoys "searching the internet", particularly YouTube, in his spare time.

5. Data analysis

A number of different analytical and explanatory processes were used in this study. In addition to the aforementioned ANOVAs, tests of difference (paired t-tests) and MANOVAs tested at the $p \leq .05$ two-tailed level between pre- and post-test Control Group and Treatment Group on casewise completion scores on the ten HRQoL dependent variables were conducted (Huck & McClean, 1975). Although the integer responses of the self-reported ratings are not normally distributed, simulation studies have offered strong support for the appropriateness of parametric analyses such as t-tests and ANOVA, even with as few as two or three ordered categories for each response item (Carifio & Perla, 2007; Harpe, 2015).

Hedges' effect sizes were calculated to measure the standardized difference between treatment and comparison (Hedges, 2008). Computing g for each variable and averaging provides a mean effect size for the phenomenon under investigation can be determined and note that Hedges' method is more suitable than Cohen's when group sample sizes are < 20 . Using Cohen's method of reporting effect sizes as a guide (Orwin, 1983), we have applied the following criteria: small to medium $g = 0.2-0.5$ (estimated bias never exceeds 0.4, according to Hedges, Pustejovsky, & Shadish, 2012); medium to large $g = 0.5-0.8$; large to extremely large $g > 0.8$, however we also recognise Hedges' (2008) caution about reporting effect sizes.

Given that the five pre- and post-test interview transcripts, which were translated from the original Khmer into English by co-authors four and five, did not consist of extensive (or rich) qual data but shorter descriptive statements, basic content analysis (Drisko & Maschi, 2016) was used to describe so-called 'manifest' or literal communications content. Coding of responses was carried out by two independent raters from the University of Southern Queensland (who were unaffiliated with this study and blind to its RQ and purpose) using basic content analysis of qual interview data.

Unlike interpretive content analysis, which requires interpretive judgement, basic content analysis relies mainly on frequency counts of low-inference events that are manifest or literal. In this case, instances of reported changes on combined physical health, mental health and social health were rated between 0-3 at pre-test and again at post-test, with '0' representing manifestly no or limited physical, mental and social health and '3' representing manifestly high physical, mental and social health. On this scale, a change in either direction of one point on the scale represents a 33% change in HRQoL.

6. Ethics and consent

This research was approved by the Maharishi Vedic Research Institute (MVRI) research ethics approval committee and by the Chairpersons of each university, and was conducted under the terms of the MVRI Code of Research Practice and Procedure, which conforms to the Australian Code for the Responsible Conduct of Research.

Results

1. Quantitative results

The difference between changes on the ten HRQoL variables in Control Group and Treatment Group pre-test and post-test means (M_s), SDs , tests of difference, and probability values are presented in Table 1. From this data, the following may be observed. When tested at the $p \leq .05$ two-tailed level, there was no significant difference between the pre-test scores and the post-test scores of any of the ten HRQoL variables for the Control Group ($df = 24$). However, there was a significant difference between the pre-test score and the post-test scores on every HRQoL variable, except disability, for the Treatment Group ($df = 13$).

Multiple analyses of variance (MANOVAs) on changed scores between the Control and Treatment groups yielded results for treatment effects shown in Table 2. From these data, the following effects can be

Table 1 Pre- and post-test means and SDs and tests of difference and probability of HRQoL variables for control and treatment groups

Variable	Pre-test Mean	Pre-test S.D.	Post-test Mean	Post-test S.D.	t	p
Control Group						
Physical health	55.6	13.6	56.9	14.4	0.45	.32
Mental health	61.2	13.6	62.3	17.4	0.31	.37
Social health	72.4	13.9	68.5	9.9	-1.97	.96
General health	63.1	10.0	62.5	10.5	-0.23	.59
Perceived health	66.0	27.8	61.5	21.9	-1.03	.84
Self-Esteem	80.8	16.1	76.9	13.2	-1.47	.92
Anxiety	59.9	15.1	54.4	14.1	-0.02	.96
Depression	55.2	16.1	55.4	18.1	0.05	.48
Pain	60.0	25.0	65.4	20.0	0.12	.54
Disability	76.0	29.3	80.8	25.3	0.94	.17
Treatment Group						
Physical Health	55.0	17.9	66.4	16.3	2.61	.01
Mental Health	49.3	19.0	70.9	16.4	4.98	.0001
Social Health	66.4	15.5	78.2	14.0	3.15	.007
General Health	56.9	13.1	71.8	12.7	4.39	.0003
Perceived Health	60.7	28.9	72.7	26.1	1.72	.05
Self-esteem	68.6	15.6	80.0	10.0	4.36	.001
Anxiety	52.4	17.4	66.5	16.8	3.14	.00310
Depression	50.7	13.8	67.3	11.9	5.21	.00008
Pain	39.3	35.0	59.1	30.2	2.50	.01
Disability	82.1	31.7	81.8	33.7	-0.03	.51

observed: when tested at the $p \leq .05$ two-tailed level, significant and marginally significant variations between the changed scores of the control and treatment groups were observed for mental health, social health, general health, perceived health, self-esteem and anxiety, while variations for physical health, depression, pain and disability were not significant. MANCOVAs using pre-test score as the co-variate yielded similar results.

Table 2 Multiple analyses of variance on changed scores for control group and treatment group HRQoL variables

Variable	Control group changed scores	Treatment group changed score	F	p
Physical health	2.3	7.3	1.03	.3
Mental health	3.1	21.8	7.62	.01
Social health	-2.3	10.9	2.89	.09
General health	1.0	13.3	7.54	.01
Perceived health	-7.7	18.2	3.42	.08
Self-esteem	-2.3	10.9	3.86	.07
Anxiety	-2.2	12.8	4.16	.06
Depression	3.8	14.5	1.92	.17
Pain	-3.8	13.6	1.44	.14
Disability	3.8	0	0.03	.84

The standardised mean difference in effect sizes is shown in Table 3. Medium effect sizes were observed for physical health, perceived health, depression and pain, large effect sizes were observed for social health, self-esteem, and anxiety, and extremely large effect sizes were observed for mental health and general

health. A non-existent effect size occurred for disability. These findings are largely consistent with those reported by MANOVAs in Table 2, but case effect sizes for physical health, social health, perceived health, self-esteem anxiety, depression and pain more closely resemble the data in Table 1.

Table 3 Effect sizes for control group and treatment group HRQoL variables

Variable	Hedges g	Effect size
Physical health	0.42	Medium
Mental health	1.42	Extremely Large
Social health	0.72	Large
General health	1.2	Extremely Large
Perceived health	0.65	Medium
Self-Esteem	0.78	Large
Anxiety	0.84	Large
Depression	0.48	Medium
Pain	0.55	Medium
Disability	0.09	Non-existent

Pearson product-moment correlation coefficients indicated the functional and dysfunctional scores of the DUKE for all participants were correlated for the following variables: self-esteem and anxiety were negatively correlated, $r = -.66, p = .00001$; anxiety and depression were positively correlated, $r = .78, p = .00001$; self-esteem and depression were negatively correlated, $r = -.52, p = .0007$; mental health and depression were negatively correlated, $r = -.79, p = .00001$; mental health and anxiety were negatively correlated, $r = -.69, p = .00001$; and mental health and perceived health were positively correlated, $r = .29, p = .01$.

2. Qualitative results

Content analysis of the five pre-test and post-test interviews yielded the following HRQoL ratings, as shown in Table 4: OP increased HRQoL = 33%; BT increased HRQoL = 66%; TA increased HRQoL = 33%; RM increased HRQoL = 33%; and LN increased HRQoL = 33%.

Table 4 Pre- and post-test HRQoL ratings for treatment group interview participants

Variable	Pre-test rating to post-test rating			
	0	1	2	3
1: OP	Pre-test	Post-test		
2: BT	Pre-test		Post-test	
3: TA		Pre-test	Post-test	
4: RM	Pre-test	Post-test		
5: LN		Pre-test	Post-test	

These ratings were derived from transcribed interview data, which are summarised below for each of the five participants:

Participant #1: At pre-test, OP stated that her present state of physical health was “average”; sometimes “I am feeling well and sometimes not”, with a breathing problem (i.e., an allergic cough) recurring since childhood. OP reported that her present state of mind could be described as “tired”, and although recently “feeling happy” was generally nervous and anxious about life and work. She did present as someone who was socially outgoing, and attended “many weddings”, but as with her physical health OP indicated not always feeling happy going to work with worries about “how to achieve the tasks and quality with less time available”. OP stated that her home life with four relatives was stable.

At post-test, OP reported her physical health was “in good condition” with no specific health problem. Similarly, she reported that her present state of mind was “normal with no specific mental health problem although she was still anxious about work because “it is complicated”. Asked about her social activities outside of work, OP indicated that she was not engaged, but did feel positive about work and “was happy upon waking and having breakfast, and then “start working and organising things”; she is happy with her present work situation but would like to further her education in law. From this data, a general improvement in OP’s quality-of-life from pre-test Rating 1 to post-test Rating 2 was observed.

Participant #2: BT described her *pre-test* physical health as “normal, but sometimes with a little bit of a headache”, and as having an “eye problem when looking at the computer screen for too long”. She also described her mental health as “stress at work [having “big responsibilities”, with the “more work to do, the more stress” she is having]. BT also reported that she was also “anxious at home when having too much work, and she “gets no help from her husband”. Sometimes she feels happy but other times not, and she “wants [her] husband to share some of the housework” which he does not; such a home situation makes her anxious. Asked about her social activities outside work, BT responded that she “rarely” gets involved in activities outside of work, but when she does, such as participating in charitable acts, she feels “happy”. BT similarly reported that her home life is not going so well due to the aforementioned issues with her husband’s home contribution, but that overall work is satisfying, despite being of a routine nature, especially when there is an increase in the number of students.

At post-test, BT reported her physical health was again “normal, but [I] have been affected by the colds of others”, however she reported no specific physical health problems. BT described her present state “normal, and [I] want to learn a foreign language so that I can travel abroad”. BT stated: “I was nervous and anxious before learning Transcendental Meditation but now I am not; I have been able to release stress more quickly than before”. BT also reported that she had visited Bangkok in the previous week, and “unlike before, I can deal with my family issues; there seems to be more mutual understanding between myself and my husband”; “we are getting on well together, better now compared to before”. BT stated that she is happy going to work and think about finances and ensuring there is enough money “to proceed the work”; “I can now delegate some work to subordinates, which makes me feel release and fresher than before”. From this data, a general improvement in BT’s quality-of-life from pre-test Rating 1 to post-test Rating 3 was observed.

Participant #3: At pre-test, TA stated that his physical health was normal, but that he “looks thin”; he reported that he sometimes “catches a cold kind of disease”. TA presented as mentally balanced with “no [general or specific] problem; I think of myself as creative, for example I updated a work form given by the director, making it more useful by adding my ideas on it” and with no nervousness or anxiety. He also said he was socially outgoing and enjoyed “doing charity work, such as participating in the university charity event distributing books to poor children in remote school areas”. TA stated that he got on well with his four brothers and eight sisters, all of whom live at home, and is happy with work: “the first thing I think of when starting the day at work is to clean the room before doing any tasks”.

At post-test, TA stated his physical and mental health was normal with no specific problem or anxiety, with a happy home life and well-integrated sociability. From this data, a general improvement in TA’s quality-of-life from pre-test Rating 2 to post-test Rating 3 was observed.

Participant #4: RM reported at *pre-test* that his physical health was not good, with “something growing inside his nose” causing difficulty with breathing. He also reported that sometimes he slept late and would wake-up late, with feelings of pain in his legs and arms and being unable to sit comfortably cross-legged. RM also reported feelings of anxiousness, and

not thinking clearly, especially when there was a lot of work to do; RM stated that he “was not thinking broadly enough”. Mentally, he stated that his memory was impaired and that he was “forgetting things a lot”, and that he felt his thinking was “slow”. RM did, however, report that he often played football and “even led a football competition”, and that he participated in charitable works, such as “giving books to poor children, and educating them about health, but only did this twice a year. He stated that he was happy at home and that he feels happy at work, starting first by “checking the overall physical environment of the school and then governing students’ overall interaction in the school”.

At post-test, RM reported significant changes. He still had the pain in his leg but that it was getting better, but his breathing was still difficult. However, his mental state had improved significantly, and he felt “normal and fresh”, with no anxiety but still with minor memory loss. RM stated that he had been to Thailand in the preceding month to participate in a conference associated with Transcendental Meditation. Asked whether he was “generally happy with his home life” he stated “Yes!” and that his home life was good with everyone “getting on well together”. RM also said he was happy with his present work circumstances and felt happy to go to work and supervise staff. From this data, a general improvement in RM’s quality-of-life from pre-test Rating 1 to post-test Rating 2 was observed.

Participant #5: LN at pre-test described his physical health as normal with no specific health issues, and his mental state as “tough” but also “thinking a lot and forgetting things sometimes, especially when there is a lot of work to do”. He also stated that he sometimes “felt stressful, particularly in relation to a lot of work”. LN stated that he can be nervous and anxious but only “once-in-a-while” participates in social activities, such as involvement in Environment Day once a year. He described his home life as generally happy, but that his five siblings living at home did not always get along with their father, who also lives in the house. However, generally LN said that he was happy going to work each day “because I can use my own capacity to support my family by just completing my duties”. LN did report that he felt stress at work and would like to finish work earlier, and while generally happy at work, was not happy with his present work situation, particularly when “my superior does not use good words, I feel upset”.

At post-test, LN stated that his physical health was normal, and he did not get sick “even under

circumstances of changing environment and atmosphere", although he did get "a little headache". His experience of stress related to "increased work" remained the same, but he did not present with any specific mental health problem. LN also reported his participation in extra-curricula events, such as workshops, seminars, and World Environment Day as a highlight of his life. While not obvious why, LN reported that there were now 12 people living in his house, including his parents, and that all of them got on well; and he felt happy at work, first "thinking about organising the workplace, then finishing off work from the previous day, before starting on tasks associated with the new work day". From this data, a general improvement in LN's quality-of-life from pre-test Rating 2 to post-test Rating 3 was observed.

Discussion

The difference in changed QUAN scores on HRQoL variables of the Control Group and Treatment Group is unequivocal. While no significant difference was observed between the pre-test scores and the post-test scores of any HRQoL variable for the Control Group, there was a significant difference observed between the pre-test score and the post-test scores on every HRQoL variable, except disability, for the Treatment Group. [Unlike the HRQoL scores of patients in a clinic or hospital, it can reasonably be argued that in a sample of 20+ year-old faculty and staff a change in 'disability' would be unlikely, which was the case for both the Control and Treatment Groups.] Similarly, effect sizes comparing the Control Group and Treatment Group ranged between medium and extremely large, except as noted above for disability, but only changed scores on two of the ten variables, mental health and general health, were significantly different, and thus further research is required to examine and explain observed changes, especially longer term changes, among the other eight variables associated with HRQoL in Cambodian faculty.

In this study, as in the earlier study in Cambodia (Fergusson, Bonshek, & Boudigues, 1995), average pre- and post-test mean scores for the two Control Groups who did not practice the Transcendental Meditation technique did not change significantly: general health pre-M = 58.9 (S.D. = 15.85) and post-M = 62.7 (S.D. = 15.4); self-esteem pre-M = 69.0 (S.D. = 18.1) and post-M = 73.0 (S.D. = 14.6); and depression pre-M = 58.5 (S.D. = 15.8) and post-M = 58.1 (S.D. = 15.4). The pre- and post-test scores for the Treatment Group in that earlier study, who practiced the Transcendental

Meditation technique, however, changed significantly: general health pre-M = 66.3 (S.D. = 12.4), post-M = 75.4 (S.D. = 10.7), $F = 4.76$, $p = .001$; self-esteem pre-M = 75.0 (S.D. = 17.5) and post-M = 82.4 (S.D. = 11.0), $F = 2.98$, $p = .05$; and depression pre-M = 63.6 (S.D. = 14.7) and post-M = 72.7 (S.D. = 16.1), $F = 5.31$, $p = .01$.

Control Group and Treatment Group scores and trends for general health, self-esteem and depression in both the earlier and present studies are largely consistent. For example, in both studies general health was approximately M = 60.0 at pre-test and post-test (average 3.5% change, p = not significant) in the Control Groups, but general health was pre-M = 66.3 in the Treatment Group increasing to post-M = 75.4 (a 14% increase, $p = .001$) in the earlier study, and was pre-M = 56.9 in the Treatment Group increasing to a significant post-M = 71.8 (a 25% increase, $p = .0003$) in the present study.

These findings can be compared to normative ADHP data from Vietnam (Hanh *et al.*, 2005), although the age ranges in that study were younger than the present study (i.e., 12-19 year olds). In the Hahn *et al.* (2005) study, physical health $M = 83.0$, mental health $M = 73.0$, social health $M = 57.5$, general health $M = 71.5$, perceived health $M = 60.0$, self-esteem $M = 67.0$, anxiety $M = 74.0$, depression $M = 76.5$, pain $M = 81.0$, disability $M = 96.5$ (all with comparable SDs). These data indicate that except for perceived health and self-esteem, all HRQoL indicators were considerably lower in Cambodia than in Vietnam.

These findings in Cambodia can also be compared to normative DUKE data of 17,733 people between the ages of 12-75 in France (Baumann, Erpelding, Perret-Guillaume, Gautier, Régat, Collin, Guillemin, & Briançon, 2011), which yielded DUKE scores for physical health $M = 72.0$, mental health $M = 77.0$, social health $M = 67.0$, general health $M = 71.0$, perceived health $M = 71.0$, and self-esteem = 77.0, respectively. Dysfunction scores were anxiety $M = 69.0$, depression $M = 72.0$, pain $M = 66.0$, and disability $M = 97.0$, respectively. From these data it can be shown that on almost every HRQoL indicator, at pre-test participants of the present study rated their current physical health, mental health, general health, perceived health, self-esteem, anxiety, depression and pain well below these normative French averages, but on each variable were at, or close to, normative means at post-test (e.g., French norm for general health $M = 71$; pre-test $M = 56.9$ and

post-test $M = 71.8$ in this study).

Of distinction is social health, with the French norm $M = 67.0$; pre-test $M = 66.4$ and post-test $M = 78.2$ in this study, although disability scores for both pre- and post-test in the present study were lower than the French norm and in Vietnam. Across all HRQoL measures, both French normative data and the findings of this and the earlier study of practitioners of Transcendental Meditation in Cambodia are generally (and predictably) higher than patients in Macedonia with signs and symptoms indicative of needing coronary angiography but who had no other previously diagnosed serious health issues, mental disorder, or any form of disability when tested on the DUKE (Dojcinovski, Naumoska, Ristovska, & Mitrev, 2014).

Given the potentially large score range for each variable (i.e., 0-100), outlier impact on the changed scores was calculated to determine if any of the data were skewed (Liao, Li, & Brooks, 2017), however only one borderline outlier for a physical health changed-score of one participant in the Treatment Group was observed, and therefore we conclude the present data were not skewed and outliers did not impact the observed results.

The secondary qual data also suggest a general improvement of physical health, mental health, and social health in the sub-set Treatment Group. Four interviewees were rated as experiencing an overall improvement in HRQoL of 33 %, with BT reporting an improvement of 66 %. Of interest is the finding that BT identified the practice of Transcendental Meditation as being the cause of her improved quality-of-life with the words: "I was nervous and anxious before learning Transcendental Meditation but now I am not; I have been able to release stress more quickly than before". Of note also is the observation that her association between Transcendental Meditation > improved mental health, which we have associated with improved quality-of-life in this study, is largely consistent with the conceptual model presented in Figure 1.

A placebo effect cannot be entirely ruled out in this study. However, previous research on the application of Transcendental Meditation to measures of health, stress, and quality of life, including measures of trait anxiety (Eppley, Abrams, & Shear, 1989; Orme-Johnson & Barnes, 2013), self-actualisation (Alexander, Rainforth, & Gelderloos, 1991), alcohol and drug abuse (Alexander, Robinson, & Rainforth, 1994), and blood pressure (Anderson, Liu, & Kryscio, 2008; Bai, Chang, Chen, Li, Yang, & Chi, 2015) suggest practice of the

Transcendental Meditation technique and not the placebo effect is the likely cause of HRQoL changes observed in Cambodia. Limitations associated with non-random selection and assignment in the current research design should also be noted, however again several of the above meta-analyses controlled for non-random assignment to treatment, and the findings reported herein are consistent with those earlier studies which showed Transcendental Meditation was the likely causal factor in improved health and observed effects were not the result of expectation, demand characteristics, special treatment, attention, or selection bias.

Suggestion

The evidence derived from the QUAN strand for both the Control Group and Treatment Group and from the convergence of data in both the QUAN and qual strands of this mixed methods design for the Treatment Group suggest that the Transcendental Meditation technique has a salutary effect on the physical health, mental health and social health of university faculty and staff participants in Cambodia, and this finding is consistent with those derived from the earlier study with Cambodian undergraduates and from other higher education settings. As a result of these preliminary findings, the research question associated with improved quality-of-life in Cambodia can tentatively be answered in the affirmative. We therefore propose that application of the Transcendental Meditation technique by Cambodian university faculty and staff may result in more widespread quality-of-life benefits and thus a general improvement in well-being and health.

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