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Scientometric analyses of the international visibility of German psychology researchers and their range of specialization

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Abstract

With reference to the role of networking, accelerated by current developments within large parts of the scientific community, the assumption is examined that the range of specialization of scientists in terms of membership in professional sections of scientific societies is related to the international impact of their publications. The sample consists of 2,788 German psychologists enrolled in the German Psychological Society (Deutsche Gesellschaft für Psychologie, DGPs). A log-linear model suggests that the citation pattern of DGPs members with no citations of their papers published in 2000 or 2005 respectively in the time intervals 2000-2004 or 2005-2009 generally differs from that of their colleagues across four ranges of specialization categories. Configural Frequency Analysis led to the identification of distinct subgroups of scientific specialization and international visibility, i.e., citations by others. Specifically, for those individuals who enjoy international visibility, one key to success seems to be multiple professional specializations with reference to different subdisciplines of psychology.

Key words: Professional specialization, internationality, international impact, citation analysis, Configural Frequency Analysis (CFA)

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Introduction

Gigerenzer et al. (1999) presented seven recommendations for improving the international visibility and reception of German psychology. These recommendations have given renewed rise to a fervid discussion: the language dispute in German psychology. In the context of this discussion, the internationalization that results from English language publishing and citations of German psychologists' publications continuously increases (Krampen, Schui, & Fell, 2010). However, internationalization does not take place homogeneously in German psychology because psychology is a heterogeneous discipline (Krampen et al., 2010): Particular subfields more than others address reports about their gain of knowledge to a more international audience which makes them internationally more visible than others. More visible implies that publications and citations by scholars in the same subfields are mostly available in English. In this paper, we ask whether there exists any factor that is unrelated to the content of subdisciplines but related to the international visibility and citations of German psychology. We hypothesize that networking within and between different professional specializations may be a crucial but, up to now, empirically unexplored influence. In the present study, we consider membership in one (i.e., single specialization) or more subgroups (i.e., multiple specialization) of the German Psychological Society (*Deutsche Gesellschaft für Psychologie, DGPs*) to be such a factor.

Many authors emphasize the importance of scientific societies for the success of their members (Anderson & Schultz, 2003; Bickel, 2007; Schimank, 1988). Bickel (2007, p. 91) sums up: "Professional societies form a living matrix where minds meet and engage and where trusted colleagues pool their knowledge, helping each other to glimpse and plumb larger forces at work, to see connections among events, and to imagine the future." Anderson and Schultz (2003) emphasize that professional societies advance both their disciplines and their individual members. In member support, the authors distinguish between instrumental, supportive, normative and voluntary interests of their members. Schimank (1988) focuses on instrumental functions and differentiates: 1) furthering scientific communication, 2) supporting careers and representing collective interests, 3) providing a meeting place and a research result trafficking spot, 4) advising in science policy decisions. Especially in consideration of the changing scientific work environment, scientific societies are important – and they may become ever more important for the scientific success of their members. Authors widely agree about the quintessential changes in scientific knowledge production and the necessity to appropriately adapt to these changes (Houghton, 2005; Houghton, Steele, & Henty, 2004; Rowlands & Fieldhouse, 2007; Thagard, 2005): There is an increasing diversity in the work conditions of scientists, and the portion of inter-/multi-/transdisciplinary and problem-oriented research is also increasing. In addition, one can find an emphasis on collaborative work and (more diverse/informal) communication and an increase in the size of research teams.

Nowadays, most scientists are involved in wider collegial networks. We concur with Houghton et al.'s (2004, p. 240) conclusion that there are two main reasons for collaboration: The first reason reflects technical or material reasons concerning costly equipment and facilities. The second reason reflects demands of "a wider range of specialist skills, with collaboration a response to complexity, increasing interdisciplinarity and an increas-

ingly problem-oriented approach to research" exist. We also concur with Thagard (2005) that the more distinct the professional profile of a scientist is, the more effective his networking will be, and the more suitable he/she is for problem-focused, multidisciplinary and transdisciplinary research in collaborative teams, the more successful in terms of impact and visibility he/she will probably be. Considering the important functions of scientific societies, the current changes in the scientific environment, the societies' influence on success and visibility of every single member becomes obvious.

Comparable to the American Psychological Association (APA) in the U.S., the German DGPs is "[…] an incorporated association of qualified psychologists engaged in research and teaching. Its goal is to advance and expand scientific psychology" (German Psychological Association, 2008). Comparable to the APA divisions, the DGPs is subdivided in 15 professional sections, largely corresponding to the common psychological subfields (e.g., General Psychology, Clinical Psychology, Work and Organizational Psychology, Differential Psychology, Developmental Psychology). Every DGPs member is encouraged to join, in addition to his/her general membership, one or more of these sections (section membership comes with an annual fee). The choice of joining one or more sections depends on and reflects (e.g., in his/her public DGPs online profile) a scholar's scientific main foci. Thus, these section memberships are an indicator of single versus multiple specialization in one, two, three or even more subdisciplines of psychological research.

Summing up, networking within scientific associations can be very helpful to scientists. The ongoing changes in the scientific environment motivate scholars to join professional societies. In addition, professional specialization in terms of a membership in one or more professional sections of a scientific association may be of importance. A clear scientific profile facilitates collaboration and communication in only one or in multiple and diverse research groups. One may assume that the international visibility of scientists in terms of citations in international journals relates to their networking in the context of single versus multiple professional specialization. In brief, the present scientometric study explores whether professional specialization of German psychologists in terms of memberships in one or more professional sections of the DGPs is related to their international impact in terms of the citations of their publications in English language journals over a span of 10 years.

Method

The number of DGPs members examined in this study is 2,788. This includes every member of the DGPs as of January 2010. The DGPs has 15 sections, and a large number of members of the DGPs is enrolled in multiple sections ($M = 1.41$, $SD = 0.96$, *Med* = 1, *Range* [0;15]).

"Most attempts to measure the 'quality' of papers or the recognition of scientists use either citations received or the impact factor of the journal as indicators" (Larivière & Gingras, 2010, p. 424). In this study, we calculate the international impact for every DGPs member as the number of citations in an international journal indexed in the *Social Sciences Citation Index (SSCI)* during two consecutive time periods, excluding self-

citations. International journals are defined as English language journals. The two citation periods cover the years 2000-2004 of the DGPs members' publications published in 2000 (= C0) and 2005-2009 of those published in 2005 (= C5). So, two citation numbers resulted for each member, one for each time period of five years.

This approach intentionally differs from the Journal Impact Factor (JIF), which is calculated for journals and which is – sometimes – added up to a personal cumulative JIF of a particular scientist. Using the JIF for evaluating scientists is far from indisputable. In his highly cited paper, Seglen (1997) describes a number of problems of the JIF. Our approach allows one to deal with some of the biggest problems: The sum of citations of an article during a certain time period is more closely related to the article itself than the JIF, which is a descriptor of the journal. The JIF does not care about self-citations; in contrast we explicitly cull them. The SSCI, data basis for JIF calculation, has an English language bias. Overall, only 7.2 % to 7.4 % (in the examined subject area 'psychology') of the indexed publications were not published in English. In the study at hand the object of research is the international visibility of individual psychologists. So the subject matter is unaffected by this problem, because only citations in Anglophone publications are examined here. In addition, according to the JIF calculation, every article has a time span of one to three years after its publication during which it can make a contribution to the corresponding JIF. However, several authors (e.g., Glänzel & Schoepflin, 1995; Vanclay, 2009) assume that the ageing of publications varies depending on the particular journal or field. The JIF fails to reflect these variations. Vanclay (2009) illustrates this point:

> The JIF does not deal evenly with 'Hares' (journals to which citations accrue quickly over a confined period) and 'Tortoises' (journals to which citations accrue slowly over an extended period), because the 2-year sample represents a much larger proportion of total citations for the Hares. (p. 4)

And whereas Tortoises show quite consistent citation trends, the Hares do not (Vanclay, 2009). Considering the scientific heterogeneity of psychology (Krampen et al., 2010) it is assumed that both exist, Tortoises as well as Hares. For that reason, we use 5-year periods for both citation measuring intervals.

Data generation

The two variables *Citation Record for the years 2000-2004 (C0),* and *Citation Record for the years 2005-2009 (C5)* were created as follows. First, a frequency variable was defined that consisted of the counts of citations (excluding self-citations) for each individual in the subject area, i.e., journal subject type, 'psychology' in the SSCI, for each of the two 5-year periods. Then, in order to prevent the cross-classification of citation counts and section belonging from becoming too sparse, the upper end of the distribution was aggregated into one category. This category contains all those incidences in which an individual was cited 5 or more times during the observation period. Thus, both C0 and C5 now have 6 categories. The first category indicates that an individual was not cited at all. The second contains those DGPs members who were cited once, and the 6th category contains those DGPs members who were cited five or more times by others.

Considering that the DGPs has 15 sections, and also considering that a large number of members of the DGPs is enrolled in multiple sections, crossing sections with C0 and C5 would have resulted in a very large, unwieldy, and sparse table. Therefore, membership patterns and sections were aggregated based on the *number of section affiliations (CS)* indicated by the DGPs members. The aggregation resulted in four superordinate sections. The first contains those 342 DGPs members who do not belong to any of the sections (it is possible to be a member without joining a section). The second contains those 1,317 DGPs members who belong to one section (single specialization in research). The third contains those 862 DGPs members who belong to two sections (double specialization in research), and the fourth contains those 267 DGPs members who belong to three or more sections (multiple specialization in research).

The following analyses use the three variables: Classification of Subdisciplines of Psychology (CS), Citation Record for the years 2000-2004 of the publications published in 2000 (C0), and Citation Record for the years 2005-2009 of the publications published in 2005 (C5). The classification is based on the section system of the DGPs. Crossed, the three variables under study form a 4 x 6 x 6 frequency table.

Results

In the following sections, we present results from two approaches to the analysis of the SSCI citation data. First, we present a log-linear model that explains the frequency distribution in the cross-classification of the variables Classification of Subdisciplines of Psychology (CS), Citation Record for the years 2000-2004 (C0), and Citation Record for the years 2005-2009 (C5). Second, we perform a Configural Frequency Analysis of the same data. The goals of these analyses are: 1) Explanation of the association structure of CS, C0, and C5 patterns at the level of variables; and 2) Identification of those patterns of the development of citation records that stand out as particularly likely or particularly unlikely.

The hierarchical log-linear model that provides a satisfactory explanation of the 4 x 6 x 6 (CS x C0 x C5) cross-classifications contains all three two-way interactions. The model comes with a goodness-of-fit LR-χ^2 = 93.69 which suggests non-significant model-data discrepancies, that is, good fit (df = 75; p = .07). The model involves 1 parameter estimate for the intercept, 13 main effect parameters, and 55 interaction parameters. Of these 55 interaction parameters, 12 are significant. The majority of these indicate that the citation pattern for DGPs members with no citations differs from the citation pattern for members with 1 or more citations, across all categories of the aggregated number of subdisciplines scale.

This log-linear model is equivalent to a logit model in which C0 and C5 are predicted from CS. We, therefore, conclude that, in general, a membership pattern that reflects the number of subdivisions a DGPs member is enrolled in is a good predictor of the member's citation success. We now follow up this result by highlighting the particular patterns that carry this predictive relationship.

Instead of interpreting each parameter in detail, we perform a Configural Frequency Analysis (CFA; Lienert & Krauth, 1975; von Eye & Gutiérrez-Peña, 2004; von Eye, Mair, & Mun, 2010). This technique of data analysis allows one to identify those cells (patterns) in a cross-classification that stand out as observed significantly more often (CFA types) or less often (CFA antitypes) than expected. CFA types and antitypes reflect the interactions needed to explain a table as a whole. For the present purposes, we perform a first order CFA. This CFA model estimates the expected cell frequencies based on the main effects of the variables that span the table. The types and antitypes explain the interactions needed for the above log-linear model. For the cell-wise CFA tests, we use the *z*-test. To protect α, we use the Holland-Copenhaver (1987) procedure. Table 1 displays a summary of results from CFA, and shows that CFA resulted in 16 types and 9 antitypes.

Pattern 1

Pattern 1 describes those DGPs members, who are not members of any professional section (12.27 %, n = 342). Type 1 1 1 describes those 191 (55.85 %) of those members whose 2000 and 2005 papers experience no citation in an English psychology-related publication during either 5 years observation period. Far more individuals display pattern 1 1 1 than one would expect by chance. Therefore, configuration 1 1 1 is said to constitute a type. One may speculate whether these individuals are still active as scholars at all. They could be retirees or practitioners since at least 2000. Accordingly, less than half of the DGPs members without section affiliation (44.15 %, n = 151) achieve at least one English citation during either period. Far fewer members than one would expect by chance, one could call them the 'whizz kids', are in lowest C0- and in the highest C5-citation category (Antitype 1 1 6, 0.88 %, n = 3).

Pattern 2

Pattern 2 describes those DGPs members, who participate in exactly one professional section, i.e. they are involved in one research area with a single specialization (47.24 %, n = 1,317). It is the largest group of the sample. Here also, there are remarkably many individuals who experience no international citation during either observation period (Type 2 1 1, 42.90 %, n = 565), but their percentage is smaller than within the previous group. Then there are 29.69 % (n = 391) of the one-section members whose C5 citation amount is increased compared to C0 (vs. 18.13 %, n = 62 no-section members) and 7.74 % (n = 102; vs. 6.43 %, n = 22 no section-members) with stable, high citation numbers. So, altogether, there are more 'climbers' and 'keepers' and, for some patterns, there are even more than one would expect by chance (Types 2 4 6, 2 5 5, 2 6 6). Significantly fewer scientists than expected experience their international citation breakthrough between 2000 and 2005 (Antitypes 2 1 5, 2 1 6, 1.75 %, n = 23), but, again, these numbers are higher than in the previous no-section-group. Another fact worth noting is that remarkably fewer one-section members than one would expect by chance experience dramatically lower citation numbers in C5 than in C0 (Antitypes 2 3 1, 2 4 1, 2 6 1).

Table 1:
Types and Antitypes of the Configural Analysis of the Citation Development Data from the Social Science Citation Index

Configuration CS C0 C5	m	$\hat{m}$	z	p	
1 1 1	191	106.77	8.15	0.0000	Type
1 1 6	3	17.04	-3.40	0.0003	Antitype
1 6 6	6	1.57	3.53	0.0002	Type
2 1 1	565	411.17	7.59	0.0000	Type
2 1 5	11	31.67	-3.67	0.0001	Antitype
2 1 6	12	65.61	-6.62	0.0000	Antitype
2 3 1	36	65.29	-3.62	0.0001	Antitype
2 4 1	14	36.71	-3.75	0.0001	Antitype
2 4 6	16	5.86	4.19	0.0000	Type
2 5 5	6	1.63	3.42	0.0003	Type
2 6 1	8	37.94	-4.86	0.0000	Antitype
2 6 6	27	6.05	8.51	0.0000	Type
3 1 6	12	42.94	-4.72	0.0000	Antitype
3 3 1	20	42.73	-3.48	0.0003	Antitype
3 4 6	13	3.83	4.68	0.0000	Type
3 5 4	7	1.60	4.26	0.0000	Type
3 5 5	6	1.07	4.77	0.0000	Type
3 6 1	0	24.83	-4.98	0.0000	Antitype
3 6 5	10	1.91	5.85	0.0000	Type
3 6 6	29	3.96	12.58	0.0000	Type
4 2 4	9	2.68	3.86	0.0001	Type
4 5 3	5	0.92	4.26	0.0000	Type
4 5 6	4	0.69	4.00	0.0000	Type
4 6 3	6	1.65	3.40	0.0003	Type
4 6 6	11	1.23	8.82	0.0000	Type

Note. m = observed cell frequencies; $\hat{m}$ = expected cell frequencies; z = z-Score; p = significance level.

Pattern 3

Pattern 3 describes those 862 (30.92 %) psychologists who are members of two professional DGPs sections, i.e., they are involved in two research areas with a double specialization. For this pattern, dramatic crashes (Antitypes 3 3 1, 3 6 1) as well as comet-like rises (Antitype 3 1 6) exist less often than one would expect by chance. In contrast, modest changes in both directions are significantly noticeable (Types 3 4 6, 3 5 4, 3 5 5,

3 6 5). In comparison with the previous patterns, we note that the percentage of not cited scientists (34.11 %, *n* = 294) decreases and the rates of keepers (7.89 %, *n* = 68), climbers (31.15 %, *n* = 303) and whizz kids (3.13 %, *n* = 27) are higher.

Pattern 4

A look at those 267 (9.58 %) DGPs members who are members of three or more professional sections (Pattern 4 = multiple specializations) reveals considerable non-random differences between C0 and C5: increases (Types 4 2 4, 4 5 6) and decreases (Types 4 5 3, 4 6 3). It is interesting to note that these members do not experience zero citations in significant numbers. Again, compared to all previous patterns, the percentages of uncited scientists (28.46 %, *n* = 76) are lower and those of keepers (11.99 %, *n* = 32), climbers (35.21 %, *n* = 94) and whizz kids (4.49 %, *n* = 12) are higher.

In all 2000 and 2005 publications (if available at all), 40.39 % (*n* = 1,126) of the 2,788 analyzed DGPs members were never cited in an international psychology-related journal indexed in the SSCI during the observed time span of 10 years. Of these, the majority are members of one DGPs section (*n* = 565; 50.18 %) which is, in absolute numbers, the largest group showing single specialization in research. In percent, pattern 1 contains most of the uncited scientists.

Configuration '. 6 6' (2.62 %, *n* = 73) constitutes a type for each of the four categories of CS, which indicates that across all membership categories, there are significantly more DGPs members than expected who are cited five or more times in an English publication in the two observation periods. Two characteristics of these four types are worth noting. First, the numbers of cases in these cells are much smaller than the numbers of cases who are never cited. Second, of those four types, the one for the members who do not belong to any subgroup (1 6 6) describes the smallest group (both in percent and frequency), whereas the one for the members who belong to three or more subgroups contains most of the highly cited scientists (in percent).

Moving to the antitypes, we note that configuration '. 1 6' (*n* = 35) constitutes (configuration 4 1 6 representing the only exception) antitypes for each of the section categories. These are individuals who experience an increase from zero to five or more citations from the first to the second observation period. In comparison with the sizes of the CS-groups, the relatively largest portion of whizz kids scrimmage in 4 1 6 (3.00 %, *n* = 8), or, in percent: the smaller the number of section memberships, the fewer whizz kids.

Discussion and conclusions

In view of the increase in international visibility (decreasing numbers of uncited scientists, increasing numbers of keepers, climbers and whizz kids) of pattern '4 . .', one might argue that, at least, the frequencies in the last pattern indicate evidence of the benefits of professional diversification. But, in fact, only 55 (20.60 %) of the 267 scientists in pattern '4 . .' belong to even more than three sections of the DGPs. So, one may

assume that the majority of DGPs members of the fourth group do not exhibit an indiscriminate diversification, but rather their multiple professional focusing. Ascribing the large number of uncited scientists during the observed time span of 10 years to retirees may not be an entirely satisfactory explication. Fewer than 10 % of all DGPs members are at an age in which they could have been retirees for the whole 10 year span of observation.

The cell frequencies of the types 1 6 6, 2 6 6, 3 6 6, and 4 6 6 indicate that among the psychologists organized in the DGPs there are just a few who are well established in terms of international visibility. In absolute numbers, most of them belong to one or two professional sections, but the relative frequencies within configuration '. 6 6' increase consistently across the stages of CS, i.e., increasing number of subdivision memberships, suggesting multiple specialization.

Two conclusions might be drawn from these results: (1) There is indeed only a small number of individuals who enjoy solid international visibility; (2) For these individuals, one key to success seems to be multiple professional specialization within psychological research.

We note that configuration '. 1 6' constitutes antitypes for each of the section categories (4 1 6 is the only exception). The group of those members who report fewer section memberships contains fewer whizz kids (in percent) than the groups of members who report more section memberships. But who are these up-and-coming scientists – the so called whizz kids? One may speculate whether they are perhaps scientific youngsters at the beginning of their careers who experience first citation success after the first five observation years. In accordance with Schneller and Schneider (2004) in Germany, graduate students of psychology are 29.9 years old on average (SD = 5.61). In the DGP's 115 members are younger than 30 years. Krampen et al. (2010) point out that the internationalization of German psychology in terms of publication and reception has continuously been rising for about ten years, first of all within younger psychologists. So, there could be about 35 budding scientists in the sample: no international citations of their 2000-publications (if available at all) in 2000-2004 and five or more citations of their 2005-publications during the following five years of observation. This very successful group of scientists has managed to establish themselves in the international psychology community in a short period of time.

Altogether, our results confirm the assumption that section membership within the DGPs, in terms of networking and multiple professional profile sharpening, improves the international visibility of German psychologists, as measured by the citation numbers of their publications in the international community. Of course, this is not a proof of a causal relationship. One could also conclude that the more successful scientists turn their attention to more particular topics, and thus join the corresponding sections. Either way, there is a relation between professional focusing on the one hand and international visibility as well as international scientific success on the other. From our perspective, the former explanation seems considerably more traceable. To conclude, we find it worth noting that the 16 types and 9 antitypes suggest that psychology is a very heterogeneous field in regard to the multiple subdisciplines and the psychologists themselves in terms of publication and reception of scholarly work (Krampen, Fell, & Schui, 2011).

Four aspects are worthy of further examination: First, we do not know whether DGPs members generally differ in international visibility from those psychologists who do not belong to the DGPs or other learned societies. However, by far the most of the German psychology researchers are members of the DGPs. Second, we do not know whether the citation advantage of the individuals belonging to multiple DPGs sections is rooted in the possibility that they particularly cite each other, maybe because they are more familiar with the papers of their colleagues. Third, we do not know whether the citation patterns found here are subfield-specific and, thus, reflect the subfields' well-analyzed specific internationalization. Last, but not least, cross-subdisciplinary research within psychology and diversity of specialization was operationalized by the number of individual memberships to different sections of a scientific association, but not by scientometric indicators (see, e.g., Bordons, Morillo, & Gomez, 2004; Porter & Chubin, 1985). Thus, the construct validity of this indicator must be tested in the context of scientometric indicators.

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