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A bibliometric analysis of the current status of psychiatric classification: the DSM model compared to the spectrum and the dimensional diagnosis

Un'analisi bibliometrica sull'attuale situazione della nosografia psichiatrica: un confronto tra DSM, Spettro e Diagnosi Dimensionale

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Key words

Classification • Nosology • Nosography • Taxonomy • Psychopathology • Philosophy of science • Diagnosis

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Summary

Aims
In the DSM-V planning process, two alternative views are conflicting: one conservative, proposing only few and minor changes, and one revolutionary, proposing a paradigm shift. The present paper will consider if today the DSM model is effectively in crisis and if two of the possible alternative models (the spectrum and the dimensional diagnosis) are strong enough to replace it.

Methods
The degree of empirical and theoretical attention that problems of classification as well as alternative approaches to the DSMs have received in the scientific community was studied by means of a bibliometric analysis. A computerized search of the PsycInfo Database was carried out for the period 1987-2004 and data evaluated within the context of bibliometric procedures. Only the database for journal articles was used; the database was searched for the appearance of the index terms anywhere in the title, abstract, keywords, text and references. The bibliometric analysis was organized in four steps in order to maximise the exclusion of false-positives.

Results
The finding that a total of 32098 articles published within the 1987-2004 period cited one or other of the DSM versions confirms the strong impact of the DSM on psychiatric diagnosis, with the number of DSM articles continuously growing (Table I): from 554 papers in 1987 to 5199 in the year 2003. A decrease to 4888 DSM articles in the year 2004 is an exception probably due to delay in updating the Database. The number of citations for every DSM version was low in the year of publication, and gradually increased with time. DSM-IV and DSM-V began to be cited before their year of publication, while this was not the case of the DSM-IV-TR (Table II).
16094 articles reported the term "DSM-" in relation to diagnostic terms. In 10586 articles, the term "dimension*" was related to the diagnostic words. It represented 16.44% of all dimensional articles and 12.43% of all diagnostic papers.*
For the spectrum articles, the number of citations in relation to diagnostic terms was 4434. It was 36.1% of all spectrum articles and 5.2% of all diagnostic writings.
The curves reproducing the time profile of the ratio of any index term within the context of all diagnostic papers (Fig. 1) shows that both dimensions and spectra have similar curves and that dimensions are quantitatively more important than spectra. However, when every model was considered in its own rhythm of growth from the baseline year 1987 up to 2004 (Table III and Fig. 2), the recent increase of spectrum articles was significantly higher than that of papers on dimensions and DSMs.

Conclusions
Reading within the context of Kuhn's philosophy of science, these findings are consistent with the status of a scientific crisis at its beginning, when the dominant paradigm trudges among its anomalies (in the case of the DSM disorders, excessive comorbidity, internal heterogeneity, lack of validity and unclear boundaries between disorders and between normal and pathological conditions) while the alternatives, even if rapidly growing (above all the spectrum model) are not yet strong enough to dethrone the old system and take its place. Ideas for further methodological research guided by a philosophical understanding of diagnostic problems are proposed.

Introduction

The initial phase of the DSM-V planning process, the probable publication of which is expected about 2010, began in 1999. Since then, researchers started to work and discuss the possible modifications that should be made in view of the new DSM edition, with many articles and a few books now available on this topic [1-16].
An overview on this debate reveals that two opposite points of view are now conflicting.
On the one hand, the "conservative approach"; it stresses that changes in criteria of the current diagnostic system have many possible disadvantages:
– changes need to be learned by thousands of clinics;
– medical record forms, structured interviews and other health-related documents need to be modified;
– meta-analyses, longitudinal researches and comparisons between patients selected with the new and old criteria may be impaired;
– too frequent changes may discredit the revision process and ridicule the DSM system [17].

As a consequence, researchers proposing a conservative approach suggest modifying the DSM diagnostic criteria only in the very few cases where the empirical evidence on the need for change is compelling.
If, as is probable, the DSM-V will follow this direction, its general form will be similar to that of the DSM-IV-TR, with only minor changes that can be grouped under the following headings:
a) a new definition of the concept of disorder in the introductive chapter of the DSM. Such a conceptual change is designed to reduce the number of patients diagnosed as having a mental disorder in epidemiological studies [18 19]. It is noteworthy that this general effect would be induced without any concrete change of the single diagnostic criteria of the specific disorders listed in Axis I and Axis II of the DSM;
b) the integration within the DSM system of data emerging from molecular genetics, neurobiology, neuroimaging and psychopharmacology. Even in this case, however, these *aetiological* data may hardly have a direct impact on the DSM-V diagnostic criteria; it is more likely that they will be included in Axis III or in the descriptive part of the manual;
c) selective change of a few diagnostic criteria aimed to increase the compatibility between DSM-V and ICD-11.

In contrast to this conservative view is that of authors who, even if they recognize the great success of the DSM system in improving the reliability of the psychiatric diagnoses, they are discouraged, at the same time, by the rather poor results obtained on files such as diagnostic validity and clinical utility. For example, Kupfer, First and Regier [10] write: "In the more than 30 years since the introduction of the Feighner criteria by Robins and Guze, which eventually led to DSM-III, the goal of validating these syndromes and discovering common aetiologies has remained elusive. Despite many proposed candidates, not one laboratory marker has been found to be specific in identifying any of the DSM-defined syndromes. Epidemiologic and clinical studies have shown extremely high rates of comorbidities among the disorders, undermining the hypothesis that the syndromes represent distinct aetiologies. Furthermore, epidemiologic studies have shown a high degree of short-term diagnostic instability for many disorders. With regard to treatment, lack of treatment specificity is the rule rather than the exception" (p. XVIII).
According to this view, which closely resembles the admission of a state of crisis, they foresee that "research exclusively focused on refining DSM-defined syndromes may never be successful in uncovering their underlying aetiologies. For that to happen, an as yet unknown paradigm shift may need to occur" (p. XIX). The use of the term *paradigm* is significant, because it is a technical word that makes sense within the context of the Thomas Kuhn's theory of scientific revolutions [20].
Accordingly, in the present paper, the implicit assumption is that the DSM-III and subsequent versions constitute a kuhnian paradigm which someone considers in crisis; it is on the basis of this assumption that alternative models will be considered.
A possible critique could be addressed to the conception of the DSM system as a kuhnian paradigm. A detailed justification of this position is discussed elsewhere [21]. In short, for the needs of the present paper the following points should be stressed: first, the DSM-I-II introduced, in the field of psychiatric nosology, a significant innovation (the operative diagnostic criteria that characterize the concept of *disorder*, which substituted classical terms such as disease or illness). Interpretations of this change vary from the extreme of stressing continuity with previous classifications (indeed, they are all categorial) to the other extreme of considering the DSM-III as a kuhnian revolution [22]. A closer application of the kuhnian analysis suggests [21] that the DSM-III be considered as the point of transition from a pre-paradigmatic phase (many schools of thought, everyone using its own classification) to a paradigmatic phase (a unique way of making diagnosis, widely shared by clinicians and researchers)*.
In theory, many alternative ways to pursue the aim of a paradigmatic shift in psychiatric classification are possible [21]. Amongst others, in the most recent de-

* The obvious critique that the DSM is not the unique system, because of the availability of the ICD-10, should consider that the ICD-10 shares with the DSM the use of operative diagnostic criteria. Because they were firstly introduced in the S. Louis' works that strictly led to the DSM-III, it is the last that is here considered the beginning of a paradigmatic phase.

bate, three diagnostic models are more frequently discussed and are often considered as the most likely alternatives to the current DSM system.

The first model arises from the critique to the descriptive approach of the DSM. According to McHugh [4], the DSM is limited because it is based on appearances (the descriptive symptoms) while a strong diagnostic system should consider first essences (in his view, the aetiology and pathophysiology of mental diseases). In accordance with this general view as well as with the most recent findings on genetic research and neuroscience, a radical redefinition of the diagnostic axes was proposed [23]. According to this new way of defining psychiatric diagnoses, which could be named *aetiopathogenetic diagnosis*, Axis I would be set aside for recording the patient's genotype, Axis II the neurobiological phenotype, Axis III the behavioural phenotype, Axis IV the environmental modifiers or precipitants and Axis V the therapeutic options [23].

A second model comes from the tendency to eliminate the boundaries between DSM disorders when they appear to be too frequently correlated (when comorbidity rates are excessively high). In this case, two or more DSM disorders may be conceived as phenomenological variations within a unique spectrum of disorders, the main common characteristics of which is probably a shared similar underlying pathophysiology. Examples of the *spectrum diagnosis* are the obsessive-compulsive spectrum [24] and the bipolar spectrum [25]. Even if critical considerations of this model can be advanced for many reasons [26 27], in the present paper methodological critiques will be avoided and the spectrum model will be considered only in relation to its concrete chances to substitute the DSM system.

Finally, the third model arises from the critique to the DSM categorical approach, a critique that stresses DSM difficulties in making meaningful distinctions between normal and pathological conditions as well as between disorders. This third alternative approach suggests evaluating psychopathological phenomena along dimensional continua, and it is generally known as *dimensional diagnosis*. Instead of the categorical attribution to any patient of one or more diagnoses, the dimensionalists suggest evaluating, in each patient, a given number of basic dimensions. At this point, a personal profile will arise from the scores obtained in every dimension, and this individual profile would be the dimensional diagnosis. According to the dimensionalists' view, the dimensional model provides a precise and individual assessment of mental distress, while the categorical problems of excessively high comorbidity, internal heterogeneity of the disorders and difficulties in tracing distinctions between disorders and between norm and pathology would be solved (a more detailed discussion of this topic can be found in Vella and Aragona [28]).

During the discussion of a DSM-V Research Planning Conference, held October 5-6, 2000 (cited in Kupfer et al. [10], p. XXI), it was suggested to distinguish a short-term from a long-term perspective. From the analysis of the current debate it seems that this distinction has good chances to be accepted. In the short-term, a conservative approach has more probabilities to be taken in view of the DSM-V. Here, the above-discussed disadvantages of a too frequent change of the diagnostic criteria are likely to be seriously considered. On the contrary, in the long-term, the limitations of the current DSM paradigm could become too evident to be further overlooked and the need of a paradigm shift may prevail.

However, if this scenario is to be considered realistic, it suggests that the dual approach is not sufficient to solve the conflict between the two opposite views (the conservative and the revolutionary ones), limiting itself to postpone it after the year 2010. In this case, it would be legitimate to ask "If the DSM is in crisis today, is it rational to spend energies working on a conservative approach in view of the DSM-V, or would it be more fruitful to focus immediately on the alternative approaches?".

In order to be valid, this question needs to be grounded on the validity of its premise. In other words, is the DSM model really in crisis?

The present paper explores this possibility by using a "sociology of scientific research" approach. The current situation of the DSM system and of two of the aforesaid alternative diagnostic models (the spectrum and the dimensional diagnosis) will be considered through a bibliometric analysis[**].

A picture of the "state of the art" within psychiatric and psychological research will arise and it will be discussed in relation to the kuhnian description of scientific revolutions [20].

Methods

The method used to assess the degree of empirical and theoretical attention that problems of classification, as well as alternative approaches to the DSMs, have received in the scientific community was the bibliometric analysis. This method was developed in sociology as a way of describing scientific activities [29] and was fruitfully used in previous research on the diagnosis of mental disorders [30]. In this field, it can be easily applied to identify articles on particular topics and to measure their relative size within the scientific literature.

[**] The aetiopathogenetic diagnosis was excluded because researchers use different names to indicate it and therefore, no unique index term was available to be entered in the computerized search.

A computerized search of the PsycInfo Database [31] was carried out for the period 1987-2004. The search was performed in April 2005; therefore 2004 was the most recent year available at the time the search was accomplished. The year 1987 was selected as a starting point because it was the year of publication of the DSM-III-R [32].

Only the journal articles database was used; books were not considered because the information often duplicates journal publications. The database was searched for the appearance of the index terms anywhere in the title, abstract, keywords, text and bibliography.

The PsycInfo database is a comprehensive source for psychology, psychiatry and journals dealing with related fields. This was preferred to general medicine databases (e.g. PubMed and Medline) in order to reduce, as much as possible, the "false positives" (e.g. papers treating diagnostic problems from medical fields outside psychiatry).

The bibliometric analysis was organized in four steps.

In the first stage, the absolute number of articles that appeared on PsycInfo, in every year from 1987 to 2004, was calculated for the following key words: a) "diagnosis OR classification OR nosolog*"; b) "dimension*"; c) "spectrum"; d) "DSM-*"; e) "DSM-III-R"; f) "DSM-IV NOT DSM-IV-TR"; g) "DSM-IV-TR"; h) "DSM-V".

In this context, the asterisk means "any letter after it" (for example, DSM-* is a way to consider all the DSM versions), while AND, OR and NOT are used according to their use in logic.

In the second stage, an advanced search was performed, successively coupling some above-listed key words. Specifically, the string at point "a" was successively coupled to the terms listed at points "b" through "d" ("a AND b"= "diagnosis OR classification OR nosolog*" AND "dimension*"; "a AND c" = "diagnosis OR classification OR nosolog*" AND "spectrum"; "a AND d" = "diagnosis OR classification OR nosolog*" AND "DSM-*"). This process was needed in order to restrict the field only to the dimensional and spectrum terms which were used in the literature within the context of the diagnostic and classification discussion. In other words, this was a way to further reduce the "false positives" (that is, to exclude articles using terms such as *dimension* or *spectrum* in their general sense, without any relation to the psychiatric classification and diagnosis).

In the third stage, the relative size of the literature of any of the following strings ("a AND b"; "a AND c"; "a AND d") was calculated as "percentage of a" (%"a AND b"/a; %"a AND c"/a; %"a AND d"/a). This was done in order to allow the comparison of the relative size that any of these subjects have within the context of diagnostic discussions in psychology and psychiatry.

Finally, in the fourth stage, the proportional increase (%) from baseline of "a AND b", "a AND c" and "a AND d" was calculated considering as a baseline the year 1987.

Results

The computerized search of the 1987-2004 PsycInfo database confirms the strong impact of the DSM on psychiatric diagnosis. A total of 32098 articles pub-

Table I. Total number of articles quoting the main index terms. *Numero assoluto di articoli che citano i termini scelti.*

	Diagnosis OR Classification OR nosolog*	Dimension*	Spectrum	DSM-*
1987	2397	1312	146	554
1988	2332	1323	147	569
1989	2506	1467	164	644
1990	2468	1568	169	615
1991	2372	1578	181	667
1992	2526	1649	196	758
1993	2528	1811	224	798
1994	2577	1763	222	799
1995	2790	1933	206	851
1996	2812	1915	238	901
1997	2880	2160	257	984
1998	3114	2390	304	1010
1999	4846	3571	663	1793
2000	5353	4051	772	2089
2001	10018	8003	1665	4382
2002	10700	8652	1915	4597
2003	12545	9935	2407	5199
2004	10369	9280	2382	4888
Total	85133	64361	12285	32098

Table II. Absolute number of articles quoting the considered DSM versions. *Numero assoluto di articoli che citano le varie versioni del DSM.*

	DSM-III-R	DSM-IV	DSM-IV-TR	DSM-V
1987	22	9	0	0
1988	98	8	0	0
1989	214	17	0	0
1990	284	19	0	1
1991	415	84	0	0
1992	497	84	0	0
1993	584	116	0	0
1994	586	117	0	1
1995	588	187	0	1
1996	555	281	0	4
1997	577	384	0	1
1998	504	481	0	3
1999	843	931	0	3
2000	909	1260	0	15
2001	1956	2688	21	34
2002	1857	3014	71	55
2003	1871	3468	165	71
2004	1601	3316	201	86
Total	13961	16464	458	275

lished within this temporal frame cited one or another of the DSM versions. The number of DSM articles in the years under consideration was continuously growing: from 554 papers in 1987 to 5199 in the year 2003. The year 2004 is an exception, with a decrease to 4888 DSM articles. A similar trend is also shown for the other index terms, including the general diagnostic string: "diagnosis OR classification OR nosolog*" (Table I).
The number of citations for every DSM version is low in the year of publication, and gradually increases with time. DSM-IV and DSM-V began to be cited before their year of publication, while this is not the case for DSM-IV-TR (Table II).
Overall 16094 articles reported the term "DSM-*" in relation to diagnostic terms ("a AND d"); this represented 50.1% of all the papers in which the term "DSM-*" appeared. Papers in which the diagnostic string was coupled with the term DSM-* ("a AND d") accounted for 18.9% of the whole number of diagnostic articles.

Fig. 1. Time profile of the ratio of "any index term coupled with the diagnostic string" within all the diagnostic papers. *Profilo temporale del rapporto tra "ognuno dei termini indice accoppiato alla stringa diagnostica" e l'insieme degli articoli sulla diagnosi.*

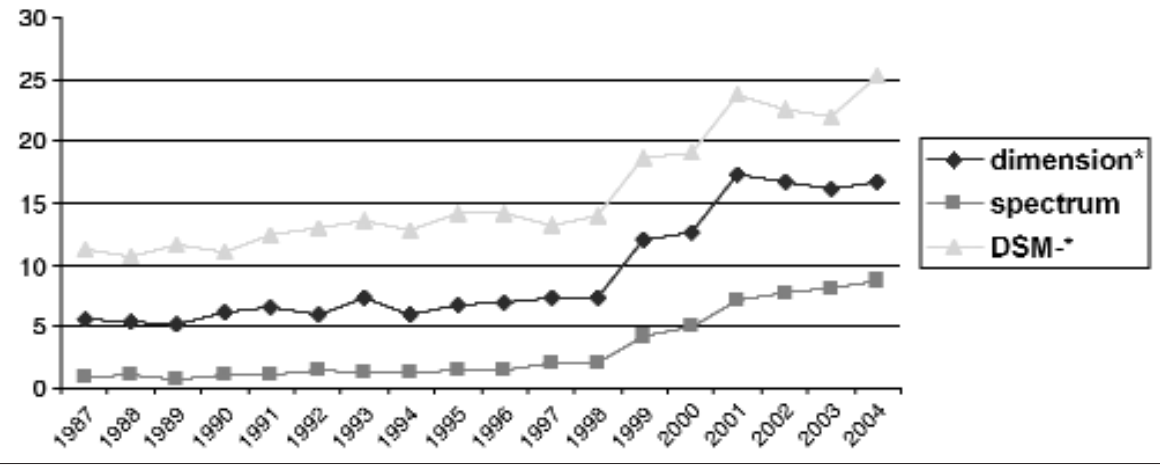


Table III. Increase from baseline (%) *. *Aumento percentuale rispetto al baseline.*

	Dimension*	Spectrum	DSM-*
1987	Baseline	Baseline	Baseline
1988	-8.02	+27.27	-7.77
1989	-5.10	-4.54	+8.51
1990	+10.94	+36.36	+1.11
1991	+13.86	+31.81	+10.37
1992	+11.67	+68.18	+21.85
1993	+36.49	+63.63	+28.51
1994	+12.40	+54.54	+22.22
1995	+37.95	+100.00	+46.29
1996	+45.25	+109.09	+47.40
1997	+56.93	+177.27	+40.37
1998	+67.15	+195.45	+62.22
1999	+327.73	+863.63	+234.44
2000	+393.43	+1150.00	+276.66
2001	+1165.69	+3168.18	+782.22
2002	+1213.13	+3695.45	+792.22
2003	+1383.21	+4545.45	+922.59
2004	+1164.23	+4072.72	+871.48

* = Any of the above-mentioned terms are coupled with the diagnostic string (diagnosis OR classification OR nosolog*).

In 10586 articles, the term "dimension*" was related to the diagnostic words ("a AND b"). It represented 16.44% of all dimensional articles and 12.43% of all diagnostic papers.

For the spectrum articles, the number of citations in relation to diagnostic terms ("a AND c") was 4434. Thus 36.1% of all spectrum articles and 5.2% of all diagnostic writings.

The curves reproducing the time profile as the ratio resulting from %"a AND b"/a; %"a AND c"/a; %"a AND d"/a (which are the ratio of "any index term coupled with the diagnostic string" within all the diagnostic papers) are shown in Figure 1.

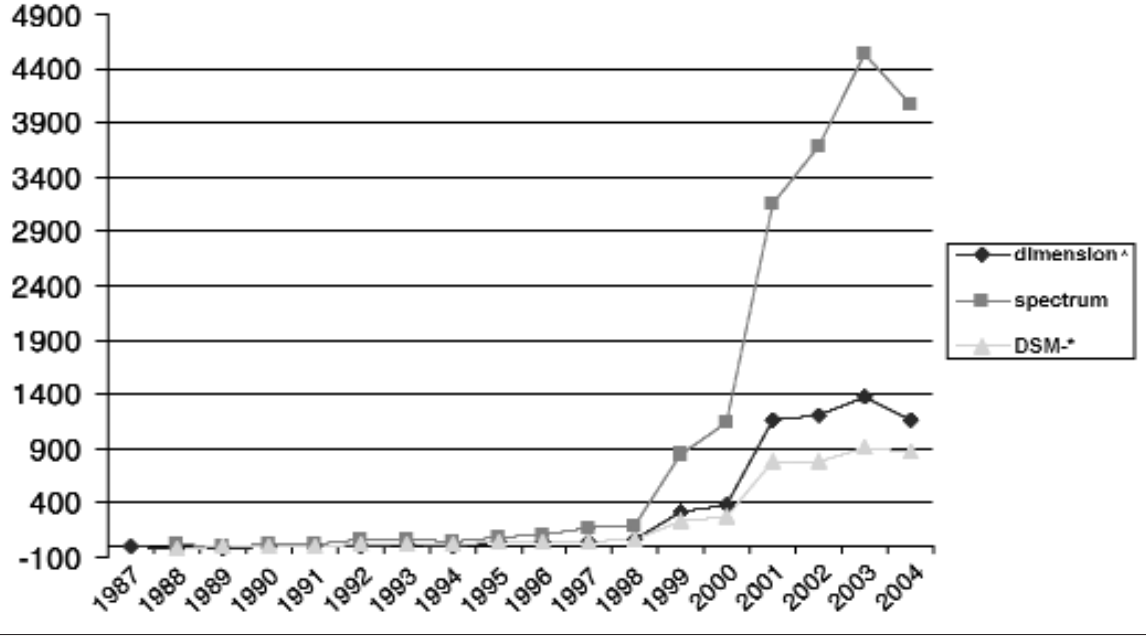
Finally, the rates of increase from the baseline year 1987 up to 2004 are listed in Table III. As shown in Figure 2, the recent increase in spectrum articles was significantly higher than that of papers on dimensions and DSMs.

Discussion

In this investigation, a bibliometric analysis was used to measure the relative impact that some alternative approaches to the psychiatric diagnosis have had, in recent years, in the literature, on the diagnosis of mental disorders. In this context, bibliometric analyses can be used to study what researchers effectively do, a kind of "sociology of scientific activity".

According to Kuhn's [20] philosophy of science, sociology of science is a sensitive indicator of the status of a scientific discipline. In his model, during a paradigmatic phase the main theory is expected to be the most widely used by researchers. On the contrary, when a crisis of the dominant paradigm is in act, an increas-

Fig. 2. Rate of increase from baseline for the main diagnostic terms. *Percentuale di incremento rispetto al baseline per ogni termine diagnostico.*



ing number of scientists would be expected to criticize it and embrace new alternative models. In this paper, two alternative models were considered for the bibliometric analysis, the spectrum and the dimensional diagnosis. To be rigorous, only the second model is intrinsically revolutionary (dramatic shift from the categorial to the dimensional approach), while the spectrum shares with the DSM the use of a categorial approach (the difference being mainly the shift from a *splitting* to a *lumping* approach). In any case, even the spectrum is an attempt to solve some of the main DSM problems by integrating the usual classification in disorders with an alternative lumping approach that should help in reducing comorbidity. It is for this reasons that it will be considered as a possible alternative model to the DSM disorders and discussed herein[***].

Returning to the bibliometric findings, the first evidence is that the number of publications decreased in 2004 for the majority of the index terms considered. This is likely to be a bias due to the fact that the PsycInfo database is not static and is frequently updated. Due to the lag time in updating a database, it is likely that many 2004 references were still not included in the database at the time the present search was performed.

As expected, the number of citations for every DSM version is low in the year of publication and gradually increases with time. It is interesting that the DSM-IV began to be widely cited before its year of publication; the same thing is now happening for the DSM-V, which is already cited even if its publication is expected about 2010. On the contrary, this phenomenon was not seen in the case of the DSM-IV-TR. These differences can be explained by the fact that articles focused on future changes of the diagnostic criteria usually reported the name of the next DSM version as the author imagined it would have been. Accordingly, authors proposing changes for the DSM version following the DSM-IV wrote directly "DSM-V", because the term "DSM-IV-TR" was not commonly known until the years immediately preceding its publication.

Another interesting finding is that the number of citations of the DSM-III-R still continues to increase. At least part of this phenomenon may be due to the fact that long-term and follow-up studies are likely to use the old classification, which was the diagnostic system of reference at the time those studies were designed. Further studies should explore the role of other possible factors in the explanation of this finding.

The absolute number of articles focused on any DSM was 32098, while the number of papers in which the term "DSM-*" was associated with "diagnosis OR classification OR nosolog*" ("a AND d") was 16094. When compared to the other two index terms ("spectrum" and "dimension*"), it appears that the DSMs are much more closely related to the diagnostic debate: the DSM articles cited in relation to diagnosis were 50.1% of all DSM articles, while this ratio was 36.1% for spectrum articles and only 16.4% for dimensional papers. This may indicate that the last two index terms are less specifically linked to the diagnostic field.

Bearing in mind this difference and since the reduction of false positives (articles not pertaining to the diagnostic debate) is to be evaluated, comparisons between these alternative models had to be performed on the "coupled search": data emerging from the computerized search obtained by entering, as keywords, the association of any index term ("DSM-*"; "dimension*"; "spectrum") with the general diagnostic string.

Within this coupled search, the first finding is that the relative size of DSM articles in relation to all diagnostic articles increased from 11.2% in 1987 up to 25.3% in 2004. This evidence suggests that the DSM classification is still strong and widely used in psychiatric and psychological research. Considered in relation to the kuhnian model, this could be interpreted in various ways. A first way of thinking on these results is to consider them as a possible refusal of the initial hypothesis that the DSM system is in crisis. However, this could be a possible shortcut that does not take into consideration the publishing workload (delay in publishing articles and updating databases) as well as the larger context in which theoretical discussions take place.

Accordingly, it could be argued that the crisis can be at its beginning, therefore it is not yet visible in the broad field of psychiatric and psychological research. According to this second viewpoint and following the kuhnian philosophy of science, it is to be expected that at the very beginning of a crisis only a small subgroup of scientists will be aware of it and, therefore, publishe articles on this topic. In this case, only a qualitative research would be able to highlight this point of controversy, while a bibliometric analysis would be unable to discover this situation, due to its general and quantitative methodology. An initial and more qualitative study on this point was started elsewhere [21] but it is still insufficient and further research needs to be done.

To sum up, by means of a bibliometric analysis, a direct demonstration of a possible crisis of the current psychiatric classification appears difficult, if the crisis is at its beginning. However, in this case, the

[***] It should be stressed that even the dimensional diagnosis was initially proposed as integrative. Accordingly, there are good reasons to think that with time even the spectrum model could become a clear alternative system; in fact, if followed to its extreme consequences even the spectrum model could result in revolutionary effects [27].

above-mentioned findings, it should be complemented for revealing an indirect feature of a possible crisis: in order to take place, every scientific revolution needs not only the old system of reference to be in crisis, but also one or more alternative systems to be available, which are ready to dethrone the old system and take its place.

Following this line, a bibliometric analysis could be used to check whether any of the possible alternatives is growing with a faster rhythm than that of the old system. If this is true, a significant change in the relative forces of the old and the new system(s) could suggest that a future scientific revolution in the psychiatric nosology is not necessarily a chimera.

When two of the possible alternatives to the DSM system (namely, the spectrum and the dimensional diagnosis) were considered, the first evidence was that their use in diagnostic research was not completely new. In fact, both alternative systems were already cited in 1987. This is not surprising if we consider that, on the one hand, in the sixties, the schizophrenic spectrum was conceptualized within the context of adoption studies [33], while, on the other hand, various kinds of dimensional diagnoses were used in psychology even in the past. For example, Eysenk's neuroticism-intraversion/extraversion model [34] was dimensional, as well as the MMPI profile [35] and many other psychological diagnostic systems.

In order to establish whether the dimensional and/or the spectrum models are strong enough to replace the DSM diagnostic system, their relative influence within the diagnostic debate was considered.

The dimensional model was cited more often than the spectrum. This finding suggests that the relative force of the dimensional model is higher than that of the spectrum. This is in line with the general impression people may have reviewing current literature on psychiatric classification. The dimensional model is one of the main candidates for the replacement of the DSM diagnostic criteria, at least for personality disorders [36 37].

However, if this alternative system should replace the DSM model, its relative strength, compared to the DSM diagnoses, should be superior (i.e., articles on the dimensional diagnosis should increase more rapidly than articles on DSM). The present findings do not support such a possibility: indeed, at the present time, both DSM and dimensional articles increase from baseline with a similar rhythm of growth (Fig. 2). According to these data, the dimensional model is currently the strongest candidate to replace the DSM system if a scientific revolution were to occur in this field. However, at the moment, such a revolution has neither happened (the number of dimensional articles is still much lower than the number on DSM, while in Kuhn's model a revolution is accomplished when the majority of scientists use the new model), nor is it going to happen in the near future. In fact, even if the increase from baseline is higher for the dimensional model (1383.2%) than for the DSMs (922.5%), their curves of growth are similar, suggesting that the dimensional model is not growing more rapidly than the DSMs (Fig. 2). Two possible limitations of this interpretation of data on the dimensional diagnosis are:

1) the first one is linked to the lag time in publishing the articles and updating the database; if the substitution of the DSM system with a dimensional model is a new frontier of research, it is not unlikely that only a few of the newly-designed studies are already published and updated in PsycInfo database;
2) the second limitation is that articles focusing on dimensional diagnosis are likely to discuss this diagnostic model in opposition to the current system, the DSM. As a consequence, the number of articles in which the terms "DSM-*" and "dimension*" are both cited is high, and this could raise the rates of DSM citations biasing the evaluation of the relative force of these two alternative classification systems. To overcome this last limitation, a qualitative analysis is needed, because it is the only means to discriminate articles supporting the DSM view from articles that mention the DSM system in order to criticize it.

When the spectrum model was considered, the following findings emerged: its quantitative force is, at present, lower than that of both DSM and dimensional diagnosis. As an example, in the year 2003, the term *spectrum* was cited within the context of diagnostic papers in 1022 articles, while 2032 papers used the term "dimension*" and 2761 papers cited at least one of the DSM versions.

However, this relative weakness was counterbalanced by the impressive evidence of a rhythm of growth unequivocally faster than that of the other two diagnostic models considered. Within the diagnostic field, in the year 2003, the increase from baseline was 922.5% for the DSMs, 1383.2% for the dimensional model, 4545.4% for the spectrum. Such a difference (Fig. 2) is theoretically significant because it indicates that the spectrum model, even if still quantitatively weaker than the DSM and the dimensional models, is, nevertheless, the most vital one.

Conclusions

A bibliometric analysis of psychiatric and psychological literature was performed for the period 1987-2004 on the PsycInfo database. From this quantitative study, it emerged that the DSM system of classification is the most widely used by researchers, and that its use is still continuously growing. Accordingly, the hypothesized crisis of the DSM model, which

has been discussed elsewhere on a methodological ground [21], is not yet evident in the current literature. This does not automatically mean that such a crisis should be categorically excluded. In fact, when considered in the general context of comparison to other diagnostic approaches, this picture may be interpreted as not only the very beginning of a scientific crisis, but also a situation in which only small subgroups of researchers are aware that the intrinsic limits of the current model drive it to a state of crisis, while the majority of researchers are still engaged in researches designed within its context. As noted in the discussion, an indirect suggestion that this interpretation may be plausible comes from data on the two alternative diagnostic models considered, and particularly from the spectrum articles whose rhythm of growth, in the last few years, is impressively faster than that of the DSMs (while the dimensional model, which is quantitatively stronger than the spectrum, showed a rhythm of growth only slightly faster than that of the DSMs, the difference being not significant). Taken as a whole, these findings suggest that the DSM system of psychiatric classification may begin to show the first signs of a possible crisis while, at the same time, the two alternative models considered are rapidly growing but are not yet strong enough to accomplish a scientific revolution. Indeed, the dimensional diagnosis (which is the most valued and theoretically grounded model) is frequently cited but, at the same time, its rhythm of growth is not higher than that of DSM. On the contrary, the spectrum is rapidly increasing and its relative growth is greater than the other models; however, at the same time, it appears to be the weakest model when it is considered from a conceptual point of view [27]. Accordingly, the current state of psychiatric nosology is still largely undecided and further research is needed:

- at a bibliographical level of analysis, to consider qualitative features of the published articles. This is fundamental in order to eliminate false positives and to understand how a given term is used within the context of the articles in which it appears. As shown, a computerized search is unable to distinguish when a given term is cited to support its use or, on the contrary, it is cited to criticize it within the context of a discussion supporting the alternative view; such a difference can be grasped only by means of a qualitative evaluation of the paper under examination;
- at a methodological level: to consider more accurately the role of the current *anomalies* emerging from the application of DSM criteria in clinical and research settings. A few examples of anomalies claiming for a possible crisis of the DSM model are the excessively high rates of comorbidity [38-40], the internal heterogeneity of many DSM disorders [4], the poorly defined boundaries between disorders and between normal and pathological conditions (psychiatric disorders as "broad biobehavioral syndromes –fuzzy sets that inevitably blur into one another and into normality" [17], p. 8);
- to go back up from the peripheral anomalies to the foundations of the DSM classification system. This last option is in line with Kuhn's suggestion that the marginal anomalies are usually the consequence of intrinsic problems of the system, problems that are often linked to the way the system was organized. All this directly casts doubts on the concept of disorder as it was used in the DSM, a concept that has been recently reconsidered [18 19] and whose specific characteristics (in relation to the discovery of the current problems of the DSM) need to be further re-evaluated.

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