

THE VISIBILITY OF JOSEF BROŽEK'S WORK

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INTRODUCTION

Professor BROŽEK has been tightly associated with the development of psychological science in the last decades. The present study intends to make an analysis of the visibility of his work in contemporary behavioral literature.

His work is of great significance in many psychological and physiological areas, such as nutrition, fatigue as well as in the history of psychology (BROŽEK, 1984).

We do not intend to give a complete view of the meaning and values of BROŽEK's work, but only to offer a cursory evaluation of his visibility in the behavioral and social sciences in the last decades through a citation analysis of his work. The data for the study are compiled from the Social Sciences Citation Index for the period 1966-1982. The study of the received quotations, allows us to determine the thematic areas of influence of BROŽEK's work, as well as the journals and authors that have paid significant attention to his work.

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THE VISIBILITY OF BROŽEK'S WORK

In determining the global visibility of BROŽEK's work we have taken into account the sum of all the quotations received by BROŽEK (GARFIELD et al., 1978), employing the well-known methodology of citation analysis, that we have been employing elsewhere (PEIRO et al., 1981; GARCIA MERITA et al., 1981; PEREZ DELGADO, 1982).

The total number of citations received by BROŽEK during the time period chosen (1966 - 1982) equals to 769 (145 self citations were excluded from the analysis). The "visibility index" (PLATZ, 1965), defined as the logarithm of that number, allows us to make some comparisons. For instance, during the same time period J.B. WATSON obtains an index of 3.03 (PRIETO, in print), or B.F. SKINNER another of 3.82 (SOLER, in print); BROŽEK's index is 2.88, very similar to the aforementioned ones.

TABLE I summarizes the evolution of the citations through the years, as well as the annual index. The percentage of citations for each year, shows a steady distribution along the years; its highest point appears to be in 1968 (8.97 per cent of the whole sum) and 1970 (3.25 per cent) shows the lowest one.

BROŽEK's visibility seems to have remained constant along these years without significant ups and downs. The average annual figure over the seventeen years studied is 45.23 citations. This figure acquires true significance when compared with the average annual citations frequency (3.48) of other authors cited in the social sciences (GARFIELD, 1984).

THE DIFFERENTIAL VISIBILITY OF BROŽEK'S WORK

The citations (769) are distributed along many different works (270) published by BROŽEK resulting an average number of 2.84 citations per work. There is one work which receives the highest number of citations (89) while on the other extreme, 89 works only received one citation along all the time period.

It is possible to group those works according to a BRADFORD'S model (1948), obtaining three nucleus with a similar percent of citations in each (TABLE II). In the first nucleus, we find 6 different works that explain 33.03 per cent of the whole citations, and an average of 42.33 citations per cited work. The second one includes 27 different works and represent a 34.44 per cent of the received citations. Finally, the third nucleus includes 250 works (81.89 per cent of the quoted works), with a mean of 1.67 citations per work. Therefore, it has been possible to establish the existence of some widely cited that explain in a large part BROŽEK's current literature. Let us now look at these most cited works.

THE MOST VISIBLE WORKS

TABLE III presents the six most cited and visible works published by BROŽEK.

As it can be seen, four of them are journal articles, while two are books.

All these works have been originated in the research made by BROŽEK during the fifties and sixties, in the Laboratory for Physiological Hygiene of the University of Minnesota and the Department of Psychology of the University of Lehigh, Pennsylvania. The most frequent subjects dealt with are the coronary disorders and nutrition, in its physiological

TABLE 1: CITATIONS TO BROZEK'S WORKS FROM S.S.Č.I. (1966-1982)

YEARS	NUMBER OF CITATIONS	CUMULATIVE	VISIBILITY INDEX
1966	39	5.07	1.59
1967	54	12.09	1.73
1968	69	21.06	1.83
1969	45	26.91	1.65
1970	25	30.16	1.39
1971	50	36.66	1.69
1972	34	41.08	1.53
1973	55	48.23	1.74
1974	61	56.16	1.78
1975	31	60.19	1.49
1976	37	65.00	1.56
1977	36	69.68	1.55
1978	51	76.31	1.70
1979	48	82.55	1.68
1980	46	88.54	1.66
1981	42	94.09	1.62
1982	46	100.00	1.66

769

TABLE III: BROŽEK'S MOST CITED WORKS (1966-1982)

	CITATIONS	AVERAGE CITATIONS PER YEAR (1966-1982)
BROŽEK, J.: "Densitometric Analysis of Body Composition: Revision of Some Quantitative Assumptions" <i>Annals of the Academy of Sciences</i> , 1963, 110, 113-140.	89	5.29
BROŽEK, J. & KEYS, A.: "Evaluation of Leanness - fatness in man: Norms and interrelationships" <i>British Journal of Nutrition</i> , 1951, 5, 194-206	44	2.58
BROŽEK, J. & HENSCHKE, A. (Eds.): <i>Techniques for Measuring Body Composition</i> . Washington, DC National Academy of Sciences-Natural Research Council, 1961.	33	1.94
BROŽEK, J. (Ed.): <i>Human Body Composition: Approaches and Applications</i> . Symposia of the Society for the Study of Human Biology, Vol. VIII. Oxford. England. Pergamon Press, 1965.	32	1.88
BROŽEK, J. (Ed.): "The Biology of Human Variation" <i>Annals of the New York Academy of Sciences</i> , 1966, 134, 497-1066.	31	1.82
BROŽEK, J.: "Changes in Body Composition in man during maturity and their nutritional implications" <i>Federation Proceedings</i> , 1952, 11, 784-793.	25	1.47
BROŽEK, J. & VAES, G.: "Experimental investigations on the effects of dietary deficiencies on animal and human biology" <i>Vitamins Hormones. Advances in Research and Application</i> , 1961, 19, 43-94.	23	1.35
BROŽEK, J.: <i>Body Measurement and Human Nutrition</i> . Detroit. Wayne University Press, 1956.	21	1.23
BROŽEK, J. & KEYS, A.: "Changes of body weight in normal men who stop smoking cigarettes" <i>Science</i> , 1957, 125, 1203.	18	1.05
BROŽEK, J. & KINZEY, W.: "Age changes in skinfold compressibility". <i>Journal of Gerontology</i> , 1960, 7, 45-51.	18	1.05
BROŽEK, J.: <i>Psychology in the USSR: An Historical Perspective</i> . White Plains, NY: International Arts and Sciences Press, 1972.	18	1.63
BROŽEK, J.: "Personality Changes With Age: An Item Analysis of the Minnesota Multiphasic Inventory". <i>Journal of Gerontology</i> , 1955, 10, 2, 194-206.	16	0.94
BROŽEK, J.: "Quantitative Description of Body Composition: Physical Anthropology's "Fourth" Dimension". <i>Current Anthropology</i> , 1963, 4, 3-39.	14	0.82
BROŽEK, J. & MORI, H.: "Some interrelations between somatic, roentgenographic and densitometric criteria of fatness". <i>Human Biology</i> , 1958, 30, 322-336.	10	0.58

TABLE VI: DISTRIBUTION OF CITING JOURNALS OF BROŽEK'S WORKS (BRADFORD AREAS)

AREA	N CITING JOURNALS	%	REFERENCES	%	\bar{x} REFERENCES/JOURNALS	RATIO
1	12	4.67	254	33.64	21.16	--
2	55	21.30	271	35.90	4.92	4.30
3	191	74.03	229	30.46	1.19	4.13
TOTAL		100.00		100.00		

TABLE V: DISTRIBUTION OF CITING RESEARCH CENTERS TO BROŽEK'S WORKS (BRADFORD AREAS)

AREA	RESEARCH CENTERS	%	N REFERENCES	%	\bar{x} REFERENCES/CENTER	RATIO
1	8	2.95	183	25.56	22.87	--
2	25	9.18	167	23.37	6.68	3.42
3	70	28.68	204	28.55	2.61	2.55
4	161	59.19	161	22.52	1	2.61

TABLE IV: DISTRIBUTION OF CITING AUTHORS TO BROŽEK IN BRADFORD AREAS

AREA	AUTHORS	%	REFERENCES	%	\bar{x} REFERENCES/AUTHOR	RATIO
1	13	2.92	136	17.86	10.38	--
2	106	23.87	296	39.16	2.79	3.72
3	325	73.19	325	42.98	1.00	2.79

TABLE II: DISTRIBUTION OF BROŽEK'S WORKS IN BRADFORD AREAS

AREA	CITED WORKS	%	CITATIONS	%	\bar{x} CITATIONS/WORK	RATIO
1	6	3.3	254	33.03	42.33	--
2	27	14.81	265	34.44	9.81	4.31
3	149	81.89	250	32.53	1.67	5.87

physiological, logical and biological areas.

Several of BROŽEK's articles deal with problems of malnutrition and their effects upon behavior, including vitaminic deficits, restriction of vitamins (BROŽEK, 1965), long-lasting food deprivation (BROŽEK, 1966) and severe nutritional deficits (BROŽEK, 1955). In them, there is always a direct reference to psychological effects.

Two books are the proceedings to two congresses, edited or coordinated by Dr. BROŽEK who acted as coordinator, president or editor. There is also another one dedicated to psychology in the USSR, an area in which he developed a real specialization.

In general, it can be seen that those works related with physiological aspects of specific problems, such as coronary diseases or nutrition and their relation with behavior, seem to have attracted most interest in contemporary scientific communities. They are closely followed by articles related with historical themes and with the development of contemporary psychology in eastern countries. Many of these works were interdisciplinary and collaborative in nature. And most of them show BROŽEK's permanent effort in promoting symposia and conferences, that could bring into contact scientist of many different languages and cultures.

TABLE III shows a list of the most cited works with indication of their average citations per year.

With these comments, we have analyzed the differential presence at BROŽEK's work and their content, but a better understanding of his importance only can be gained through the study of these authors who have used these contributions as relevant information in their own studies. We will now identify these authors and the institutions in which their underlook their research and work.

AUTHORS CITING BROŽEK'S WORK AND THEIR INSTITUTIONAL PROCEDURE

Many authors have quoted BROŽEK's works developing or discussing his research. The 756 citations have been produced by 444 authors (13 citations are from "anonymous" author and have been excluded here. That means an average of 1.70 citations per author. The 73 per cent of the authors (325) only produced one citation in the whole time period, and, at the same time, (TABLE IV) there is a small group of 13 authors that have produced a great volume of citations (135) with an average of 10.38 citations per author. Among them we find L. MECCACI (27 quotations); R.M. MALINA (20); F.E. JOHNSON (12); F.I. KATCH (11); M.L. POLLOCK (10). With more than five citations we find A.F. ROCHE (9); S. FRANKOVA (9); J. METCOFF (7); M.H. SLAUGHTER (7); M. JETTE (6); A. KEYS (6) and G.T. LESSER (6).

From these authors, we may underline L. MECCACI, of Italian origin, interested in historiographical themes in science, to which BROŽEK contributed, and A. KEYS, Head of the Laboratory of Physiological Hygiene of the University of Minnesota, where BROŽEK worked during the decades 1940 and 1950, with whom BROŽEK had frequent encounters (BROŽEK, 1984) and with whom he collaborated in several researches.

Our information will be completed with the analysis of those universities or the research centers in which these authors work. Institutional variables may influence scientific communication and, with it, the visibility of an author.

As before, we have distributed the citations according to their institutions of procedence (TABLE V) (54 papers whose procedence was not identifiable were not taken into account). Following the model of a BRADFORD's distribution it was possible to establish four groups perfectly differentiated. At the bottom of the distribution we find 161 centers with only one citation each, and at the top we have 8 universities (2.95 per cent) of all the institutions) and 182 quotations (26.56 per cent of all the citations). Here are placed the universities of Pennsylvania and Texas (with 28 citations each), the University of California (27); Illinois (25); the Consiglio Nazionale de la Ricerche, de Roma (23); the University of Michigan (22); Minnesota (17) and finally, the Institute of Aerotics Research of Dallas (13 quotations).

The last area contains 161 institutions (59.19 per cent) which make 161 quotations, so that the distribution index for quotations is equal to 1.

Looking at these institutions, we see that seven of them are centers of the United States and mostly are universities, together with one Italian center specialized in psychological research.

THE PRESENCE OF BROŽEK'S WORK IN SCIENTIFIC COMMUNICATION MEDIA

We will now study the journals in which citations to BROŽEK have appeared during our time period. There are 754 citations coming from journals (we do not take into account coming from books). According to the distribution, there is one journal with 52 citations, and at the other hand 153 publications make just one quotation. To any of BROŽEK's works (TABLE VI).

Among the highly citing journals we find: *Research Quarterly for Exercise and Sport* (52 citations); *American Journal of Clinical Nutrition* (32); *Human Biology* (31); *Pavlovian Journal of Biological Science* (23); *American Journal of Physical Anthropology* (22); *Current Anthropology* (17), and *Journal of Gerontology* (16 citations).

These journals have been classified by the same SSCI according to their specific thematic areas. *Research Quarterly of Exercise and Sport*, considers sports and physical education from very different aspects including the psychological and social ones; *American Journal of Clinical Nutrition*, has great importance in nutrition and dietethics. There are some biology journals, as *Human Biology*, and the *Pavlovian Journal of Biological Science*. On the other hand, two publications are from the area of anthropology: the *American Journal of Physiological Anthropology* and *Current Anthropology*. Finally, the *Journal of Gerontology* is one of the best known journals in the area of geriatry and gerontology.

Summing up all these results, it appears that BROŽEK's work has a broad and diversified visibility related to a variety of areas in which he has made significant contributions: anthropology, human physiology, psychophysiology, and history of psychology.

SUMMARY AND CONCLUSIONS

BROŽEK's work appears to us as an important contribution to the behavioral sciences, characterized by its rich complexity and variety. Its greater impact seems to be found in the field of psychobiology.

His contribution the behavioral sciences (nutrition and behavior, composition of the human body, historiography of science and the history of psychology) are specialized subjects that have received a differential attention from many research groups as is shown by the citation analysis and, more concretely, by the study of the citing journals.

In concluding we may say that BROŽEK's work remains influential in different areas of behavioral sciences in which he has developed his research and made contributions of long-lasting interest.

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