

INTERNATIONALIZATION OF CLINICAL AND EXPERIMENTAL MEMORY RESEARCH

D. Tomov, O. Persson*

*The Library and Information Service, Medical University of Varna, Varna, Bulgaria, and *Inforsk, Department of Sociology, Umea University, Umea, Sweden*

A problem-oriented retrospective information search in MEDLINE on CD-ROM in 1981-1993 revealed the relevant publications devoted mainly to physiology and pharmacology of human and animal memory. The annual dynamics of a set of bibliometric parameters (number of articles and journals containing these articles; number of countries of authors and journals; number of publications in own and foreign journals; number of interdisciplinary and international journals, language of papers, etc.) was studied to identify some essential patterns of internationalization of the interdisciplinary memory research. There were a total of 5597 papers by authors from 48 countries in 809 journals from 40 countries. In 1988-1993 only, there were 1361 papers (48,47 %) in foreign journals. In 42 international journals from 9 countries a total of 231 papers were published while 50 interdisciplinary journals from 13 countries contained 579 papers. Bulgarian memory research was relatively insufficiently presented in this data-base.

Key-words: Memory research, scientometrics, internationalization, interdisciplinarity, MEDLINE on CD-ROM

Memory of humans and animals represents an attractive interdisciplinary research field of increasing socio-medical and economic importance. Recently, computerized scientometrics undoubtedly proves its rising capacity in successful detecting the "hot topics" of modern science thus contributing to the improvement of the scientific communication media in the world at the threshold of the information

society of the next millenium (5,7,12). Scientists from small countries should collaborate with strong research groups in the scientifically advanced countries as a means of integration into the international research community (9,10). Internationalization of the interdisciplinary contemporary science occupies a key position among its most essential challenges when taking into consideration the enormous requirements by the society today (3,6,8,11). There are calculations of WEB impact factors (4). Problem-oriented scientometric investigations devoted to actual aspects of science

Address for correspondence:

D. Tomov, The Library and Information Service,
Medical University, 55 Marin Drinov St,
BG-9002 Varna, BULGARIA
E-mail: library@asclep.muvar.acad.bg

policy and management have already become a reliable evaluation tool in this aspect.

The main purposes of the present scientometric investigation are the following: i) to establish the dynamic stratification structure of world publication output in some aspects of interdisciplinary memory research; ii) to identify the most important profile journals ("core" journals), iii) to compare these data with some results dealing with neuropsychology of memory as reflected in *SSCI-CDE* for the same period, and iv) to hold out opportunities for fruitful international collaboration of small countries.

MATERIAL AND METHODS

A problem-oriented retrospective information search on physiology and pharmacology of memory in *MEDLINE* on CD-ROM of the NLM (Bethesda, USA) during the period from 1981 till 1993 was carried out. The relevant papers devoted to memory of humans and animals were selected using contents-analysis of the retrieved documents. A set of bibliometric parameters (number of articles and of journals containing these articles; number of countries of authors and of journals; number of publications in own and foreign journals; number of interdisciplinary and international journals, language of papers, author's affiliations available in 1988-1993 only, etc.) was comprehensively studied to identify some essential patterns of internationalization of research. Tomov's own complex scientometric

methods for studying the international scientific communications (1) and the interdisciplinarity of modern science (13) were applied. Only a few of the scientometric distributions characterizing different features of the international exchange of new scientific information were presented.

RESULTS AND DISCUSSION

In *MEDLINE*, there are 5597 relevant papers by authors from 48 countries in 809 journals from 40 countries. In *SSCI*, there are 4464 relevant papers by authors from 45 countries in 598 journals from 28 countries (14). The annual dynamics of publication output in *MEDLINE* is indicated on Table 1. The USA occupy a dominant position in all the scientometric distributions which is almost absolutely valid for most disciplines and for the science as a whole. In *MEDLINE*, there are 338 USA journals (41,78 % of all the journals) with 2557 articles (45,68 % of the papers). In *SSCI*, there are 332 USA journals (55,52 %) containing 2884 relevant papers (64,61 %) (14). In Table 2 and Table 3, publications of authors from some countries in own and foreign journals are summarized. The "core" journals in physiology and pharmacology of memory are listed in Table 4. The occurrence of Soviet publications among those of dominating Western European countries stresses, indeed. In 1988-1993, 13 memory-research institutions from 4 countries have published 64 articles in 31 journals from 5 countries while in 1981-1993

Table 1*Publication output on memory research (MEDLINE, 1981-1993)*

Year	Art.	Jour.	States	New jour.	Int. jour.	States	Art.	Int-disc. jour.	States	Art.	Eur. soc. jour.	Art.
1981	320	158	22	*	8	5	11	16	7	57	15	30
1982	372	194	24	111	7	5	13	23	7	77	21	37
1983	352	173	27	58	4	2	9	7	7	31	18	24
1984	396	178	21	47	9	5	16	19	8	51	15	40
1985	463	187	26	52	7	4	15	17	8	59	20	53
1986	460	199	26	56	13	7	22	16	7	68	18	39
1987	426	194	26	42	9	5	16	12	5	33	17	29
1988	340	179	24	36	8	4	10	14	9	31	13	21
1989	405	209	26	43	10	4	16	17	7	35	10	21
1990	458	237	23	51	10	5	25	15	7	38	15	20
1991	468	218	25	52	11	5	20	13	5	25	14	21
1992	573	262	23	54	13	5	27	16	7	38	7	9
1993	564	241	23	49	11	5	31	19	7	36	6	9
Total	5597	809	40	651	42	9	231	50	13	579	70	353

in SSCI, there are 41 papers by authors from memory-specialized institutions located in 6 countries (14). It should be mentioned, however, that the author's addresses are relatively regularly listed in *MEDLINE* since 1988 and they are, unfortunately, often incomplete.

In our opinion, the complex interrelations between interdisciplinarity, institutionalization, and internationalization of research remain insufficiently clarified from the scientometric viewpoint yet (2). In *SSCI*, 34 international journals contained 111 papers (14) while in *MEDLINE* 231 papers were published in 42 international journals from 9 countries.

In 1981-1993, one Bulgarian journal published 12 papers on memory research (one by Soviet authors) while Bulgarian authors published 11 papers in 5 journals from 5 countries. In 1981-1993, nine Swedish journals contained 27 papers. In 1989-1993, authors from 7 countries published 8 papers in 4 Swedish journals while Swedish authors published 4 papers in 2 own journals along with 39 papers in 29 journals from 8 foreign countries.

Spanish authors published 1804 papers in "pharmacology and pharmacy" but 744 in "cardiovascular system" in 1990-1993 *SCI* data-base (3). Fifteen

Table 2*Publications in own and foreign journals by authors from some countries*

country author / country art.	USA	ENG	GER	CAN	FRA	NET	ITA	JAP	RUS	SWI	Oth.
USA	851	142	48	4	2	131	12	0	0	13	38
ENG	45	160	42	1	2	24	16	1	0	5	26
GER	24	20	65	1	0	7	4	0	0	5	12
CAN	63	28	2	13	0	19	1	0	0	3	0
FRA	22	11	16	1	46	14	2	0	0	2	7
NET	14	11	7	0	0	17	1	0	0	5	9
ITA	21	24	8	0	1	9	39	0	0	11	4
JAP	17	8	4	0	1	3	1	50	0	0	4
RUS	7	2	0	0	0	3	0	0	68	1	4
SWI	2	4	4	0	0	5	0	0	0	7	0
Other	98	102	29	3	2	41	6	4	0	7	*

Table 3*Relative share of publications in foreign journals*

State	total (n)	Own authors' papers foreign journals' states	papers in foreign journals	%	total (n)	Own journals' papers foreign authors' states	papers by foreign authors	%
USA	1241	16	390	31,43	1164	34	313	26,89
ENG	322	14	162	50,31	512	30	353	68,94
GER	138	10	73	52,90	225	21	160	71,11
CAN	129	6	116	89,92	23	7	10	43,48
FRA	121	10	75	61,98	54	6	8	14,81
NET	64	10	47	73,44	273	26	256	93,77
ITA	117	11	78	66,67	82	13	43	52,44
JAP	88	8	38	43,18	55	4	5	9,09
SUN	85	7	17	20,00	68	0	0	0
SWI	22	5	15	68,18	59	15	52	88,14

Table 4*"Core" journals on memory research*

No	Journal title	Country	Papers	Papers 88-93	By foreign authors	Foreign countries	% of foreign papers
1.	<i>Psychopharmacology</i>	GER	172	84	82	16	97,62
2.	<i>Behav. Neural. Biol.</i>	USA	119	18	9	6	50,00
3.	<i>Pharm. Bioch. Behav.</i>	USA	110	23	10	5	43,49
4.	<i>Zh. vyssh. nervn. deyat.</i>	SUN	93	14	0	0	0
5.	<i>Brain Res.</i>	NET	91	25	25	6	100,00
6.	<i>Cortex</i>	ITA	80	55	42	10	76,36
7.	<i>Int. J. Neurosci.</i>	ENG	51	23	22	10	95,65
Total		6	716	242	190	25	78,51
%		0,74	12,79	8,62	78,51	52,08	*

Table 5*Interdisciplinary and international journals and papers in them*

Country	Interdisciplinary		International		Total*	
	journals	papers	journals	papers	journals	papers
USA	29	399	11	35	39	433
ENG	4	52	9	83	13	135
FRG	3	26	7	48	9	70
NET	3	22	5	43	7	64
SWI	1	32	6	16	7	48
SUN	3	17	-	-	3	17
BUL	1	12	-	-	1	12
Other - 9	6	19	4	6	10	25
Total*	50	579	42	231	89	804

Note: *Three journals containing 6 papers are simultaneously designed as interdisciplinary and international

highly productive Mexican scientists published about 85 % of the total of 797 research papers in 1980-1994 in *SCI* journals (9).

Our results undoubtedly indicate the rising interest of scientists from different disciplines and countries in the actual problems of memory of humans and animals. There exists a stable science stratifi-

cation (15) concerning the most important scientometric characteristics of research such as relatively permanent publication output, country participation with journals and/or authors, regular publishing of both national and international journals, author's publications not only in own national, but also in foreign journals as markers of an increasing internationalization of research,

thematic differentiation and integration of the journals reflected in their titles and article's contents, etc., as reliable indicators of gradually improving science effectiveness. The increasing role of secondary information sources for rapid improvement of the international system of interdisciplinary scientific communications is obvious. In 1988-1993, there are 1361 papers (48,47 %) in journals from foreign countries. This percentage varies between 44,93 (in 1989) and 55,67 % (in 1993) outlining a stable tendency towards augmentation. A total of 16 countries are involved with international and/or interdisciplinary journals containing papers on memory research. The country distribution of these journals is summarized on

Table 6
Language distribution of papers

Language	1981-1987		1988-1993		Total	
	n	%	n	%	n	%
English	2407	86,30	2552	90,89	4959	88,60
Russian	194	6,96	70	2,49	264	4,72
German	39	1,40	50	1,78	89	1,59
French	39	1,40	47	1,67	86	1,54
Japanese	46	1,65	34	1,21	80	1,43
Chinese	23	0,82	17	0,61	40	0,71
Italian	13	0,47	9	0,32	22	0,39
Spanish	8	0,29	9	0,32	17	0,30
Polish	9	0,32	6	0,21	15	0,27
Swedish	4	0,14	3	0,11	7	0,13
Other-9	7	0,25	11	0,39	18	0,32
Total	2789	100	2808	100	5597	100

CONCLUSION

The relative share of the publication output of some Western European countries with substantial importance for the world science such as United King-

dom, Germany, the Netherlands, France and Italy is permanently enlarging thus representing an attractive target for colleagues from Eastern Europe who look intensively for effective international collaboration. Contemporary computerized sciento-

Table 5. The permanently rising importance of the English language in scientific communications is demonstrated in Table 6.

These results are in agreement with Tomov's concept (2) about the unity of interdisciplinarity, internationalization, and institutionalization of modern applied science and university education. Researchers from many small countries attempt at publishing significant papers in world-prestige journals, too, if only to a considerably lower extent. That is why the mutual interest between the economically powerful science centres and the enthusiastic science periphery promises much broad opportunities for purposeful cooperation.

metrics enables purposeful usage of these comprehensive bibliographic data for improving the communication patterns and

the research policy at any level in the small countries of lower international stratification rank like Bulgaria.

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Интернационализация на клиничните и експериментални изследвания върху паметта

Д. Томов, О. Першон*

*Библиотека с бюро за научна медицинска информация, Медицински университет-Варна, България и *Катедра по социология, Университет-Умеа, Швеция*

Резюме: Проблемно-ориентираното ретроспективно информационно търсене в *MEDLINE* on CD-ROM за периода от 1981 до 1993 г. разкри релевантните публикации, посветени предимно на физиологията и фармакологията на паметта при човека и животните. Изследвана бе ежегодната динамика на комплекс от библиометрични параметри, между които: брой на статиите и на списанията, съдържащи тези статии; брой на страните на авторите и на списанията; брой на публикациите в отечествени и в чужди списания; брой на интердисциплинарните и на международните списания; език на статиите и др.). Разкрити бяха някои съществени характеристики на

интернационализацията на интердисциплинарните изследвания върху паметта. В 809 списания от 40 страни бяха публикувани 5597 статии от автори от 48 страни. Само през 1989-1993 г. имаше 1361 статии (48,47 %) в чуждестранни списания. В 42 международни списания от 9 страни бяха публикувани общо 231 статии, а в 50 интердисциплинарни списания от 13 страни се съдържаха 579 статии. Българските изследвания по въпросите на паметта са сравнително незадоволително представени в тази база-данни.