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On The Comparison Of Factorial Analysis Techniques And Multidimensional Scaling In Examining The Validity Of Life Quality Scale Construct.

Farzaneh Raaei[1], and Zahra Karami Baghteyfouni[2]*.

[1]Assistant Professor, Department Of Psychiatry, Kerman University Of Medical Sciences, Kerman, Iran.
[2]Assistant Professor, Department Of Psychology, Payame Noor University, PO BOX 19395 - 3697, Tehran, Iran.

ABSTRACT

Examining components of a construct and the very structure of that particular construct and also validation of the test is fundamentally done for investigating or proving something which is measured by that test. In fact, examination of the validity avoids many vague and unpractical results. In this research, in order to assess the structure and components of life quality construct, two multidimensional scaling and confirmatory factorial analysis styles were used. Methods: this research has a fundamental and developmental nature in terms of goal. This research falls under descriptive and analytical researches and the population of this research was consisted of all students studying at Tehran's Universities in the academic year of 2014-2015. The sampling method was random and it was comprised of all majors and all B.A., M.A and Doctorate students and the number of 315 people was selected. The tool for this research is the World Health Organization Life Quality (WHOQOL-100). Normalized raw stress and standardized stress both showed ./01, suggesting full stress and is indicative of the fact that the model tolerates the least pressure existing along with the data obtained. In fact, findings implicated that there was a full proportion between data and the model. Both models confirm at least four dimensions. Statistical models like multidimensional scaling, due to peculiar characteristics and lacking assumptions as with other categorization ways in mental constructs seem to be more applicable.

Keywords: Multidimensional scaling, Factorial analysis, Construct validity, Life Quality Scale.

Corresponding author

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Introduction

The term life quality is a concept with an abstract nature and due to having varied dimensions, one can hardly obtain a comprehensive and united definition of this term; however, according to its applications, one can offer various operational definitions. This term can be used by areas in which it is used and with various interpretations[1].

Multidimensionality of life quality construct allows for entering into various studying areas. Each study areas, given its indices and scales addresses life quality. On the other hand, dynamism and constant changing of this construct over time requires coherent researches. Thus, it has to be measured in various time intervals. These two major characteristics of life quality, along with increasing significance of this constructs have entailed much research in this are [2].

Despite increasing attention of life quality construct and increased researches in this area, no single definition has ever been offered of this notion from a conceptual point of view. The ambiguity of this construct is among other characteristics that have caused various interpretations, thus rendering in various definitions to be offered. Recent researchers on life quality maintain that life quality is an objective and subjective construct; however, its subjective facet outweighs the other. The difference with existing perspectives in this area and the way life quality which is measured has added to dynamism and fascination of it. An aggregate of these factors along with each other has resulted in a number of researches and interests by researchers working on life quality. The information which is obtained from the examination of life quality dimensions could be regarded major instruments at the hand of planners and policy makers for understanding and measuring the status quo, thus becoming a useful assessment for new orientations in the future [3].Examining components of a construct and the very structure of that particular construct and also validation of the test is fundamentally done for investigating or proving something which is measured by that test. In fact, examination of the validity avoids many vague and unpractical results. In this research, in order to assess the structure and components of life quality construct, two multidimensional scaling and confirmatory factorial analysis styles were used.

Firstly, factorial analysis is merely a discovery statistical method; however, recently it has been made possible that one can test hypothesis via using factorial analysis. In this method, based on previous studies or according to the theories, a factorial load is hypothesized for variables; then, confirmatory factorial analysis is performed for fitting target matrix loads and additionally, fitting level cam also be measured [4].

The common way for examining fundamental and factorial structyure is factorial analysis. This method is applied for specification and elimination of correlations between variables and it is also a means for reducing dimensions, visualize and analyzing data. This method in fact reduces dimensions successfully and produces a spatial map which is similar to the actual distribution of infrastructure system parameters. Factorial analysis is a general term which is used for a number of various but related mathematical and statistical techniques in order to investigate the very nature of relations between variables of a specific set. Therefore, factorial analysis links the size of parameters together. In fact, it estimates structure's paradigm coefficients and hence, completes the model's description and thereby, provides indices so that fitting quality between model and data is measured. In fact, via using factorial analysis, we address the subject that whether existing data fit with the pre-empirical limited structure which meet assimilation conditions? [5].

Though factorial analysis is one of the widespread statistical analyses in [psychology and is one of the most important statistical tools for studying complex behavioral phenomena, factorial analysis model parameters like normalcy and linear relation between questions is non-resilient. A useful way for these problems is to use new and alternative and most economical methods and using multiple scaling statistical approaches [6].

While using multidimensional scaling, the general goal is to specify dimensions which affect perception of the behavior; for instance, behaviors not being specific in data. This will help the analyst to have an overall review over relations between variables. Such an insight in psychological researches along with qualitative data being extracted from scaling is of high value or is highly useful in ranking or arranging skills and questionnaires. Multidimensional scaling could model non-linear relations between variables, deal with nominal and rank based data and yet there is no need for multivariate normalcy [7]. Multidimensional scaling is based on this rational assumption that in some of the phenomena, relations between subjects is unclear.

However, matrix of their distances could be estimated; therefore, the researcher will be able to explore its possible structure while discovery of data [8].

Multidimensional scaling is a technique which has been designed for outlining the map illustrating relations between a numbers of observations. This map could be mono-dimensional (if observations are situated on one line), bi-dimensional (if observations are situated on one surface), tri-dimensional (if observations are specified by means of some points in the space) or multidimensional (where in this state there is no direct geometric display) [9].

The usefulness of the multidimensional scaling arises from that fact that relations between objects or observations is in most cases unclear, however, matrix of their distances can be estimated. This situation occurs in Humanities and social sciences. Under circumstances where people under experiment can discover degree of similarity or difference between pairs and objects, but are not capable of delineating an overall, picture of relations between them, the Multidimensional scaling could bring about a picture of relations [10].

Studying life quality dimensions in an Iranian sample and different historic experiences of the people of this land in transition from a traditional realm tom a modern realm assumes high importance among world's nations and requires comprehensive researches. This category of studies allows for cross-cultural comparisons between different countries. In this research, that which is raised for the researcher as a basic issue is that life quality construct dimensions could be obtained by using two factorial analysis and multidimensional scaling and the two models can be compared and weak and strong points be determined. In fact, we seek to explore this issue whether there is a similar structure for the life quality construct in then two models? We will investigate which model could prove to be useful in determining life quality components? On the other hand, validity of life quality construct can be examined.

METHODOLOGY

This research has a fundamental and developmental nature in terms of goal, because in this research, discovery of the nature of phenomena and relations between variables, principles and rules as well as construction or testing of theories related with life quality are addressed and the research general contributes to the expansion of knowledge borders regarding this subject. In fact, we want to explain the relations between phenomena, test theories and add existing knowledge with regards to this dynamic and multidimensional construct.

This research is descriptive-analytical. The word descriptive is meant as the fact that the current research is non-experimental and in terms of data analysis, the current research methodology will be based on linear and non-linear correlation between variables or questions under study. The appropriate method for gathering data in this research was a survey type research, because in order to examine the structure and identify dimension and components of life quality and examinee other psychometric charac6ers, various aspects of information are used and in fact we are seeking the distribution of comprehensive traits.

Given the nature of these sorts of researches, the population under study could involve various populations and since there is a need for gathering information and data along with saving time and money in researches, one has to determine a population. Given statistical conditions and prevailing methodology regarding life quality construct and notion which must be a symbol of the Islamic Culture of Iran, the population of this research was consisted of all students studying at Tehran's Universities in the academic year of 2014-2015. The sampling method was random and it was comprised of all majors and all B.A., M.A and Doctorate students and the number of 315 people was selected.

The tool for this questionnaire was the World Health Organization's Life Quality Questionnaire (WHQOL-100). The World Health Organization's Life Quality Questionnaire has been simultaneously designed and translated into different languages in 15 countries across the world and through long strife, the correspondence of the ideas was made sure of. The World Health Organization's Life Quality Questionnaire enjoys high acceptance and has been translated into 40 languages including Farsi and standardized in many of the countries across the world. This tool has been made useable for measuring in both healthy and unhealthy groups [11]. The World Health Organization's Life Quality Questionnaire (WHQOL-100) is a tool organized in six domains of life quality where the six domains are as follows:

Physical Health domain: It measures physical health and involves daily activities, drug dependency, energy knowledge, feeling of fatigue, mobility status, pains, sleeping, rest and working capacity.

Psychological domain: It evaluates mental aspect and consists of one's perception of his own physique and appearance, degree to which he enjoys life, meaningfulness of life, level of self-satisfaction, examination of psychic states like depression, hopelessness, sad mood, level of concentration and memory.

Social communication domain: It is comprised of personal communications social states and sexual activities.

Environmental domain: It measures factors affecting the environment and involves financial resources, physical security and freedom, health and social care, home's physical setting, opportunities for acquiring skills and information, creative activities, and leisure time, transportation and physical environment.

Two other domains include spiritual domain and independence level domain which are not seen in other life quality tools [12].

According to the results reported by the designers of World Health Organization's Life Quality Construct, which is done in 15 international centers, Cronbach's Alpha was reported to be ./73 to ./89 for the subscales of it and the overall scale [13].

In Iran, in 2006, Nasiri used three ways of retest, split half and Cronbach's alpha for the reliability of the scale which were ./67, ./87 and ./84 and he has also used concurrent validity method for determining validity. The overall score correlation of each dimension was used along with each and every question constituting that dimension. Correlation coefficients ranged from ./45 to ./83 and all coefficients were found to be meaningful at the ./01 level and any item did have the highest correlation with the related dimension. In another research by Yousefi and Safari in 2010 done for determination of validity, the range of obtained coefficients was ./47 to ./85 and all the coefficients were meaningful at the ./01 level. Concurrent validity of the Persian Version of the World Health Organization's Life Quality Questionnaire (WHQOL-100) was assessed by using Pearson Correlation Coefficient as regards various dimensions. All the estimated correlation coefficients for various dimensions were positive values; however, some of these coefficients were not statistically significant. Also, in this study, t test of two independent groups and multiple regression analysis were used for evaluating differential validity. Given the results obtained, a statistically significant difference was seen between healthy and disables people in all thee dimensions except for the spiritual dimension. The findings obtained were indicative of an acceptable validity of the scale [14].

FINDINGS

Table 1: level of stress obtained in the model within the Multidimensional scaling

Stress and Fit Measures	
Normalized Raw Stress	.01231
Stress-I	.11097[a]
Stress-II	.17979[a]
S-Stress	.01030[b]
Dispersion Accounted For (D.A.F.)	.98769
Tucker's Coefficient of Congruence	.99382

As seen from Table 1, the level of normalized raw stress and standardized stress in the multidimensional scaling is ./01, indicating full stress and thus means that the model tolerates the least pressure existing along with the data obtained. In fact, findings implicated that there was a full proportion between data and the model.

Graph 1: Gravel graph of the Multidimensional scaling model

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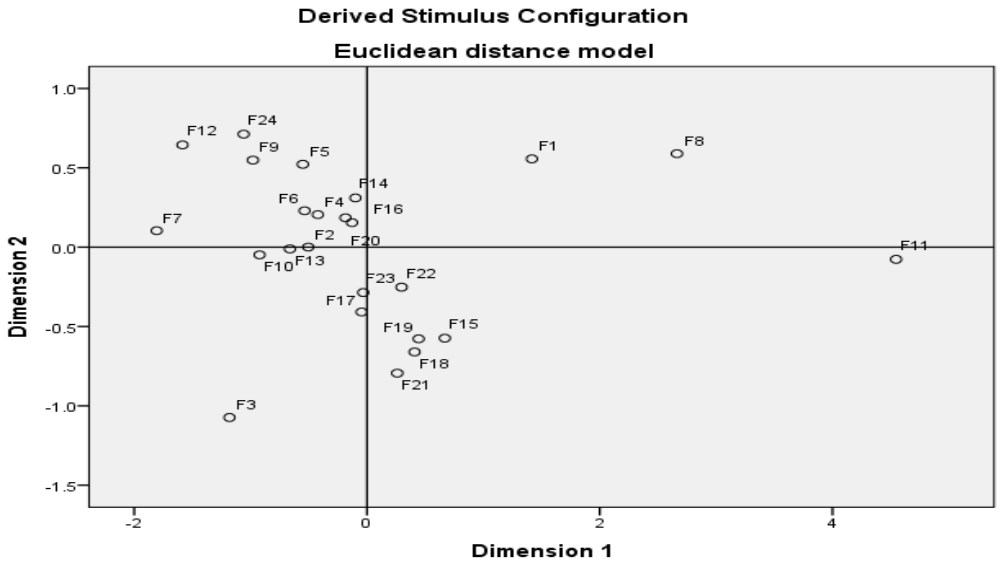
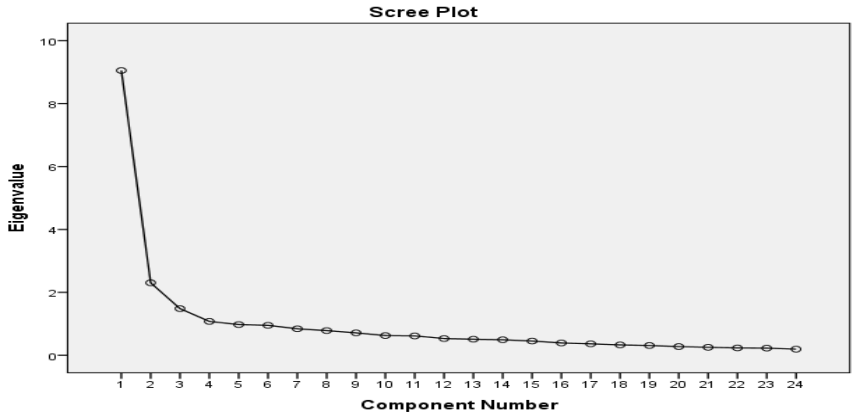
Graph 1 shows the gravel graph in a multidimensional scaling which affirms at least four dimensions in existing data.

Graph 2 : Dispersion of subgroups of each of the domains in the multidimensional scaling model



Graph 2 shows the map of location of each of the subgroups and the way life quality dimensions ate formed in a student sample in Tehran Universities. A number of subgroups like F1,F3, F7, F8 and F11have distanced from other groups and cannot be located in none of the dimensions.

Graph 3: gravel graph of the factorial analysis model



Graph 3 indicates a gravel graph in a factorial analysis model.

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Table 2: Component components of each of the domains

	Component			
	1	2	3	4
Pain and suffering	-.097	.102	.642	-.514
Energy and fatigue	.700	-.314	-.255	.215
Sleeping and rest	.565	-.257	-.386	-.059
Positive feeling	.720	-.161	.249	.028
Thinking and learning	.632	-.276	.357	.255
Self-esteem	.718	-.304	.355	.049
Appearance and bodily picture	.648	-.210	-.025	-.172
Negative feeling	-.602	.245	.347	-.020
Displacement	.585	-.142	-.066	-.392
Daily activities	.734	-.159	-.198	-.106
Dependency on drug therapy	-.545	.263	.241	.545
Working capacity	.580	-.474	.212	-.048
Individual relations	.747	-.015	.052	.235
Social support	.597	.190	.122	.264
Sexual activity	.554	.315	-.077	.040
Physical security and confidence	.674	.209	.146	.040
Home setting	.582	.465	.145	-.095
Financial sources	.657	.465	-.024	-.036
Social and health care	.524	.574	.013	.036
Opportunity to acquire new information and skills	.636	.225	.285	.007
Participation in recreation	.568	.204	-.098	-.065
Physical setting	.519	.329	-.198	.104
Transportation	.650	.451	-.226	-.143
Spirituality/religion and personal beliefs	.603	-.383	.161	.161

In Table 2, the way 24 subgroups are located in four dimension are shown. In each dimension scores of over ./5 will remain either with positive and negative signs and the rest of the subgroups will be deleted from that domain or dimension.

DISCUSSION AND CONCLUSION

In analyzing multidimensional scaling, Normalized raw stress and standardized stress both showed ./01, suggesting full stress and is indicative of the fact that the model tolerates the least pressure existing along with the data obtained. In fact, findings implicated that there was a full proportion between data and the model. Gravel model in multidimensional scaling affirms at least four dimensions in existing data. Also, by using the Euclidian space, all the 24 domains f life quality and the distances obtained have been shown and the subgroups distanced can be observed well. In this technique, dimensions in a Euclidian space and dispersion and grouping of domains in intended clusters in accordance with obtained data from the sample have been shown as a two dimensional map. This sort of dimension display shows dimensions through a picture in four dimensions in a student sample. This is when the stress graph affirms the four dimensions and the rest of the domains cannot be placed in a special dimension. In this map, the way each of the subgroups is placed and the ways life quality dimension are formed in a student sample at Tehran Universities have been shown. A number of subgroups like F1, F3,F7, F8 and F11 have been distanced from other subgroups and cannot be placed in none of the dimensions.

In dispersion graph, data are located on a line appropriately, showing the least dispersion, Aggregation of data dispersion is on the rise in the dispersion graph. Via using confirmatory factorial analysis, following results were obtained: at first, factorial analysis assumptions are checked and confirmed so that they have been met and thereafter, by using the gravel graph, the existence of the four dimensions are confirmed in the data. BY observing graphs Q-Q, it is concluded that all the observations must adapt to delineated regression lines where in each of the dimensions, small deviation of lines is seen. In dimensional analyses, the way all 24 subgroups area paced in the four dimensions is shown. In each dimension scores of over ./5 will

remain either with positive and negative signs and the rest of the subgroups will be deleted from that domain or dimension.

In the later stage, by using varimax and using Kisser normalcy, subgroups of the four dimensions are shown. Of course, rotation in the sixth repetition will be reached. Results obtained from confirmatory factorial analysis ad multidimensional scaling are correspondent; however, given a student sample of dimensions and subgroups placed in each dimension do not match with the World Health Organization where this issue looks due to the student population and special natural needs which attract the practitioners.

Life quality construct involve numerous challenges, which the first and most important challenge surrounding this construct s the general, vague and undivided nature of it. In fact, there is a kind of dispersion with regards to the dimensions of this construct in various countries that lead to vague and unpractical results in researches by nations and comparisons in the international arena. The second challenge is that, via examinations regarding quantitative and qualitative researches surrounding life, we conclude that in most of these researches, no statistical or appropriate measurement has bane used. There are differences between factorial analysis and multidimensional scaling. Guttmann ha refereed to two major differences. Factorial analysis yields estimates of higher rank being multidimensional compared to scaling techniques and scaling techniques provide for a widespread arrangement of similar coefficients which are applied. Generally. Multidimensional scaling method and factorial analysis have differences:

- Data psychometric characteristics are obtained from that;
- Analysis methodologies;
- Results obtained and the way they are shown;
- Interpretations which are obtained from these results [7].

From another point of view, multidimensional scaling is like a factorial analysis and could be applied in test of modeling question's answers. Davidson and Sky considered these two methods as similar, because both methods provide a coherent space of structures which are called dimensions in a factorial analysis named factor and dimensions in the multidimensional scaling. They state factorial analysis of correlation and covariance provides a spatial display of variability between people; whereas multidimensional scaling provides a spatial space of variability in the tests [15].

This is when multidimensional scaling, dud to the fact it is a modern way in Iran and the fact that it involves positive characteristics like lack of limitation of factorial analysis, the possibility for examining all the subjects, thus making this method more distinct from others [6].In fact, that thing making multidimensional scaling more salient than other method's is that assumptions like minimum data scale distances, deletion of disperse data and satisfaction of assumptions of normalcy and equality of variance matrix and covariance is not necessary [16].

As per characteristics of the two multidimensional scaling and factorial analysis and due to high privileges that the multidimensional scaling has compared to other clustering methods and also appropriate functions of multidimensional scaling in fitting model with data under special situations, results of this research and using modern and powerful methods like multidimensional scaling in examining life quality construct and its dimensions will be key for experts of cultures, psychologists, sociologist a d ethnographers and health experts. Generally, an accurate assessment of structure and life quality dimensions in the students population in Iran with various cultures and attaining those dimensions, could contribute to planers and policy makers and general welfare in the society. This research could be key for new researches in Iran when it c0mes to using multidimensional method on other psychological constructs and educational sciences.

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