

# An incipient fuzzy logic-based analysis of the medical specialty influence on the perception about mental patients

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**Abstract** Analyses of the stigma associated with mental patients have been exhaustively developed. Some of these analyses refer to the general population in different countries, some other compare conclusions from these countries, and some others discuss the attitudes of either current or future (psychiatric and non-psychiatric) health professionals with respect to mental illness. Most of these analyses are based on well-known questionnaires (usually on their country-adapted versions), each of them corresponding to a multi-item scale evaluated using either a 5-, 6- or 7-point Likert scale and focussing on different attitudinal factors or constructs. This paper introduces a quite preliminary study in this setting, aiming to examine the influence of the medical specialty on the perception about mental patients and involving a more expressive and flexible scale to rate attitudes: the fuzzy rating scale (allowing a free fuzzy set-valued response assessment to items).

## 1 Introduction and background

The stigmatization associated with mental illness is a topic receiving an increasing attention along the last decades. People with mental disorders are often facing prejudices and discrimination, that could be removed to a great

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The representatives of the Three Wise Men from Agones brought illusion to my home every Christmas. Over the years, oneself perceives and understands that the legacy of their Majesties cannot be compared even with gold, incense or myrrh. The representative embodied the humanity and captaincy of genius, the contagiousness of dreams, and Gil's excellence. Thank you tío Pedro! (Pilar).

extent if nonexperts become more sensitive and they get achieve a deeper knowledge and health care about this illness.

To evaluate this stigma many studies have been developed. Some of them have been focussed in rating attitudes towards mental illness at the social-level on general populations/communities by simply analyzing the effect of sex, age, country, and so on (see, for instance, [10, 20, 21, 27, 37]). Other studies have concerned attitudes of medical/health care students ('tomorrow's' doctors) and non-psychiatric physicians (see, for instance, [1, 2, 3, 8, 9, 12, 13, 15, 16, 21, 22, 33, 34, 35, 40, 42, 46]) and some few are devoted to compare attitudes of psychiatrists, psychiatric nurses and relatives of mental patients in contrast to the general population (see, for instance, [39]). Also some others, like [38], deal with a comparative analysis of beliefs and attitudes among different countries.

The most common instruments to evaluate stigmatization and discrimination of mental illness in either general populations or health care professionals are questionnaires. The *Opinions about Mental Illness Scale (OMI)* has shown satisfactory psychometric properties and a long history of usage in different populations. It was originally developed by Cohen and Struening [6] (see, among others, [23, 31, 43] for some comments about).

Most of items in this questionnaire are based on a 6-point Likert scale ranging from STRONGLY DISAGREE to STRONGLY AGREE. The items have been conceived to evaluate five main dimensions, namely, *interpersonal etiology* (the belief that mental illness is due to problematic interpersonal relations and experiences), *authoritarianism* (the belief that obedience to authority is critical and mentally ill persons require coercive handling), *social restrictiveness* (the idea that mental patients should be restricted in some social domains such as voting, jobs, parenting, etc.), *negativism* (that can be viewed as opposite to the so-called mental hygiene ideology, this one supporting the idea that mental illness is an illness like any other, it should be treated by specialists and most of mental patients are not dangerous), and *prejudice* (that can be intended to be contrary to the so-called benevolence, the belief that they are not different from others).

This scale (as well as others like the well-known Community Attitudes Toward the Mentally Ill scale, CAMI, by Taylor and Dear [41], a briefer revised updated version of OMI which additionally involves the community mental health ideology) has been translated, adapted and validated in various languages (see, for instance, [31, 32, 45, 47, 48, 49]). In particular, the translation, adaptation and validation of the OMI scale to Spanish has been carried out by Ylla [47] and Ozamiz [32] by including a few new items, and leading to the so-denoted OMI-R.

This paper aims to perform a comparison of attitudes towards mental illness of three groups of nonpsychiatric physicians (more concretely, primary care doctors, neurologists and internists). Although a few attempts to such a comparative analysis can be found in the literature (see [4, 16, 30, 36]), and the need for eliminating the stigmatization and discrimination within

the medical profession has been often claimed (see [28]), the topic has not yet received a deep research attention.

The comparison is to be based on an innovative tool in this setting, namely, the psychometric *fuzzy rating scale (FRS)* by Hesketh *et al.* [17, 18, 19]. This tool can be immediately applied to deal with classical questionnaires like OMI (or OMI-R) and it simply affects the way responses to items are given. Thus, instead of choosing a point in a Likert scale, the fuzzy rating scale allows respondent to draw a fuzzy value with a total freedom, whence the variability, diversity, subjectivity and the intrinsic imprecision corresponding to attitudes can be much better captured and expressed.

FRS-based data can be statistically analyzed by using some already developed methods (see [5, 7, 11, 25, 26]) and their implementation in R through the statistical package for fuzzy data SAFD [44].

## 2 Methods

To develop the comparative analysis a 14-item excerpt from the OMI-R questionnaire has been considered. The excerpt has been conducted on a sample of 22 physicians from the Hospital Son Llàtzer in Palma de Mallorca. The composition of the sample has been as follows: 7 primary care doctors, 4 neurologists and 11 internists. The excerpt, the fuzzy scale and the method to get statistical conclusions are to be briefly commented in this section.

### *2.1 Excerpt from the OMI-R questionnaire*

The (sub)questionnaire includes 14 items selected from the OMI-R. These items, which have been viewed as very informative for the considered target, are the following:

- I.1. Mental illness is an illness like any other
- I.2. Most of the patients who are hospitalized either in the psychiatric units of general hospitals or in mental hospitals are not dangerous
- I.3. Mental illness is a way to react to social demands and pressures
- I.4. People who are mentally ill let their emotions control them; normal people think things out
- I.5. People who are mentally ill are so worried by their own problems that do not care about what others can think about them
- I.6. A heart patient has just one thing wrong with him, while a mentally ill person is completely different from other patients
- I.7. People with mental illness should never be treated in the same hospital as people with physical illness

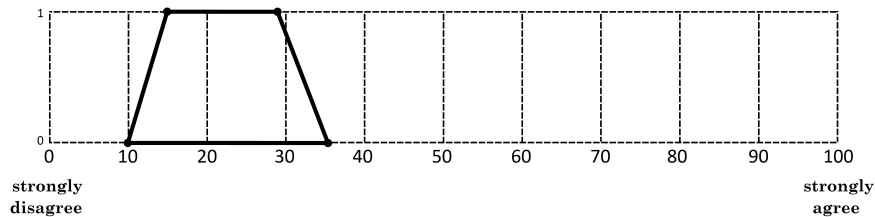
- I.8.* People who have been patients in a mental hospital will never be their old selves again
- I.9.* Mental illness is usually caused by some disease of the nervous system
- I.10.* Regardless of how you look at it, patients with severe mental illness are no longer really human
- I.11.* One of the main causes of mental illness is a lack of moral strength or will power
- I.12.* Most of us feel a bit uncomfortable or restless in the presence of mentally ill people
- I.13.* People who suicide are always mentally ill
- I.14.* What do you think about the convenience of the fact that along the last decades psychiatric units are being opened in general hospitals?

Items *I.3*, *I.4*, *I.5* and *I.6* relate to interpersonal etiology, *I.9* concerns authoritarianism, *I.2* affects social restrictiveness, *I.8*, *I.10*, *I.13* and *I.14* refer to negativism, and *I.12* regards prejudice.

## 2.2 The fuzzy rating scale and the adapted form

Respondents to this type of OMI-based questionnaires are asked to rate their level of agreement with each of the statements in the items. The level of agreement is usually assessed by considering the 6-point Likert scale consisting of STRONGLY DISAGREE, DISAGREE, SOMEWHAT DISAGREE, SOMEWHAT AGREE, AGREE and STRONGLY AGREE.

Since the number of possible ‘values’ to choose among is small, variability, adjustment, diversity, subjectivity of the natural level of agreement is lost. Moreover, the choice of the ‘value’ that best represents respondent level of agreement is not easy.



**Fig. 1** Example of a FRS-based level of agreement with the statement of a given item

To avoid such a restrictive scale, Hesketh *et al.* [17, 18, 19] have suggested to consider a *fuzzy rating scale (FRS)* allowing respondents to draw the fuzzy number that best represents their score. In case the rating concerns the level of agreement with a given statement, the FRS-based level is to be stated as follows: firstly, a reference bounded interval (for instance  $[0, 100]$ ) is first

considered, with 0 = STRONGLY DISAGREE and 100 = STRONGLY AGREE; the interval of real numbers which are considered to be ‘fully compatible’ with the level of agreement of the respondent is drawn with height 1 (this corresponds to the so-called core of the fuzzy number); the interval of real numbers which are considered to be ‘compatible to some extent’ with the level of agreement of the respondent is drawn with height 0 (this corresponds to the so-called support of the fuzzy number); these two intervals are linked to get a trapezium (see Figure 1).

A FRS can cope to a full extent with the intrinsic imprecision associated with the level of agreement with a statement, it means a double continuum (w.r.t. both location and imprecision), its flexibility allows raters to properly capture individual differences, whence the intrinsic variability, diversity and subjectivity are not lost, and it is much richer and more expressive than any one based on a (unavoidably finite) natural language (or its numerical encoding).

### *2.3 The statistical methodology*

FRS-based responses can be mathematically and computationally handled in a suitable way, since one can state arithmetic and distances preserving their meaning and allowing us to extend/adapt/develop many concepts, results and procedures from the real-valued data data analysis (see, for instance, [5, 7, 11, 25, 26] for more details).

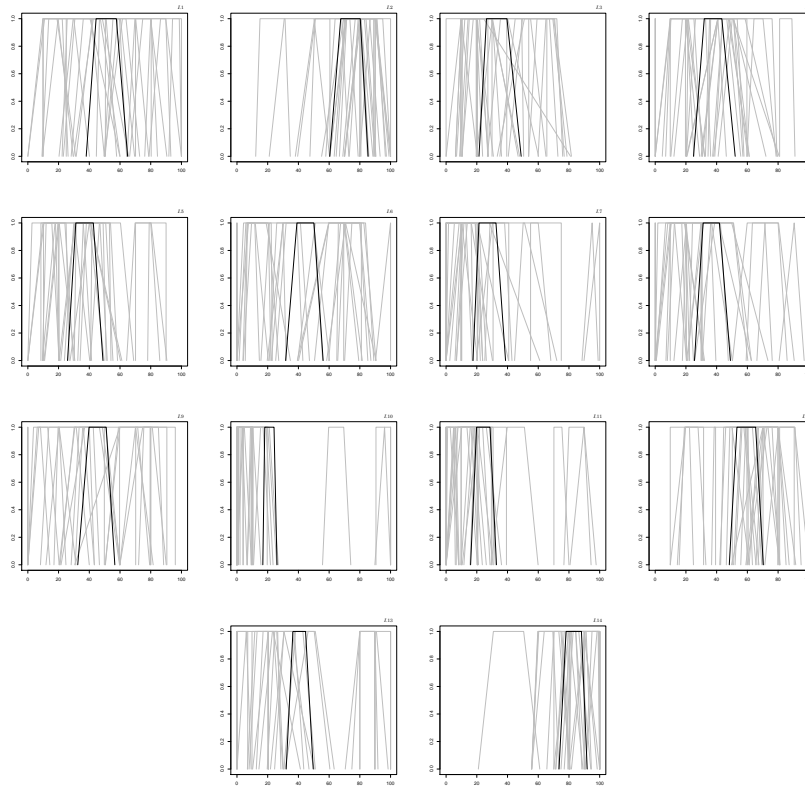
To analyze Likert-type data a posterior numerical encoding of Likerts values is usually considered. This makes all differences between consecutive values to coincide, which is often unappropriate, and the transition from a value to another within the scale is rather abrupt. Moreover, only a few statistical techniques are rigourously applicable (they being mainly based on the frequencies of different values or their position in accordance with a certain ranking) and, as a consequence, relevant statistical information is often lost.

In this paper, to compare the influence of the medical specialty on the attitude towards mental illness an ANOVA test for fuzzy data introduced in [14] and implemented in [44] is to be applied. It should be pointed out that the mean value of a trapezoidal fuzzy dataset is a trapezoidal fuzzy number in which each of the four characterizing vertices is given by the mean of the real-valued dataset corresponding to these vertices.

## **3 Results and discussion**

Figure 2 displays the FRS-based datasets and means for each of the considered 14 items.

On the basis of the outputs in Figure 2, one can empirically conclude that non-psychiatric physicians in the considered sample have shown a unequivocally high average agreement with the assertion in Item *I.14* and a rather low average agreement with the assertion in Item *I.7* (which seems quite coherent and indicate these physicians are quite in favour of avoiding discriminate/separate mental patients by hospitalizing them in non-general hospitals). The physicians have also shown on the average a quite low level of agreement with the statements in Items *I.10* and *I.11*. Actually, the average behavior can be associated with a rather high sensitivity w.r.t. mental illness.

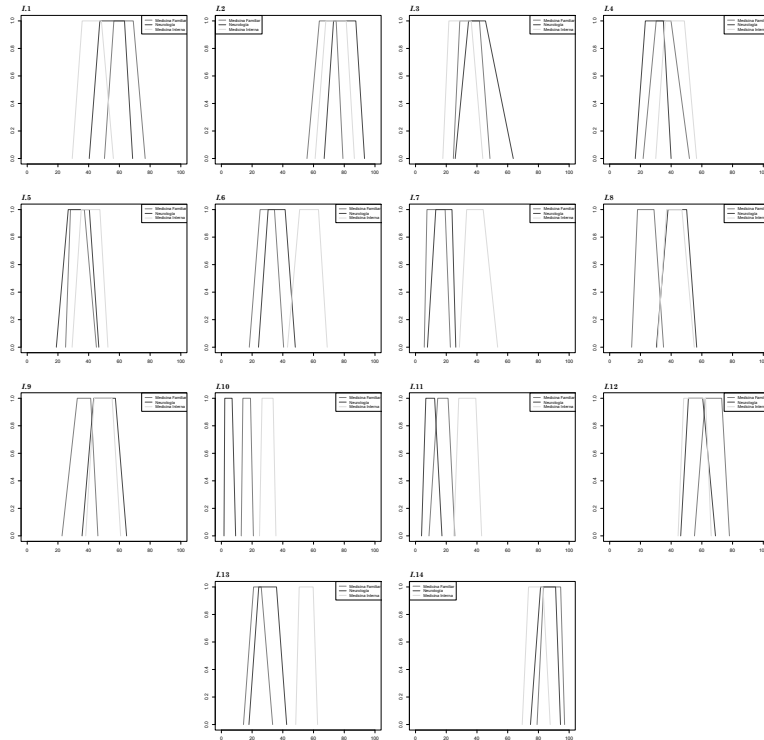


**Fig. 2** Datasets (in gray) and fuzzy-valued sample means (in black) of the FRS-based responses to the 14 considered items

In connection with the analysis of the influence of the medical specialty on the attitude towards the mental illness, Figure 3 displays the three FRS-based means for each of the considered 14 items. At the first glance, we do not expect differences in attitude are significant. Actually,  $p$ -values of the ANOVA test for FRS-based data have been collected in Table 1. For most of

the items, but  $I.7$  and  $I.13$ , these  $p$ -values are greater than 0.1, so that we cannot consider the medical specialty as influential for these items.

However, if we look at  $p$ -values of the ANOVA test for FRS-based data concerning items  $I.7$  and  $I.13$ , we get them to be either close to or lower than 0.05, whence we can consider the medical specialty affects the responses to these items.



**Fig. 3** Fuzzy-valued sample means for three specialties of the FRS-based responses to the 14 considered items

In fact, for both items the lowest average level of agreement is the one associated with primary care doctors, whereas the highest (which is much greater than the other two) is the one associated with internists.

## 4 Conclusions

It should be pointed out that, because of the novelty of the considered scale, and the need for a certain training before filling questionnaire forms, the sample has been small, so conclusions are not as clear as one can expect for

**Table 1** ANOVA  $p$ -values for the influence of the medical specialty on the attitude towards mental illness (with FRS-based responses)

Item	$p$ -value
<i>I.1</i>	0.331
<i>I.2</i>	0.501
<i>I.3</i>	0.590
<i>I.4</i>	0.427
<i>I.5</i>	0.656
<i>I.6</i>	0.162
<i>I.7</i>	<b>0.052</b>
<i>I.8</i>	0.324
<i>I.9</i>	0.596
<i>I.10</i>	0.299
<i>I.11</i>	0.106
<i>I.12</i>	0.490
<i>I.13</i>	<b>0.044</b>
<i>I.14</i>	0.261

larger samples. In fact, the claimed advantages of the use of a (continuous) FRS are not as visible when small samples as considered.

In addition to have a larger sample, it would be also interesting to analyze the influence of other factors, like medical expertise or age, sex, as well as comparing psychiatrists' opinions with non-psychiatric physicians' ones.

Furthermore, since the same items can be responded simultaneously with both scales, a Likert- and a FRS-type one, it would be valuable to compare statistical conclusions (e.g.,  $p$ -values) for both scales. Thus, in accordance with previous analyses with other problems, [11, 25, 26]), conclusions sometimes differ.

Finally, it would be worthy to validate the 14-item subquestionnaire, as well as to quantify its internal consistency for the FRS, and to compare it with the one for the 6-point Likert one.

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