Neutrosophic Linguistic Scale in the Assessment of Knowledge of Psychosomatic Medicine in University Students

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Abstract. Psychosomatic medicine research has been of interest to the scientific community, due to the benefits it provides in the treatment of different diseases. Its techniques have facilitated the clinical management of some pathologies. This aspect of medical sciences has been systematized from different approaches and perspectives, but undoubtedly it is still necessary to deepen the link with neutrosophy. Based on these arguments, the present research aims to apply a neutrosophic linguistic scale for the assessment of psychosomatic medicine knowledge in university students. During the development of this study, theoretical, empirical, and statistical methods were taken into account, particularly neutrosophic descriptive statistics. The results obtained reveal the need for further study of this subject in medical school.

Keywords: Neutrosophic linguistic scale, neutrosophic statistics, knowledge, psychosomatic medicine.

1 Introduction

Research in the field of health plays a leading and transcendental role since its objectives in the vast majority are aimed at preventing, educating, or curing diseases that society faces. That is why it is characterized by a humanistic approach, where several applied sciences and branches of knowledge converge. One of them, psychosomatics, is the one that will be deepened in this research based on the benefits that it brings in the cure of diseases.

Medicine in its origins, according to the researcher Sokkegui [1], was psychological medicine. Derived the art of healing like all other activities of primitive peoples from the animistic conception of the Universe. This idea is one of the bases that gave rise to the development of psychosomatic medicine.

The term "psychosomatic" has often been used to refer to different phenomena, thus denoting or generating a certain ambiguity in its meaning. Sometimes it has been used to refer to a renovating movement in Medicine; others, to refer to research on psychological factors involved in the etiology of physical illnesses, to classify illnesses in which psychological factors are hypothesized to play a crucial role, or even as a generic label to name all those somatic symptoms for that there is no proven medical explanation [2].

Psychosomatic medicine presents a wide field of research and work, but most researchers agree that the relationship between psychological factors and physiological phenomena in general and the mechanisms in pathogenesis converge in it [3].

Psychosomatic medicine is the answer, or answers, that medicine has given to the mind-body problem. Each of the theoretical models adheres to some of the theories on the mind-body relationship that have been studied by philosophy, but this topic exceeds the scope of these sciences and disciplines. Hence, it is considered a discipline with a multidisciplinary field of action [4], [5].

Based on the arguments raised above, it is argued that the psychosomatic orientation implies a change in the assessment and integration of the data collected in the interrogation and exploration, ordering them in a current biographical and historiographical sense.

An important aspect to take into account is the multifactorial etiopathogenic conception and the transactional criterion, which allow us a much more real and therefore much more effective prognostic-evolutionary consideration [6].

As evidenced in what has been described above, psychosomatic medicine is so important in the field of health that all professionals in the process of training must study it and keep in mind its models and forms of action.

That is why in the present investigation the assessment of the level of knowledge of the medical students of

the Autonomous Regional University of the Andes (UNIANDES) is deepened. For the sake of being able to perfect the design of this study program. For this, neutrosophy comes to help because it is a new branch of philosophy, which opened a new field of research in metaphilosophy, and which studies the origin, nature, and scope of neutralities, as well as their interactions with different ideational spectra [7], [20], [25], [26].

Based on the arguments raised above, this research aims to apply a neutrosophic linguistic scale for the assessment of knowledge of psychosomatic medicine in university students.

2 Methodology

2.1 Study subjects

From the first moments of the investigation, the postulates of neutrosophic statistics were taken into account, whose objective was to calculate the population. In the case of the present investigation, the population is known, so the formula presented below is applied.

Where the letter p = means the approximate proportion of the reference population, while the letter q = refers to the proportion of the reference population that does not present the research (1 -p). The desired confidence level for the statistician (Z), this letter is indicative of the level of confidence that will be had in the true value of the parameter in the population found in the calculated sample. For its part, absolute precision is represented by the letter (d). Which in turn means the desired width of the confidence interval on either side of the true value of the difference between the two proportions (in percentage points). While the N refers to the size of the population.

Before making the selection of the sample by applying the selected formula, it is necessary to know what is meant by a neutrosophic sample, for this what is proposed by Smarandache is assumed, who agrees in stating that it is a chosen subset of a population, a subset that contains some indeterminacy: either with respect to several of its individuals (which may not belong to the population we are studying, or may only partially belong to it) or with respect to the subset as a whole. While classical samples provide accurate information, neutrosophic samples provide vague or incomplete information. [23]

That is why Smarandache also says that any sample is neutrosophic since it can be considered that its determination is equal to zero. A neutrosophic population is a population that has not determined the membership of its members (that is, it is not known with certainty whether some individuals belong to the population or not). [8], [9], [21], [22].

Being consistent with the selected formula and to increase the validity of the research, a confidence level between 90 and 95% is desired, z= [1.642, 1.99], d= [0.04, 0.2] and p = [0.5, 0.43], N=40. The result that we call the neutrosophic sample n= [10.1, 30.9] indicates that the sample must be in values between 10 and 32 university students.

Once the procedure was applied to know the number of university students that could be part of the sample, a raffle technique was applied where 30 university medical students of the Autonomous Regional University of the Andes (UNIANDES) were selected. Of them, 19 are female and 11 are male with an average age of 26.9 years.

2.2 Instruments used

Both classical methods of research methodology were used in the study, particularly those proposed by authors such as Herbas [10], as well as neutrosophic techniques. In this study, descriptive exploratory research is carried out and on these arguments, the methods and techniques of the research were planned.

Of a theoretical nature, the synthetic-analytic method stands out, this was useful in the first moments of the investigation since it facilitated the work with the bibliographic sources and in turn allowed the processing of the information offered by the different instruments applied to diagnose the current state problem and draw conclusions.

The inductive-deductive method was also used: this was useful for making inferences and generalizations of the answers given by the students to the survey and in the selection of the aspects contained in the applied scale.

Within the empirical methods and techniques, the student survey was used, which allowed identifying the level of knowledge of university students regarding the contents of psychosomatic medicine. [27], [28], [29]

The measurement was used to attribute values to each of the responses and opinions of university students regarding the subject under investigation.

Within the mathematical statistics, descriptive statistics were used, particularly the percentage analysis, and inferential statistics were also used, within it the Pearson correlation test to identify whether or not there were coincidences in the answers of the students to the questions of the survey.

2.3 Neutrosophic method

The neutrosophic method of investigation is used to take into account the contradictions and uncertainties in the linguistic labels, for which processing is carried out using techniques of neutrosophic statistics to handle the indeterminacy in the sample. The research follows the neutrosophic model proposed in this work, it is presented, as illustrated below:

Stage 1. Initial diagnosis for the selection of personnel who will apply the survey

Stage 2. Selection of the questions that make up the survey

Stage 3. Preparation meeting to unify criteria on how to apply it

Stage 4. Application of the survey

Stage 5. Tabulation of the results

Stage 6. Neutrosophication of the data

Stage 7. Analysis and interpretation of the results

Stage 8. Rules of neutrosophic inference

Neutrosophic Evaluative Scale:

This scale used single-value neutrosophic numbers (SVNS) [11]. For this case study, the universe of discourse is an SVNS which is an object with the following form [12], [24].

To represent inconsistent, imprecise, and uncertain information from the real world, the membership of indeterminacy is represented independently together with the membership of truth and falsehood in the set of neutrosophy this has been recommended by several researchers such as Smarandache, [7], [13], [14], [15], [16]. The interval represents the true, undetermined, and false memberships of x in A, respectively.

$$A = \{\langle x, u_a(x), r_a(x), v_a(x)\rangle : x \in X\}d \tag{1}$$

Where

$$u_a(x): X \to [0,1], r_a(x): X \to [0,1] \; y \; v_a(x): X \to [0,1]$$

With

$$0 \leq u_a(x), r_a(x), v_a(x) \leq 3, \qquad \forall \, x \in X$$

The intervals $u_a(x), r_a(x)$ y $v_a(x)$ denote the true, indeterminate, and false memberships of x in A, respectively.

For convenience, an SVN number will be expressed as A, where a, b, c [0, 1], and +b +c $\leq$ 3.

Linguistic term	SVN numbers
Excellent (E)	(1,0,0)
Very good (VG)	(0.70,0.35,0.30)
Good (G)	(0.50,0.50,0.50)
Regular (R)	(0.40,0.85,0.70)
Bad (B)	(0,1,1)

Table 1: Linguistic terms of the scale.

Where A = (T, I, F) is a single-valued neutrosophic number, a scoring function S is in turn related to a single neutrosophic value, corresponding to the degree of relevance to truth, the degree belonging to indeterminacy and the degree of belonging to falsity is defined by [4]. The scoring function for single-valued neutrosophic sets is proposed to make the distinction between the numbers. [17]

$$d(A - B) = \sqrt{\frac{1}{3}\sum_{i=1}^{n}[P_A(x_i) - P_B(x_i)]^2 + [I_A(x_i) - I_B(x_i)]^2 + [N_A(x_i) - N_B(x_i)]^2} \tag{2}$$

3 Results

The results obtained with the application of the survey in university students are reflected below. For this, each of the questions of the survey is interpreted, in correspondence with the selected neutrosophic linguistic terms.

Question 1	Excellent (5)	Very Good (4)	Good (3)	Regular (2)	Bad (1)
How do you evaluate your knowledge about	2 (6.6%)	5 (16.6%)	8 (26.6%)	10 (33.3)	5 (16.6%)

Question 1	Excellent (5)	Very Good (4)	Good (3)	Regular (2)	Bad (1)
the means of psychosomatic medicine?					

Table 2: Results of question 1 of the survey applied to university students. Source: own elaboration.

Observing the results obtained, it becomes evident that the knowledge of university students about the means of psychosomatic medicine is not the most satisfactory. Well, only 2 students indicated the linguistic terms with the highest score (E), the category of (VG) was also one of the least marked since only 5 university students indicated it. In the category of (G), although there was an increase in students, are still a minority, since only 8 selected this option. Most of the university students selected the category of (R), (10) one of the lowest of the selected scale, and 5 selected option (B). These results show the existence of insufficiencies in the knowledge of the students with this subject. [18], [19]

Question 2	Excellent (5)	Very Good (4)	Good (3)	Regular (2)	Bad (1)
How do you rate your knowledge of the techniques of psychoso-matic medicine?	3 (10%)	2 (6.6%)	4 (13.3%)	8 (26.6%)	13 (43.3%)

Table 3: Results of question 2 of the survey applied to university students. Source: own elaboration.

As shown in Table 3, which represents the results of question 2 of the survey of university students. They rated their knowledge of psychosomatic medicine techniques as follows. Only 3 students attributed the option with the highest score of the presented scale (E). Also, a minority of 2 students gave it a rating of (VG). Category (G) was marked by 4 students. While that of (R) was only chosen by 8. On the other hand, the category with the lowest score on the scale was the one selected by a majority of students (B) with 13. This denotes that the sample of this research requires actions that enhance their preparation on psychosomatic medicine.

Question 3	Excellent (5)	Very Good (4)	Good (3)	Regular (2)	Bad (1)
How do you evaluate the training you re-ceived in psy-chosomatic med-icine during your studies?	2 (6.6%)	8 (26.6%)	3 (10)	12 (40%)	5 (16.6%)

Table 4: Results of question 3 of the survey applied to university students. Source: own elaboration.

The results displayed in table 4 correspond to question 3 of the survey. Where, as in the remaining questions, a minority of university students select the categories with the highest score on the applied scale. Well, only 2 members of the sample marked the category of (E). For their part, 8 did so for (VG), and 3 for (G). While the majority of the students investigated are grouped into the categories with the lowest score on the scale. As are the cases of (R) that was selected by 12 students and that of (B) by 5. This confirms that the level of knowledge of students about psychosomatic medicine is regular and poor. Therefore, it is suggested to delve into research that enhances their training and preparation.

To validate the results of the present investigation, a correlation study was carried out, since this marks the relationships between 2 or more variables, in the case of the present investigation, the content of the three questions of the survey, that is, the degree of possibility that these have to coincide. Once the data has been processed with the SPSS 20.0 software for Windows, Table 5 is built. Where it shows, through the Pearson test, that there was a high level of significance since r, ($p<0.005$). This allows to state that there is an important correlation between the results obtained.

		Question 1	Question2	Question3
	Pearson correlation	1	.901**	.844**
Question 1	Next (2-sided)	-	,000	,000
	N	30	30	30
	Pearson correlation	.928**	1	.971**
Question 2	Next (2-sided)	,000	-	,000
	N	30	30	30
	Pearson correlation	.859**	.971**	1
Question3	Next (2-sided)	,000	,000	-
	N	30	30	30

**. The correlation is significant at the 0.01 level (bilateral).

Table 5: Correlation matrix between the responses of university students. Source: SPSS 20.0 Processing for Windows.

Conclusion

In the analysis of the theoretical references, as well as the main models of psychosomatic medicine, it is evident that they have focused research on revealing its benefits and importance, to the detriment of its impact on the medical training curricula in the universities.

The methodological logic followed was based on general methods, as well as neutrosophic techniques to know more accurately the assessment of the knowledge of university students about psychosomatic medicine.

The interpretations of the results offer important validity since they allow identifying the level of knowledge of university students about psychosomatic medicine. For this, statistical processing was carried out and it reveals a level of significance that makes the present investigation pertinent.

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