Do Research Interests Differ Between Women and Men in Psychology? An Analysis of PSYNDEX Records over a Period of 50 Years

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Abstract: The debate initiated in the mid-1990s about the increasing proportion of women among psychology students in Germany was followed by a series of studies that, among other aspects, examined gender-specific interests. To date, the overall picture of such preferences is mixed, and there is no comprehensive study comprising a longer time period. Therefore, the present study examined (1) whether the research interests of female and male doctoral students in psychology differ and (2) which temporal trends can be identified for these interests. Specifically, 17,971 references from the psychological reference database PSYNDEX to dissertations from the German speaking countries published between 1968 and 2017 were analyzed. The individual research interests were identified with Latent Dirichlet Allocation (LDA) using standardized keywords of the references. Temporal trends were investigated with multilayer perceptrons (MLP). A total of 48 areas of interest could be identified, where only two areas persistently showed major differences between women and men over time: „mother-child relationship and development in infancy“ was addressed with a higher probability by women, „statistics and methods“ was more likely to be addressed by men. Other differences were characterized by temporal fluctuations. Overall, the findings support the assumption that similarities between women and men are more predominant than the differences between them.

Keywords: research interest, sex differences, scientometrics, topic modeling, multilayer perceptrons
The provocative speculations of Urs Baumann (1995) on the consequences of a growing proportion of women for academic psychology in the mid-1990s initiated a debate on gender-specific interests. Besides the assumption of a lower willingness of female psychologists for a scientific career, Baumann expected a "thinning out of single subfields" and a "shift in the research profile" (Baumann, 1995, p. 10), which is caused by a gender-dependent preference for psychological subdisciplines. From today's perspective considering the continually rising rate of female PhDs – which is becoming more and more similar to the proportion of female Masters graduates (Antoni, 2019) – the idea of a female "hostility towards science" can be dismissed (cf. Gundlach, Tröster & Moschner, 1999).

However, it still remains unclear whether the research interests of male and female psychologists actually differ, even nearly 25 years after Baumann's statements. Over the course of different years and study samples, two areas in particular turned out to be addressed to a different extent by women and men: While women seem to have a more pronounced preference for developmental psychology (Brack, Reinhardt, Dahme & Hoffmann, 1997; Gnambs, Hanfstingl & Leidenfrost, 2006; Hartmann, 2012), the methodological topics are more likely to be addressed by men (Brack et al., 1997; Hartmann, 2012; König, Fell, Kellnhofer & Schui, 2015). In addition, the results of a survey among students showed that women more often named topics from clinical and educational psychology and less frequently topics from basic research and IO psychology as a focus of interest (Gundlach et al., 1999). A cross-disciplinary analysis of word frequencies in titles, abstracts and keywords of scientific publications also revealed that in psychology the term "theory" was more frequently used by men (Thelwall, Bailey, Tobin & Bradshaw, 2019). The authors conclude that, across all subjects studied, women prefer topics with a social impact, while men's publications more often deal with physical objects or abstract entities. The authors thus go beyond a prominent hypothesis from career choice research, which states that women and men differ in terms of a postulated "people-things dimension" (Prediger, 1982): Accordingly, women show a stronger interest in

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1 Baumann (1995, p. 9) attributed his assumption that women have "in many cases only limited opportunities and willingness to pursue an academic career" to statistics on the increasingly declining proportion of women at doctoral and post-doctoral level. With regard to the ratio of women to men, he reported 1 to 2.2 (today 2.5 to 1) for PhDs and 1 to 5.5 (today about 1 to 1) for habilitations.
interpersonal activities, whereas men prefer object-related professions (Lippa, 1998; Su, Rounds & Armstrong, 2009).

There is a variety of theoretical approaches to the emergence of such gender differences. A current model that attempts to map the complex interplay between individual interest and socio-cultural context during education and professional development is found in Su and colleagues (Su, 2020; Su, Stoll & Rounds, 2019): In this integrative approach, three levels of interest are distinguished: (1) The affective reactions to an object/activity, (2) the cognitive appraisal in terms of utility and valence, and (3) the cognitive appraisal in terms of compatibility with the personal self-concept (identification). On the third level, the individual socialization process is included, in which the interests of a person are transformed by social role expectations and cultural values, "[...] e.g., a young woman who is good at math and is fascinated by robotics may hesitate to express interest in it due to its perceived incompatibility with her gender identity [...]" (Su, 2020, p. 31). Against the background of this model and within the aforementioned area of conflict between individual interests and social role models, it could be expected that women and men would distribute across different research areas. Consequently, this should be reflected in the contents of PhD theses and scientific publications. Therefore, the present study examines whether indications of such gender-specific research interests can be found among psychologists.

From a methodological point of view, it can be criticized that the data from previous studies on gender-specific research interests originate from relatively short periods of time, often with country-specific and heterogeneous samples. On the contrary, a comprehensive study with a full survey of psychological dissertations from the German-speaking countries allows a closer look at developments over time. In line with the social trend towards a convergence of gender roles (Lang & Risman, 2006) and the rising rate of female PhDs (Antoni, 2019), convergences in the research interests of women and men might be observed as well. In fact, König et al. (2015) could not find any significant gender differences in the publication topics of young psychologists, which can be interpreted as an indication of a convergence trend.

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2 For an overview see, e.g., Su et al (2019).
In previous studies from German-speaking countries, interests were recorded with rather broad categories (such as "general psychology"), "clinical psychology", etc.). However, the use of predefined classifications as proxies for research topics and interests has been criticized primarily for its level of detail (Bittermann & Fischer, 2018; Ding, 2011). Accordingly, it can be assumed that differences reveal in specific aspects that cannot be generalized to entire disciplines of psychology (e.g., specific disorders vs. general clinical psychology). Subsuming specific topics in broad categories could lead to rather small or even absent effects. Therefore, it seems reasonable to derive research interests from the contents of scientific papers in a data-driven way instead of using a priori, broadly defined classifications. The choice of dissertations as a data basis also offers the advantage that their content can be clearly assigned to individual scientific work.

**Research Questions**

Against this background, the current study examines

(1) research interests of female and male PhD students, and

(2) temporal trends of differences in interests.

To this end, the contents of dissertations are extracted from a period of 50 years and compared with regard to author gender. With respect to the descriptive character of this study, an empirical evaluation of aforementioned theoretical models is not intended. However, the results of the analysis will be discussed against this theoretical background. Using a complete dataset of doctoral dissertations should make it possible to assess whether previous results were bound to time and place or can be considered representative. In addition, we are addressing a question which is of current relevance: Is the overall social trend towards a convergence of gender roles (Lang & Risman, 2006) reflected in shifts in the research interests of psychologists?

**Methods**

The methodological procedure is outlined below, detailed descriptions including the software used can be found in *PsychArchives-OD 1* and *PsychArchives-OD 2*. 
Data

We gathered all \( N = 18,050 \) dissertations from the German-speaking countries and the years 1968 to 2017 recorded in the psychological reference database PSYNDEX\(^3\). Author gender was determined via first name\(^4\). After excluding non-assignable cases, the final data set consisted of \( n = 17,971 \) dissertation references\(^5\).

Research Interests

Deriving research interests from the topics of scientific papers is an established approach in scientometrics, especially since the Author-Topic Model of Rosen-Zvi, Griffiths, Steyvers and Smyth (2004). Accordingly, we assume that the individual interest of a person is reflected in the choice of a research topic, even though other aspects such as structural factors or pragmatic and career-oriented considerations may be of relevance as well. Our focus is primarily on horizontal patterns of segregation, i.e., the distribution of women and men across different topical areas, and less on vertical segregation (i.e., processes that relate to a heterogeneous positioning of the sexes within a hierarchical labor market and academic structure).

As in Bittermann and Fischer (2018), the content of the dissertations was analyzed using standardized keywords\(^6\) in PSYNDEX (ZPID, 2016). Using these standardized keywords as input, topic modeling based on Latent Dirichlet Allocation (LDA; Blei, Ng & Jordan, 2003) was applied w.r.t. best-practice recommendations by Maier et al (2018). The results of topic modeling are clusters of frequently co-occurring words (i.e., topics) and document-topic-probabilities, which are used to determine the prevalence of a topic. In this context, prevalence describes the average probability of a topic in the corpus. Its level depends on the number of topics in the

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\(^3\) PSYNDEX is produced by the Leibniz Institute for Psychology Information (ZPID); free access via [www.PubPsych.eu](http://www.PubPsych.eu)

\(^4\) We are aware of the fact that first names do not necessarily allow conclusions about the gender of a person. However, given the lack of self-declaration of all persons, this was the best option for this study.

\(^5\) Since our data is almost a complete on a population level, inferential statistics are not reported.

\(^6\) These controlled keywords are assigned by the scientific staff of the information and research services at ZPID and represent the central contents of publications with a standardized vocabulary (ZPID, 2016). For more reasons to use these standardized keywords and not abstracts in this paper, see PsychArchives-ESM 1.
model.\textsuperscript{7} Prevalence differences greater than half the average prevalence are considered to be larger differences.

**Temporal trends**

In order to account for temporal fluctuations in time series, nonlinear trend curves for each were calculated using multilayer perceptrons (MLP). As in Bittermann and Fischer (2018), a structure with two hidden units was used for each MLP in order to model the average topic probability as a nonlinear function of the year of publication. Finally, the temporal trends were examined on three dimensions:

(1) The "prevalence difference" dimension, i.e., the mean difference between the female and male trend curve,

(2) the "convergence" dimension, i.e., trend differences gradually getting smaller over time, and

(3) the "overall trend" dimension, independent of gender.

**Results**

**Share of women and men in the data set**

Of the 17,971 dissertations included in the analyses, 9,608 (53.5%) were authored by women and 8,363 (46.5%) by men. The proportion of women rose continuously\textsuperscript{8} from 27.6% in 1968 to 64.2% in 2017, thus more and more approaching the relatively constant proportion of female first-year students in Germany (approximately 79%; Destatis, 2019; see PsychArchives-OD 3).

**Differences in interests and topic trends**

Forty-eight topics could be identified. Figure 1 gives an overview of each topic’s position on the dimensions prevalence difference, convergence and overall trend. The majority of topics are located in the area of small differences (Gini coefficient $G = .50$): 38 of 48 topics (79.2%) showed an absolute prevalence difference $|D| \leq 0.5\%$.

\textsuperscript{7} For example, in a model with four topics, the average prevalence is 25% (if each document covers each topic equally). Correspondingly, the average prevalence is 1% in a model with 100 topics.

\textsuperscript{8} $b_1 = 0.828; R^2_{adj} = .931$
Larger differences ($|D| > 0.5\%)$ could be observed for Topics 27 ("human females, sex roles, human males, sex role attitudes, human sex differences"; $|D| = 0.99\%$), 83 ("parent-child relations, family relations, childrearing practices, mothers, childhood development"; $|D| = 0.91\%$), 78 ("mother-child relations, attachment behavior, infant development, mothers, mother-child communication"; $|D| = 0.72\%$) and 70 ("obesity, eating disorders, bulimia, human females, anorexia nervosa"; $|D| = 0.51\%$). Only for Topic 78 the trend was constant for all years (horizontal line in Figure 1). With a higher prevalence among men, larger differences were found in Topics 95 ("theories, philosophies, history of psychology, theory formulation, psychology"; $|D| = 1.06\%$), 24 ("methodology, statistical analysis, measurement, models, mathematical modeling"; $|D| = 1.01\%$), 9 ("cognitive processes, problem solving, models, theory formulation, knowledge level"; $|D| = 0.76\%$), 72 ("driving behavior, drivers, highway safety, automobiles, motor traffic accidents"); $|D| = 0.69\%$), 94 ("decision making, cognitive processes, judgment, choice behavior, uncertainty"; $|D| = 0.65\%$) and 76 ("test validity, intelligence measures, test construction, measurement, testing"); $|D| = 0.61\%$). As on the women's side, a constant trend could be identified for only one of these topics (Topic 24). For a complete table with all topics see PsychArchives-OD 4.

With regard to changes over time, a correlation between the overall trend and the convergence of the trends of women and men was found ($r = .73$): generally rising trends tended to diverge, falling trends tended to converge. In the sense of a bottom effect, convergence in the case of falling trends is due to the generally skewed distribution of topic prevalence: A topic is only addressed by a part of all documents, for the rest the topic has a corresponding prevalence of zero. However, Figure 1 also shows exceptions. The illustrations of all topics' time courses can be found in PsychArchives-OD 5.

Discussion

The present study examined differences in research interests of female and male PhD students in psychology and respective temporal trends. First of all, it should be noted that no exclusively "male or female topics" were found. As depicted in Figure 1, the topics are concentrated in the area of minor differences. This supports the conclusion of Hyde (2005) that the similarities
between women and men predominate. Nevertheless, our results show that despite a large overlap in the research interests of women and men, certain differences remain. In our data, such a difference was found stable over time and across different model variants for "mother-child relationship and development in early childhood" (Topic 78), which was addressed more strongly by women. Women were also more likely than men to deal with gender roles and differences (Topic 27), raising children and development in childhood (Topic 83), and eating disorders (Topic 70) in their doctoral dissertations, although there were variations over time for these topics. Overall, these results are consistent with the findings that women's interest often focuses on people or has a prosocial dimension (Brack et al., 1997; Gundlach et al., 1999; Hartmann, 2012; Su et al., 2009; Thelwall et al., 2019).

"Theories in psychology, history of psychology and philosophical aspects" (Theme 95) proved to be the most male-dominated area that can be linked to the assumption that men seek to engage with more abstract issues (Thelwall et al., 2019). However, it must be emphasized that the prevalence of this topic has clearly declined for both women and men in the last ten years (see PsychArchives-OD 5), so that no significant difference can currently be identified. The same applies to Topic 9, which includes cognitive processes and problem solving.

Moreover, in line with previous studies (Brack et al., 1997; Hartmann, 2012; König et al., 2015), the topic referring to methods and statistics (Theme 24) was characterized by being addressed more strongly by men with a stable trend over time. The fact that this is still evident decades after the discussion about Baumann (1995) is remarkable and gives reason for future studies. Thus the question arises as to whether a "fear of statistics" (Hartmann, 2012), which is more pronounced among women, is of importance or whether – from a career choice theoretical point of view – men within a female-dominated subject such as psychology tend towards a gender stereotypical specialization. The latter corresponds to rather male attributions of these fields at the societal level: A male preference was also found for "Driving Behavior and Vehicles" (Topic 72) and, as a tendency, also for "Sport" (Topic 52) – two likewise gender stereotypical topics (cf. Figure 1 and PsychArchives-OD 4). With regard to female psychologists, it can also be assumed that gender stereotypes contribute in two ways to females being less likely to obtain a PhD in the field of methods and statistics. On the one hand, the confrontation with stereotypes
leads to different expressions of the ability self-concept of men and women. Women may therefore be less likely to opt for this field in the sense of self-selection. On the other hand, gender stereotyped attitudes of professors might contribute to the fact that women are less likely to get doctoral positions in statistics/methods university departments. Thus, structural factors may be a contributing factor as well. Of course, an analogous argumentation for men can be made for topics relating to developmental psychology. More information on the influence of stereotypes in academia can be found in a special issue on gender relations in science (IHF, 2015) and in Zimmermann and Matthies (2010). For future research, it would be worthwhile investigating and soften the influence of existing gender stereotypes in science and at a general social level – a project to which female psychologists in particular have already contributed (see Topic 27).

Using topic modeling, interests could be captured in more detail than with predefined categories. In general, the results fit in with previous research, especially with regard to the stronger male preference for methods (Topic 24). The assumption, supported by earlier research, that women have a greater interest in developmental psychology must be differentiated according to our results. Although two of the topics in question are in the area of greater differences (Topics 83 and 78 on development in (early) childhood), the third topic on cognitive development (Topic 47) was equally likely for both sexes.

Analogous to the basic idea of Rosen-Zvi et al. (2004), we have used topics in dissertations as an indicator of the author's research interest. Whether the topic of the dissertation is actually of highest personal interest, or whether the choice of a topic is associated with possible career advantages or pragmatic reasons (such as financial security through an associated position at the chair) cannot be answered on the basis of our data alone. Self-reports from a representative sample of psychologists working in research or an analysis of structural factors

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9 A more detailed discussion of the relationship between interests and educational and occupational decisions can be found in Su (2020).

10 As an anonymous reviewer notes, in addition to interest, occasional structures can also influence the choice of the dissertation topic, including: the development of chair nominations, the orientation of the chairs (e.g., the decreasing number of chairs in the history of psychology), the importance of graduate schools or the level of third-party funding of a subject and thus the offer of doctoral positions. In this context, it needs to be examined to what extent these factors affect both genders equally or differently.
would be beneficial in that matter. Moreover, further research should address whether the gender-specific topic preferences found are retained in the further academic course after the doctorate – which in psychology is associated with a decrease in the proportion of women (Antoni, 2019).

**Conclusion**

Taken together, it is concluded that only a few areas with major differences of interest were identified. With two exceptions, all areas showed a fluctuating trend over time. The new methodological approach and the comprehensive data set lead to more differentiated results than previous research. The findings support the assumption that similarities between men and women predominate. We therefore agree with Hyde's conclusion that there is no empirical basis for "[...] overinflated claims of gender differences [...]" (Hyde, 2005, p. 586). No conclusions should be drawn from our findings with respect to genuinely female or male interests, detached from socialization processes, role expectations and other influencing factors.

**Acknowledgments**

Our special thanks go to Veronika Kuhberg-Lasson and Ute Wahner for their helpful discussions and comments at all stages of the manuscript, and to Katja Trillitzsch for her support in preparing the dissertation data sets.

**Open Data**

Electronic supplementary materials can be found on PsychArchives.org:

OD 1. (Forschungsinteressen_ESM 1.pdf): Details on study methodology.
   [http://dx.doi.org/10.23668/psycharchives.2678](http://dx.doi.org/10.23668/psycharchives.2678)

   [http://dx.doi.org/10.23668/psycharchives.2677](http://dx.doi.org/10.23668/psycharchives.2677)

OD 3. (Forschungsinteressen_ESM 3.pdf): Figure depicting female shares of dissertations.
   [http://dx.doi.org/10.23668/psycharchives.2678](http://dx.doi.org/10.23668/psycharchives.2678)

OD 4. (Forschungsinteressen_ESM 4.pdf): List of all topics.
   [http://dx.doi.org/10.23668/psycharchives.2678](http://dx.doi.org/10.23668/psycharchives.2678)
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[https://doi.org/10.1007/s11192-015-1646-y](https://doi.org/10.1007/s11192-015-1646-y)


Figure 1. Positions of the topics on the dimensions "prevalence difference" and "convergence". The x-axis shows the prevalence difference of the trends averaged over all years in percent. Negative values indicate a higher probability of the topic being addressed by men, and vice versa. The y-axis shows the coefficients of the linear regression model with predictor "year of publication" and criterion "difference in trends" in percent. If the difference between women and men becomes smaller over all years, the trends converge. Topics printed in black are characterized by a rising trend over all years, while those printed in grey have a falling overall trend. Selected topics are described in the text; a complete table with all topics can be found in PsychArchives-OD 4.