VALIDATION OF MALAY VERSION OF RECOVERY STRESS QUESTIONNAIRE AMONG UNDERGRADUATE STUDENTS IN HEALTH CAMPUS, UNIVERSITI SAINS MALAYSIA

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by

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LIST OF SYMBOLS, ABBREVIATIONS AND ACRONYMNS

AVE	-	Average variance extracted
CFA	-	Confirmatory factor analysis
CFI	-	Comparative fit index
CI	-	Confidence interval
CLfit	-	Close fit
C .R	-	Critical ratio
CR	-	Composite reliability
CR	-	Construct reliability
CVI	-	Content validity index
D	-	Mahalanobis distance
GCP	-	Good clinical practice
GFI	-	Goodness of fit index
GOF	-	Goodness-of-fit
IQR	-	Interquartile range
MAR	-	Missing at random
MCAR	-	Missing completely at random
MI	-	Modification indices
ML	-	Maximum likelihood
MLR	-	Robust maximum likelihood estimator
NFI	-	Normed fit index
PA	-	Physical activity
PAGH	-	Physical activity guideline for health
q	-	Number of free parameter to be estimate
R2	-	Coefficient of determination
RESTQ		Recovery Stress Questionnaire
RESTQM	-	Recovery Stress Questionnaire – Malay version
RMSEA	-	Root mean square error of approximation
SD	-	Standard deviation
SE	-	Standard error
SEM	-	Structural equation modelling
SMC	-	Squared multiple correlation
SRMR	-	Standardised root mean square residual
TLI	-	Tucker-Lewis index
USM	-	Universiti Sains Malaysia
VIF	-	Variance inflation factor

WHO	-	World health organization
df	-	Degree of freedom
P-value	-	Probability value
n	-	Sample size
%	-	Percentage
β	-	Path coefficient/ parameter estimate

PENGESAHSAHIHAN VERSI BAHASA MELAYU SOAL SELIDIK PEMULIHAN STRES DI KALANGAN PELAJAR SISWAZAH DI KAMPUS KESIHATAN, USM

Pengenalan: Soal selidik Pemulihan Stres atau tekanan (SPS/RESTQ) merupakan soalan soal selidik yang dibangunkan untuk mengukur kekerapan stres atau tekanan dan aktiviti-aktiviti pemulihan berkaitan yang mempunyai teori asas yang kuat. Namun begitu disebabkan oleh perbezaan budaya, bahasa dan persekitaran antara populasi German dan Malaysia, kesahihan dan kebolehpercayaan soal selidik itu perlu ditentukan semula sebelum ia boleh digunakan dalam persekitaran ini.

Objektif: Untuk menentukan kesahihan dan kebolehpercayaan soalan (SPS/RESTQ) versi Bahasa Melayu di kalangan pelajar siswazah USM Kubang Kerian. Pendekatan pengukuhan telah digunakkan.

Kaedah: Untuk kajian ini, satu kajian tinjauan lintang digunakan di kalangan pelajar siswazah di USM. Subjek kajian dipilih secara kaedah sampling bukan kebarangkalian. Analisis secara perihalan (CFA),analisis faktor pengukuhan, pemodelan persamaan struktur penjelajahan dan analisis berbilang kumpulan digunakan untuk analisis secara statistik.

Keputusan: Sejumlah 617 pelajar mengambil bahagian dalam kajian ini dengan min (SD) 307 (178.26). Majoriti pelajar terlibat terdiri daripada pelajar perempuan (66.17%), bangsa Melayu (76%) dan terlibat dalam satu jenis sukan atau senaman. Bagi tujuan pengukuran penilaian model menggunakan CFA, model akhir untuk pemulihan stres umum mempunyai indeks padanan: CFI=0.927, TLI=0.915, SRMR=0.047, CLfit=0.884,

RMSEA=0.046(90%CI:0.040 ,0.051), pemulihan stres sukan mempunyai indeks padanan: CFI=0.921, TLI=0.911, SRMR=0.062, CLfit=0.995, RMSEA=0.044 (90%CI:0.041,0.048). Penilaian model pengukuran menggunakan ESEM, model akhir untuk pemulihan stres umum mempunyai indeks padanan: CFI=0.925, TLI=0.903, SRMR = 0.040, CLfit = 0.601, RMSEA= 0.049 (90%CI: 0.043, 0.055), indeks padanan untuk pemulihan stres sukan adalah: CFI=0.923, TLI=0.907, SRMR=0.036, CLFIT=0.995, RMSEA= 0.044 (90%CI:0.041,0.048). Kebanyakan indeks padanan berada diantara nilai ambang yang diterima untuk kedua-dua skala umum dan sukan dengan menggunakan pendekatan CFA dan ESEM. Namun begitu, pendekatan ESEM menghasilkan indeks padanan yang lebih memuaskan berbanding dengan pendekatan CFA untuk kedua-dua skala. Kebolehpercayaan tergubah untuk skala umum dan sukan masing-masing dalam julat 0.543 – 0.848 dan 0.930-0.962. Pengukuran model ketakberubahan mengesahkan ketakberubahan SPS/RESTQM di kalangan jantina (gender).

Kesimpulan: Soalan soal selidik Pemulihan Stres versi Bahasa Melayu dianggap sahih dan bolehpercaya untuk mengukur pemulihan dan stres di kalangan pelajar siswazah.

VALIDATION OF MALAY VERSION OF RECOVERY STRESS QUESTIONNAIRE AMONG UNDERGRADUATE STUDENTS IN HEALTH CAMPUS, UNIVERSITI SAINS MALAYSIA.

ABSTRACT

Introduction: Recovery-Stress Questionnaire (RESTQ) is a questionnaire developed to measure the frequency of stress along with associated recovery activities with strong theoretical foundations. However, due to cultural, language and environmental differences between validated German population and intended Malaysian population, the validity and reliability need to be established before it can be used in these settings.

Objectives: The aim of this study is to determine the validity and reliability of the Malay translated version of RESTQ among undergraduate students in USM Kubang Kerian using confirmatory factor analysis (CFA) and exploratory structural equation modelling (ESEM) approach.

Methods: A cross-sectional questionnaire survey was employed for this study among undergraduate university students in USM. Participants were selected using a non – probability sampling method. Descriptive, confirmatory factor analysis (CFA), exploratory structural equation modelling (ESEM) and multi group analysis were applied in the statistical analysis.

Results: A total of 617 students participated in this study. Majority of the students, were female (66.1%), Malay (76%) and participated in at least in one sport or exercise. For

measurement model assessment using CFA, the final model of general stress-recovery had fit indices: CFI = 0.925, TLI = 0.915, SRMR = 0.047, CLfit =0.884, RMSEA = 0.046 (90% CI: 0.040, 0.051)], sports stress-recovery had fit indices: CFI = 0.921, TLI =0.911, SRMR = 0.062, CLfit = 0.995, RMSEA = 0.044 (90% CI: 0.041, 0.048). For measurement model assessment using ESEM, the final model of general stress-recovery had fit indices: CFI= 0.925, TLI =0.903, SRMR = 0.040, CLfit = 0.601, RMSEA = 0.049(90% CI: 0.043, 0.055), sports stress-recovery had fit indices: CFI = 0.923, TLI = 0.907, SRMR = 0.036, CLfit = 0.995, RMSEA = 0.044 (90% CI: 0.041, 0.048). Majority of the fit indices were within the acceptable threshold values for both general and sport scales by using CFA and ESEM approach. However, ESEM approach yielded more satisfactory fit indices than CFA approach for both scales. The composite reliability for general and sports scales ranged from 0.557 – 0.857 and 0.815 – 0.880 respectively. The measurement invariance model confirmed invariant of RESTQM among gender.

Conclusion: The Malay translated version of Recovery-Stress Questionnaire (RESTQM) is considered valid and reliable to measure recovery and stress among undergraduate students.

CHAPTER 1

INTRODUCTION

1.1 Background

Participation in physical activity is a vital part of a healthy lifestyle that has enormous physical and mental health benefits (Romaguera et al., 2011; Mike, 2003). A bodily movement produced by skeletal muscles that result in energy expenditure is known as physical activity. Everybody participates in the physical activity but at different levels due to individual differences (Caspersen, Powell, & Christenson, 1985). The preceding indicates that living a healthy life includes incorporating physical activity into our lifestyle, and it depends on the type and frequency of physical activity depend on each.

Health benefits gained from physical activity depends on the participant's activity level (Frey & Berg, 2002). According to Bergeron, Nindi, Deuster, Baumgartner, Kane, & O'Connor (2011), there are different ways to classify physical activity; the simplest classification makes a distinction between the physical activity that occurs while sleeping, at work, and leisure. Physical activity can also be divided into light, moderate or heavy intensity (Caspersen, Powell, & Christenson, 1985). Moderate–intensity physical activity is encouraged for healthy adults aged between 18–65 years for a minimum of five days per week (Haskell et al., 2007). Performing physical activity regularly has a broad range of health benefits. For example, it can lower the risk of cancer, diabetes, hypertension, coronary heart disease and osteoporosis (Gerber & Pühse, 2009; Mike, 2003; Scully, Kremer, Meade, Graham, & Dudgeon, 1998), but there are times when the aftermath of physical activity could lead to stress. Therefore, physical activity could be seen as a

physical stressor but not an uncomfortable psychological stress (Stults-Kolehmainen & Sinha, 2014).

Stress is a disruption or deviance from the normal biological or psychological system. It is the total biological adaption reaction with the purpose of maintaining or re–establishing the inner or outer balance. It is related to the stimulating of the intellectual functions and is understood as a psychological demands or mental activity (Boucsein, 1991; Noce et al., 2011).

The overwhelming effect of stress makes people unable to make time to recover as they should or to take on more active approaches for managing the situation (Kellmann, 2010). Therefore, they need to recover from stress.

Recovery is a process through which the psychological effect of stress, caused by prior events are well–adjusted and the efficient capability restored; it requires quality and or quantity of recovery activities need to stabilise the stress state. It is a psychological, physiological and social process. For physiological recovery, food, water and minerals must be restored to the body along with the recovery from injuries, restoration of hormonal, and biological processes which occurs during sleep (Kellmann, 2010; Kenttä & Hassmén, 1998; Noce et al., 2011; Savis, 2010).

According to Noce et al. (2011), high-performance sport demands persistent performance increase from athletes which causes stress. The stress from training, competition, and lifestyle factors has been recognised as the main reason for overtraining and

underperformance in sports (Kellmann, 2010). The failure to properly recover from the stress of training produces a state of overtraining, under-recovery and burnout (Davies, Orzeck, & Keelan, 2007). A higher level of physiological and cognitive stress is reported among Malaysian athletes than any other categories of athletes and greater behavioural stress among Malaysian national level athletes (Parnabas et al., 2013). The findings suggested that athletes also go through stress in the process of preparing for games and competition. Due to the desire to win the competition they are involved in, this stress causes overtraining which if not monitored and proper recovery activities put in place, will cause poor sports performance. It could be deduced from this that poor performance in sport is not only the account of defective training but also overtraining that leads to stress without proper recovery activities.

An instrument named RESTQ was been developed to measure 'stress and recovery' generally for non-athletes and athletes in the German language which reported to be valid and reliable (Kellmann & Kallus, 2001). This instrument began to find useful application outside the sport contents and other languages such as; Germany, Spanish and English version were developed, validated and used by other authors (see Davies et al., 2007; Gonzalez-Boto, Salguero, Tuero, Márquez, & Kellmann, 2008). Although the English version has been used for research amongst adolescent athletes in Malaysia (Kuan & Kueh, 2015); there is the need for a Malay version of RESTQ instrument for the Malaysian community whose national language is Bahasa Melayu. This gap necessitated the need to translate and validate the RESTQ into Bahasa Melayu.

1.2 Problem statement

RESTQ is a questionnaire developed to measure the frequency of stress along with associated recovery activities with strong theoretical foundations. However, due to cultural, language and environmental differences between validated German population and intended Malaysian population, the validity and reliability need to be established before it can be used in these settings.

1.3 Justification

It is best to identify the stress and recovery state of the population while they have a lot of activities to do at the same time. Therefore, the undergraduate students were deemed fit as they combine the academics with physical activity and other extra-curricular activities both within and outside the educational institutions. This study provided a valid and reliable Malay version of RESTQ among undergraduate students in the Health Campus, USM; it provided the invariance information of the Malay version of RESTQ among different gender of undergraduate students of the USM health campus

1.4 Research questions

1. Is the Malay version RESTQ a valid and reliable measurement to measure the level of stress and recovery among undergraduate students in USM, health campus?
2. Is the Malay version of RESTQ invariant among different gender of undergraduate students in USM health campus?

1.5 Research objectives

The research objectives are subdivided into; General objective and Specific objectives which are listed below:

1.5.1 General Objectives

To determine the validity and reliability of the Malay translated version of RESTQ among undergraduate students in USM health campus.

1.5.2 Specific objectives

1. To determine the validity and reliability of the translated version of RESTQ-Malay among undergraduate students in USM health campus using confirmatory factor analysis (CFA).
2. To determine the validity and reliability of the translated version of RESTQ-Malay among undergraduate students in USM health campus using Exploratory Structural Equation Modelling (ESEM).
3. To determine the invariance of the translated version of RESTQ-Malay among different gender of undergraduate students in USM health campus.

1.6 Research hypothesis

1. The Malay version of RESTQ is valid and reliable to measure the level of stress and recovery among undergraduate students in USM health campus.
2. The Malay translated version is variant among different gender of undergraduate students in USM health campus.

CHAPTER 2

LITERATURE REVIEW

2.1. Definition of Physical Activity

Physical activity can be defined as “any movements carried out by the skeletal muscles that require energy above the basal (resting) metabolic rate” (Berry, Fahey, Insel, Roth, & Singletary, 1995). It encompasses diverse activities such as walking, hiking, stair-climbing, aerobic exercise, callisthenic, resistance training, jogging, running, cycling, rowing, and swimming. It also covers sporting activities such as tennis, badminton, soccer, basketball, and “touch” football that will give significant benefits when it is regularly performed (Duncan, Gordon, & Scott, 1991; Rippe, Ward, Porcari, & Freedson, 1988). The preceding indicates that physical activity involves putting our body to work such as to create body movements and it demands energy, physical activity is therefore, a deliberate and planned action which is done repetitively to obtain its benefits.

2.1.0 Classification of Physical Activities

Physical activity could be divided into light, moderate or heavy intensity (Caspersen et al., 1985). Ainsworth et al. (2000) discussed the Compilation of coding scheme for physical activity which linked a five-digit code that represents the specific actions done in various settings, with their respective metabolic equivalent (MET) intensity levels. Using the classification for MET as the proportion of work metabolic rate to an acceptable inactive metabolic rate of 1.0 (4.184 kJ) kg 5-h- 5, 1 MET is measured as relaxing metabolic rate obtained during quiet sitting. Activities are itemised in the Compilation as multiples of the inactive MET level and range from 0.9 (sleeping) to 18 METs (running

at 17.54kmh). It is observed that there is a wide range of physical activities and it could also be classified according to the intensity of the metabolic equivalent.

2.1.1. The Benefits of Physical Activities

To encourage and preserve good health all adults aged between 18-65 years, were suggested to perform a moderate-intensity aerobic physical activity for at least 30 minutes on five days each week (Haskell et al., 2007). Physical activity provide long-term benefits for everyone, thus regular physical activities has a broad range of health benefits such as lower the risk of cancer, diabetes, hypertension, coronary heart disease and osteoporosis (Hutchinson, 2011; Mike, 2003; Scully, Kremer, Meade, Graham, & Dudegon, 1998). Despite the fact that physical activity demand energy, there are different intensities depending on age, strength, health condition of the participants. The good thing about physical activity is that everybody will be benefited from participating in physical activity to maintain a healthy body and lowering the risk of having diseases.

2.1.2. Gender Differences in Physical Activity amongst Male and Female

Adults are encouraged to partake in moderate-intensity physical activity for a minimum of 150 minutes per week, or 75 minutes a week of vigorous-intensity aerobic physical or an equivalent combination of both moderate and vigorous physical activity to achieve substantial health benefits (Eime, Young, Harvey, Charity, & Payne, 2013). Though, it has been observed that male and female exercise for different reasons; women are more likely to engage in non-competitive activities to keep fit (Tomlinson, 1995). According to Franzoi (1995) women focus more on their body as an aesthetic statement, while male attend to dynamics aspect of their bodies such as coordination speed and strength. The

female attitude towards exercise settings may bring about feelings of Social-physique-anxiety (SPA), which can be worsened by the nature of clothing required for physical activity. In a review by Eime et al. (2013), it was reported that slight difference existed in perceived stress and emotional distress among men and women across different sports, the significant relationship was noted between involvement in walking and meditative sports with stress appraisal and emotional distress among women. It is observed that though male and female gender participates in physical activities, they have different reasons for their participation. The female gender is more interested in the fitness and well-being of their body while the focus of the male gender is more on the functionality of the body, despite little difference was only observed in the way both sex perceive stress (Fletcher et al, 1996).

2.2 Concept of Stress

There is an increase in the use of the word "stress" in our regular conversation. Though almost everyone talk so much about stress, it is often not clear what stress is? The following words are used synonymously for stress. These words are stress, strain, conflict, burnout, depression and pressure

2.2.1 Definition of Stress

Stress is defined as an anxious or intimidating feeling that a person experiences when a person concludes a state as being more than his or her psychological resources can handle (Boucsein, 1991). It is a disruption or deviation from normal happenings in the biological or psychological system (psychophysical balance) (Ampofo-Boateng & Wahab, 2010). Stress is also understood as the total organic alteration response with the aim to sustain

or re-establish the inner and or outer stability. From the psychological point of view, stress is related to the stimulation of the cognitive functions and is understood as psychological demands or mental activity (Noce et al., 2011). Professionals from different sector identify stress as modern society's illness which affects people's behaviour, communication and efficiency (Redhwan, Sami, Karim, Chan, & Zaleha, 2009). According to Lazarus (1966), relationship between individual differences and the environment that is assessed as dangerous or beyond their ability to deal with, is associated with stress. Selye (1956) defined stress as a physiological nonspecific reaction to external or internal demands. It is observed that words cannot adequately describe 'stress', and is defined according to individual perception. Research has also shown that stress could either be physical, psychological or both, stress is an individual issue based on individual differences and the biological and psychological make-up of each, it is a sensation that has to do with the brain and perception of an individual.

2.2.2 Indicators of Stress

According to Parnabas, Mahmood, Parnabas, Ismail, Abdullah, & Ralim (2013), the indicators of stress can be divided into physiological, behavioural, cognitive, and emotional. The physiological elements trigger autonomic arousals, negative symptoms which include feelings of nervousness, difficulty of breathing, increased blood pressure, dry throat, muscular tension, increased heart rate, sweaty palms and butterflies in the stomach. The behavioural indicators include lack of sleep, loss of appetite, alcohol abuse, drug abuse, smoking and failure to attend classes. The cognitive signs are the intellectual part, characterised by negative expectations on success or self- assessment, negative self-talk, negative thoughts, fear of failure, low self-esteem, low self-confidence, worries about performance, images of failures, inability to concentrate and disrupted attention.

The emotional indicators of stress include depression, sadness, irritation, emotional outburst, panic attacks, inability to cope and frequent mood swings. It is observed that stress can be divided into two main groups (physiological and psychological), stress is an individual feeling or perception which alters the normal functioning of the body and mind and most of which are detrimental alterations. These could bring about negative performance or reaction by the stressed individual if not properly taken care or handled carefully.

2.3 Recovery

Recovery is described as a compensation of deficit conditions of the organism that are activity determined (Kellmann & Kallus, 2001). According to Allmer & Niehues (1989), recovery is a "process through which the psychological consequences of stress from preceding activities are balanced and the individual condition to act is restored". Recovery is a progression through which psychological impact concerning stress, caused by prior events which are well adjusted and the efficient capability restored; it is also a physiological, mental and social process (Noce et al., 2011). Recovery involves undertaking behaviours that affect physiological, psychological, social and environmental needs after training load (Kallus & Kellmann, 2000). Physical aspects of recovery include restoring resources such as food, water and minerals (Kenttä & Hassmén, 1998) along with recovery from injuries and the restorative hormonal and biological processes that occur during sleep (Hellman & Hettinger, 2000). As indicated by Kellmann & Kallus (2001) in the RESTQ manual, the psychological recovery connotes the restoration of relaxation and mood to homoeostasis and equilibrium. Behaviours that facilitate recovery are diverse and span the gamut from cross training to leisure activity, communal recovery efforts might include a focus on family meals as well

as on social contact with friends or intimate partners. It is observed that recovery is a gradual process with the purpose of restoring the body to its normal state and it needs time to be achieved. There are various methods for recovering, which depends on the type of stress; it could be physiological, psychological or both.

Kellmann & Kallus (2001) defined recovery as an inter-individual and intra-individual multi-level (e.g. psychological, physiological, social) course in time for the rehabilitation of performance abilities. Recovery includes an action-oriented component and those self-initiated activities (proactive recovery), can be systematically used to improve situational conditions and build up and refill personal resources and buffers. Recovery could also be described as a process in time that depends on type and duration of stress. It depends on a reduction, change, or a break from stress, which is unique to the individual and depends on personal evaluation, it could be inactive or pro-active and it is closely linked to situational conditions (Kellmann & Kallus, 2001). Indicating that recovery could be achieved personally or with a group of people who determines or chooses to make out time to engage themselves in activities that facilitate restoration of the body and mind to its normal state by taking a break or putting an end to activities which lead to stress.

2.4 Validation of Recovery-Stress Questionnaire

Measurement is an indispensable part of scientific research which ought to be approached by the development of appropriate instruments. Psychological studies are based on subjective judgement and most often measurements are taken using the questionnaire. To produce a functional questionnaire, the measurement of validity and reliability needs to be considered (Streiner, Norman, & Cairney, 2014).

2.4.1 Construct Validity

Construct validity is the extent that a set of measured items actually reflects the latent theoretical construct those items are designed to measure (Brown, 2015). It deals with the accuracy of the measurement. Results of the construct validity provide confidence that the questions measured were taken from sample that represent the exact actual score that exists in the population. Two subsets of construct validity are convergent and discriminant validity (Hair, Black, Babin, Anderson, & Tatham, 2010).

2.4.1.1 Convergent Validity

Convergent validity measures how closely constructs are related to each other, items that are indicators of a particular construct should converge or share a high proportion of variance in common. Convergent validity can be measured by factor loadings, average variance extracted, construct reliability (Hair et al., 2010).

2.4.1.2 Discriminant Validity

Discriminant validity is the degree to which a construct is indeed different from other constructs. High discriminant validity provides evidence that a construct is unique and captures some occurrences other measures do not capture. CFA provides two ways of assessing discriminant validity;

1. Correlation between any two constructs can be specified (fixed) as equal to one; this means that items making up two constructs can be added up to make only one construct if there is any difference between the fit of the two-construct model and one construct

model, the discriminant validity is reinforced. Although this does not always apply to practical issues, sometimes correlation of .9 can still produce a difference of fit between two models(Hair et al, 2010).

2. Comparing the average variance extracted (AVE) values for any two constructs with the square of the correlation estimate between these two constructs. The AVE should be greater than the squared correlation estimate. It is alleged that a latent construct would be able to explain more of the variance in its item measure that it shares with another structure. If this occurs there is a good sign of discriminant validity (Fornell & Larcker, 1981).

2.4.2.1 Factor Loadings

The size of factor loading is important for convergent validity, high loadings on a factor indicate that they converge on a common point, the latent construct. All factor loadings should be statistically significant, a good indicator that standardised loadings estimate should be between 0.5 and 0.7 or higher (Hair et al., 2010).

2.4.2.2 Average Variance Extracted (AVE)

The average variance extracted (AVE) is "calculated as the mean variance extracted for the items loading on a construct and is a summarized indicator of convergence" (Hair et al., 2010). An AVE of .5 or higher is a good indicator suggesting adequate convergence. An AVE of less than .5 indicates that an average, more error remains in the items than variance accounted for by the latent factor structure imposed on the measure (Hair et al., 2010)

2.4.2.3 Construct Reliability (CR)

High construct reliability (CR) indicates that internal consistency has occurred, this implies that the measures all consistently represent the same latent construct. The rule of thumb for CR estimate is that 0.7 or higher suggest a good estimate but CR between 0.6 and 0.7 may be acceptable (Hair et al., 2010).

2.5 Factor Analysis

2.5.1 Overview

Since being introduced by Spearman in 1904, factor analysis is a multivariate analysis that has been widely used. Factor analysis is a statistical procedure which is employed in the various field such as psychology, education, sociology, public health, and environmental. Factor analysis primary purpose is to define the underlying structure among variables in the analysis. Factor analysis offers tools for examining the structure of the interrelationships (correlations) among a large number of variables by outlining sets of variables that are highly related, known as factors. Factor analysis has two distinct groups namely; a) Exploratory Factor Analysis (EFA) and b) Confirmatory Factor Analysis (CFA) (Hair et al., 2010).

2.5.2 CFA

CFA is a way of testing how well-measured variables represent a similar number of constructs. According to Hair et al. (2010), CFA is applied to assess the degree to which a researcher's deduction, the theoretical pattern of factor loadings on pre-stated constructs (i.e. variable loadings on specific constructs represents the actual data). CFA is an instrument that enables us to either "confirm" or "reject" a preconceived theory. CFA statistics tells how well our theoretical measurement of the factors matches the actual data or (reality).

2.6 Exploratory Structural Equation Model (ESEM)

ESEM is a hybrid of EFA and Structural Equation Model (SEM), which has recently been implemented in the Mplus programme (Asparouhov, 2009). Unlike CFA. Alternatively, the four restrictions on the factor loadings, factor variances and factor covariances necessary for observation are imposed by rotating the factor loading by the matrix and fixing the factor residual variances at one (Muthén & Muthén, 2007).

2.7 Multigroup Analysis

Multigroup analysis is used in testing any number or type of distinctions between similar models estimated from different groups of respondents. The primary objective is to see if there are differences between individual group models. Multigroup analysis compares the same model across a diverse sample of respondents (Hair et al., 2010).

2.8 Conceptual Framework of RESTQ-M

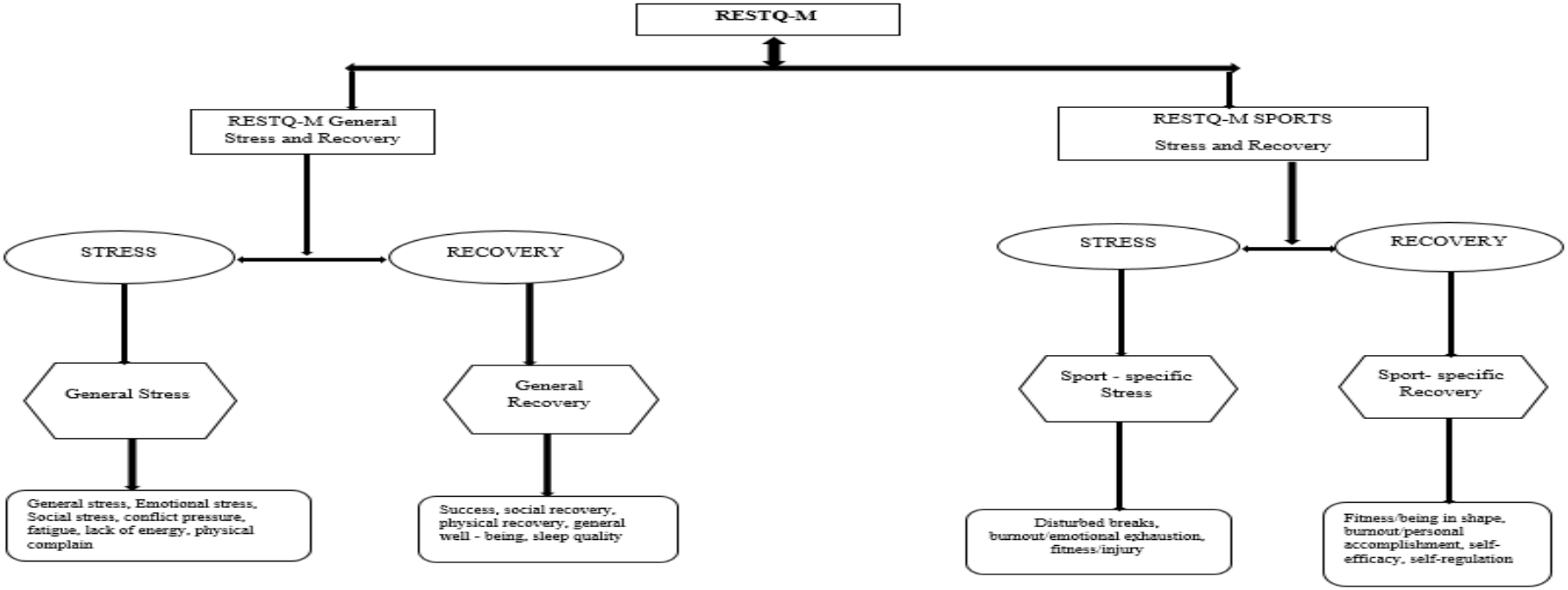

Figure 2.1: Conceptual Framework of RESTQ-M

CHAPTER 3

METHODS

3.1 Study design

Cross-sectional validation study

3.2 Study period

August 2015 until April 2016

3.3 Data collection period

September 2015.

3.4 Study location

Universiti Sains Malaysia (USM), Health campus.

3.5 Reference population

Universiti Sains Malaysia (USM) Undergraduate students

3.6 Source population

Universiti Sains Malaysia (USM), Health campus undergraduate students

3.7 Sampling Frame

Universiti Sains Malaysia (USM), Health campus undergraduate students in the year 2015

3.8 Study participants

Universiti Sains Malaysia (USM), Health campus year one and year two undergraduate students in the year 2015

3.9 Study criteria for the study subjects

3.9.1 Inclusion criteria

Year 1 and year 2 Universiti Sains Malaysia Kubang Kerian undergraduate students.

Students who actively involved in some physical or sports activities (students who spend more than 60 minutes a week in physical / sports activities).

3.10 Sampling method

Non-probability (purposive) sampling was applied for the study due to the large sample size. All eligible participants were approached and those who gave consents included in the study

3.11 Sample size determination

The sample size was computed for objective one and two. In objective one, two measurement models were developed: General stress-recovery and Sports stress-recovery. Therefore, the sample size was estimated for each measurement model.

The sample size determination was based on Monte Carlo simulation study run in Mplus software. Kline suggested that a path model with sample size of 200 or more is necessary in order for the estimates to be comparably stable (Kline, 2011). Thus, sample size of 200 was used as a starting value in the simulation study.

The estimated parameters used in the simulation study include: factor loading, factor covariance, factor mean, and item mean, all were set as 0.50. The alternative hypothesis tested in the simulation was all the factor loadings of observed variables for General scale were significant and above 0.40. Table 3.1 shows the statistical power by sample size using Monte Carlo simulation study in measurement model for General stress-recovery. Based on Table 3.1 a total sample size of 260 was needed to achieve the power of 0.80.

Table3.1: Estimated statistical power by sample size using Monte Carlo simulation for General stress-recovery measurement model

Sample size (n)	Power
200	0.694
220	0.737
240	0.753
260	0.803

280	0.829
300	0.894

Table 3.2 shows the statistical power by sample size using Monte Carlo simulation study in measurement model for Sports stress-recovery. The alternative hypothesis tested in the simulation was all the factor loadings of observed variables for Stress scale were significant and above 0.40. Based on Table 3.2 a total sample size of 200 will achieve power of 0.980.

Table3.2: Estimated statistical power by sample size using Monte Carlo simulate for Sport stress-recovery measurement model

Sample size (n)	Power
200	0.980
220	0.985
240	0.995
260	0.995
280	0.995
300	0.995

Therefore, the largest sample size for objective 1 was 260.

Though the power is different for model General and Sport using the same sample size to test. The complexity of model are different for General and Sport, therefore with the same sample size, it is possible to have a different power.

Objective 2 was to test the invariance among two groups (male and female) using the measurement models identified in objective 1. Therefore, the estimated sample size for this objective was 520 (260 x 2). After adding non-response rate of 20% using formula suggested by Arifin (2013), the total sample size is 650 (520 / (1-0.2)).

3.12 The Measurement Tool

The Recovery-Stress Questionnaire (RESTQ) was developed to measure the frequency of current stress along with recovery activities. The RESTQ has precise features which enables it to measure systematically and directly assessed events, states, and activities about their frequency while considering stress and recovery process at the same time. It provides a distinguished picture of the current recovery-stress state based on 12 nonspecific and seven additional sport-specific scales (Michael Kellmann & Kallus, 2001). The RESTQ can be useful in almost all settings: at team meetings, in classrooms, on the track, in the gym, or at the pool (Michael Kellmann & Klaus-Dietrich, 2000).

3.12.1 Importance of RESTQ

According to (Kellmann & Kallus, 2001), RESTQ is useful in identifying the current recovery-stress state of athletes, it provides a complete picture of the extent of stress they are actually experiencing; RESTQ is beneficial to participants and coaches in determining whether the intensity of training should be increased or decreased, it also provides a convenient way to monitor individuals and / or groups during training camps.

Kellmann & kallus, 2001, also stated that RESTQ has a systematic multilevel approach which enables users assess subjective stress and recovery concurrently; there is the

possibility to use RESTQ in research survey to get an overview about the recovery and stress balance and on the other hand for individual assessment too.

3.13 Questionnaire translation

The world health organisation's (2010) guideline on translation and adaptation process of the Management of Substance Abuse questionnaire was adapted in this study. The procedure includes the following steps: (1) forward translation into the Malay language, (2) expert panel review the translated version (3) back-translation into English language, (4) group of experts review for both forward and backwards version, and questionnaire was pre-tested before the translated questionnaire was finalised.

This process was necessary since English is not the first language of a target respondents. Its goal is to achieve equality between the original English version and the translated Malay version of the scale regarding conceptual equality, item equality, semantic identity and measurement equality (Streiner, Norman, and Cairney, 2014). During the process, it was necessary to ensure that both versions are equivalent to the number of elements that are attributed to the construct; each particular item is acceptable and relevant to target population; the meaning was achieved; format, instruction and mode of administration suitable for the target population; and the psychometric.

The questionnaire RESTQ was forward-translated from the original English versions into the Malay versions by two bilingual translators who are also native Malay speakers. Reconciliation of both forward versions was done subsequently. Then a bilingual translator (English native speaker) carried out the back translation. The semi-final version of Malay RESTQ was derived from the reconciliation of the original, back translation and

forward translation. The three translators who conducted the forward and backwards translation together with three experts in sport and exercise with the knowledge in questionnaire design and pretesting met and examined the Malay version RESTQ in term of cultural adaptation (preliminary Malay version of RESTQ). The Malay version RESTQ was re-tested with ten undergraduate students. They were asked to answer the Malay version RESTQ and comment on the wordings of each item. The questionnaire RESTQM translation process was considered complete at this stage by the research team (Table 3.3).

3.14 RESTQ-M

The Malay version (RESTQM) is a module developed to measure the frequency of activities, experience (mood) states and evaluated events regarding current stress and recovery, focusing not only on stress but also on recovery. It contains 53 questions which are distributed into 19 scales, 12 scales out of 19 has two questions each and the remaining seven scales have four questions each. Table 3.3, describes an overview of this module after being translated in the form of Likert scale ranging from "Tidak pernah (never)" (scored as 0) to "Sentiasa (always)" (scored as 6):

1) Jarang (seldom)
2) Kadang kala (sometimes)
3) Kerap (often)
4) Lebih kerap (more often)
5) Selalunya (very often)

Questions 2–25 is the General stress and recovery section while questions 26-53 is the Sports stress and recovery. The scale value is to be calculated by taking the mean of the item values. Disturbed sleep item in the "Sleep Quality, scale" is reversed score i.e (6→ 0, 5→1, 4→2, 3=3, 2→4, 1→5, 0→6) (Kellmann, 2001).

Due to the licensing agreement with the publisher of the original version of RESTQ, the items in the RESTQ-M cannot be revealed in this dissertation. However, the full items of RESTQ-M can be obtained with permission from the publisher, which is Pearson Assessment & Information GmBH, Germany.

3.15 Data collection

Data collection for all objectives was done simultaneously. Permission was sought from the lecturers of the undergraduate students. Briefing and explanation regarding the questionnaire were also done before the questionnaire was distributed to the undergraduate students. As this is a self-administered questionnaire, the questionnaire was distributed to the undergraduate students by the researcher.

Participation in this study is voluntary and verbal consent was obtained from the participants. Implied consent was obtained when participants volunteer to participate in this study by completing the questionnaire and return it to the researcher. Answered questionnaires were collected immediately after completion from the participants. The undergraduate students used about seven to 10 minutes to answer the questionnaire.