

Brazilian research productivity fellows in physics and nursing under a gender lens: 17 years of data

ABSTRACT

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This article explores the gender scenario regarding proposal and concessions of a research productivity grant from a Brazilian funding agency (Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq) in the fields of physics and nursing. Data for this investigation was provided by the funding agency and refers to the total number of grant proposals and concessions from 2005 to 2021. In the descriptive data analyses, the percentage of grant distribution in relation to the sex of the researchers was evaluated. The results revealed that, in physics, women are the minority in proposals and concessions with no significant evolution over time. On the other hand, in nursing, the percentage of proposals from men (the underrepresented group) increased, but the concessions did not follow the same trend. Based on the findings, it is concluded that underrepresented groups, whether women or men, remained in this position over the years, without significant changes.

KEYWORDS: Research scholarship. Minorities. Gender bias. Gender stereotypes.

INTRODUCTION

The subject of women in the scientific career has been considerably highlighted in the last decades, especially with research demonstrating through data that women are underrepresented amid researchers worldwide. According to UNESCO data (2017), only 28% of researchers in the entire world are women. Their presence in university circles happened belatedly, since the evolution of scientific thought was molded by an understanding of science as developed by male individuals. It is notorious that diversity (of gender, race, ethnicity, and others) is a key part for the better development of science and technology (CALAZA *et al.*, 2021; HOFSTRA *et al.*, 2020; NIELSEN *et al.*, 2017) Notwithstanding, the findings of Hofstra *et al.* (2020) show that there is a diversity and innovation paradox in science as well as in organizations. Underrepresented groups produce higher rates of scientific novelty and diversify science; yet, have less success in their career. Their innovations are disregarded, which partly explains their underrepresentation in more influential positions in academia. In this sense, women have their great scientific innovations ignored, since they are less accepted than those presented by the dominant sex. In the case for low-impact innovations, minorities and majorities are rewarded equally.

The entrance of women in the modern scientific career only occurred in the decade of 1880, as they were first admitted in the undergraduate and then to the doctorate, prerequisite for the scientific work from the XX century onwards (SCHIEBINGER, 1999). The feminine universe begins to have visibility, especially from the emerging academic production. Besides, Londa Schiebinger (1999) reckons other aspects involved in this discussion such as “hierarchical segregation” and “territorial segregation.” The first refers to the phenomenon where the more one climbs the scale of power and prestige, the less women can be seen. The second is about the division by sex in the areas of knowledge, with women more concentrated in traditionally feminine areas as humanities, social sciences and some areas of care. The referred author was also a pioneer in studies on gender prejudice in academia (HOFSTRA *et al.*, 2020; LOPES, 2004).

Several factors contribute the segregation women suffer within science and academia, including harassment – responsible for harming or even preventing the career of talented researchers (BELL; KOENIG, 2017; MCDONALD *et al.*, 2020; WITZE, 2018) –, and conscious and unconscious bias (CALAZA *et al.*, 2021; CARLI *et al.*, 2016; GASTON, 2015; MOSS-RACUSIN *et al.*, 2012; REUBEN *et al.*, 2014). It is also important to mention that obligations related to motherhood, domestic labor, child and/or elder care impact progression in the academic/scientific career of women, since they are historically responsible for all unpaid domestic labor (FRIETSCH *et al.*, 2009; KARASIK *et al.*, 2015; MACHADO *et al.*, 2019).

Facing all these challenges, female researchers have greater difficulty than males to reach the highest positions or greater prestige and leadership roles. Expressions as “glass ceiling”, “leaky pipeline” and “scissors effect” are institutional gender metaphors that describe the manner in which women in academia can feel both socially and intellectually isolated in these established male networks (AMERY *et al.*, 2015).

In Brazil, recent studies ascertained the so-called “scissors effect” in academia: in 2015, women represented 57% of undergraduate students, 53% of graduate students, 45% of undergraduate professors, 43% of graduate professors, and 41%

of coordinators in graduate courses (AREAS *et al.*, 2021). It is noteworthy that women scientists reach the top of their careers in less proportion than men. This reality is still more accentuated in some areas of knowledge, as the STEM fields. In the physics and astronomy areas, women were only 6% of the members in the Brazilian Academy of Sciences (ABC), and amid researchers in the top of their career, they were only 5% (SAITOVITCH *et al.*, 2015).

Bourdieu's (1997) concept of scientific capital can be applied as the theoretical reference to analyze and evaluate differences in scientific activities regarding sex. The French thinker speaks of two species of scientific capital, or two forms of power: the first is a temporal, institutionalized power connected to occupying important positions or jobs in scientific institutions (as head of labs, departments, or committees). The other kind is a specific power, of personal prestige connected to peer acknowledgment, a result of objective products such as publications. Besides, the theoretical framework of the Feminist Point of View Theory will also provide support to the discussions. This theory has its origin in the Marxist philosophical belief that whoever is in power has a very different viewpoint of the structures and social contexts of those who are not. The perspective of a person belonging to the system and of a person which is not benefited by it is completely different (BARTHELEMY *et al.*, 2016).

Within the context of scientific careers in Brazil, funding agencies as the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) and the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) play a major role in the Brazilian Science and Technology system, and the Research Productivity (PQ) scholarship has a singular importance in acknowledging the scientific-academic researcher trajectory. This scholarship was first created in 1976 and it is destined to Ph.D. researchers with eminent research productivity among their peers, valuing their scientific contribution. The PQ scholarship has a category 2 (PQ-2, initial) and a category 1, which is divided into four ascendant levels: PQ-1D, PQ-1C, PQ-1B, and PQ-1A (highest). The scholarship candidate is evaluated according to the minimum requirements to participate in each category as defined by CNPq and is classified according to the evaluation criteria developed by the judging committee of each knowledge area.

Regarding the participation of women researchers in the distribution of PQ scholarships, they were only 36% of the total 14.102 in 2015 (AREAS *et al.*, 2021). In 2020, the percentage of female scholarship holders was 37% of the total active PQ scholarships in all areas of knowledge (OLIVEIRA *et al.*, 2021). Data reveal no significant changes in distribution of this scholarship modality by sex during the 5-year period.

In this scenario, it is necessary to deepen the study on sex differences in science productivity in Brazil. For this article, we will focus on the physics and nursing areas. This choice is since, in 2019, women represented only 10% of the 995 PQ scholars in physics, while in nursing they were 94% (of 179 scholarships), invoking again the concept of territorial segregation (SCHIEBINGER, 1999). For this analysis, the landscape of scholarships proposals and approvals for men and women will be compared in both areas. The questions to be answered with this study are: does the percentage of proposals by sex reflect the approval percentage by sex? Were there pattern changes throughout time? Is there a trend of the majority group gaining in detriment of the minority group?

METHODS

The data used in this investigation were directly provided to the first author by CNPq and represented the proposals for the Research Productivity (PQ) Scholarships calls from 2005 to 2021 for the physics and nursing areas, showing the total demand from researches requesting the scholarship in this period (proposals) and the total number of concessions (approvals) by year and separated by sex.

Data referring to the Brazilian population were collected in the Instituto Brasileiro de Geografia e Estatística (IBGE, 2021), and the data for active research scholarships in 2019 and 2020 were extracted from the open data portal from the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq, 2019, 2020). The global budget of the PQ scholarship calls was retrieved from the CNPq portal (CNPq, 2021). The number of graduate professors in the analyzed areas was obtained in the open data portal of the Sucupira Platform (CAPES, 2019). In this case, gender was assigned on a first name-basis using the Gender API platform (<https://gender-api.com/>).

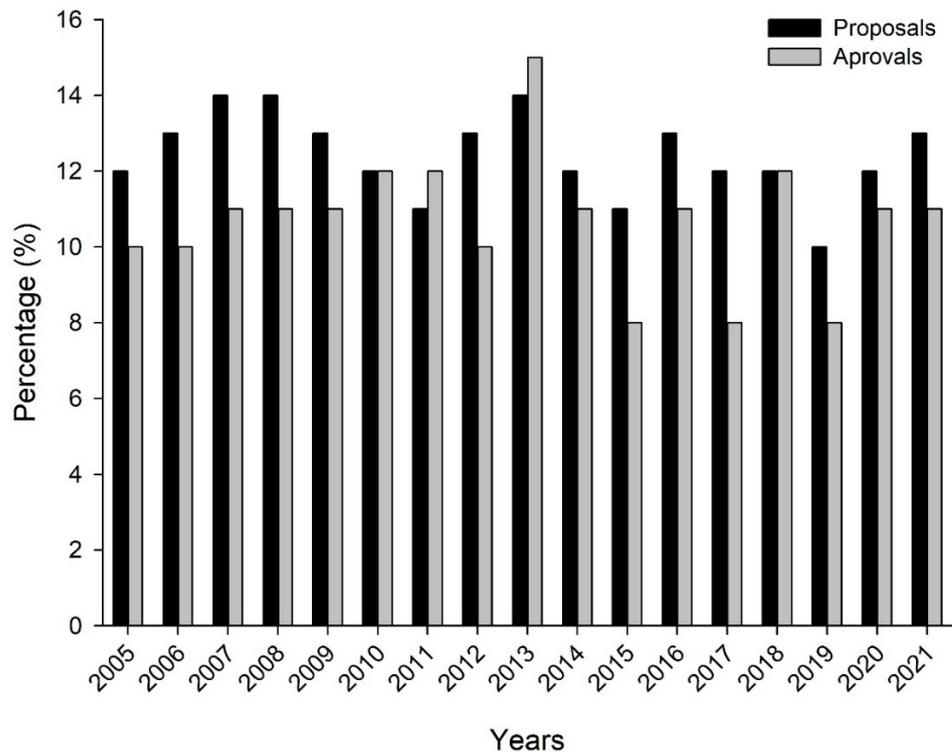
For data analysis, the concept of scientific capital was utilized to identify and measure how differences in sex affect the academic journey. The analysis and interpretation were made from the descriptive statistics.

RESULTS

The results section contains the research scholarships proposals and approvals from 2005 to 2021 in the physics and nursing areas highlighting the underrepresented group (female researcher in physics, male researchers in nursing).

Figure 1 represents the percentage of proposals submitted and approvals of PQ-Scholarship for women throughout the years in the physics area. Women represented 14% of total proposals in 2013 and 10% in 2019. We chose to highlight the minority sex in this area which is traditionally represented by men. In grants, women are only 10% in average. Noticeably, there is no ascendant curve neither in the proposals nor in the approvals, and there is no significant change, only fluctuation in data. Only in 2013 an increase was observed, where women represented 15% of the awarded grants. This non-growth throughout time had already been observed in a previous study which analyzed the total number of researchers with scholarships in the physics and medicine areas by year from 2001 to 2011 (BARBOSA; LIMA, 2013). While Lima and Barbosa's study focuses on the total number of scholarships each year, our analysis observes the evolution in proposals and approvals throughout time, which allows for the identification of microscale effects.

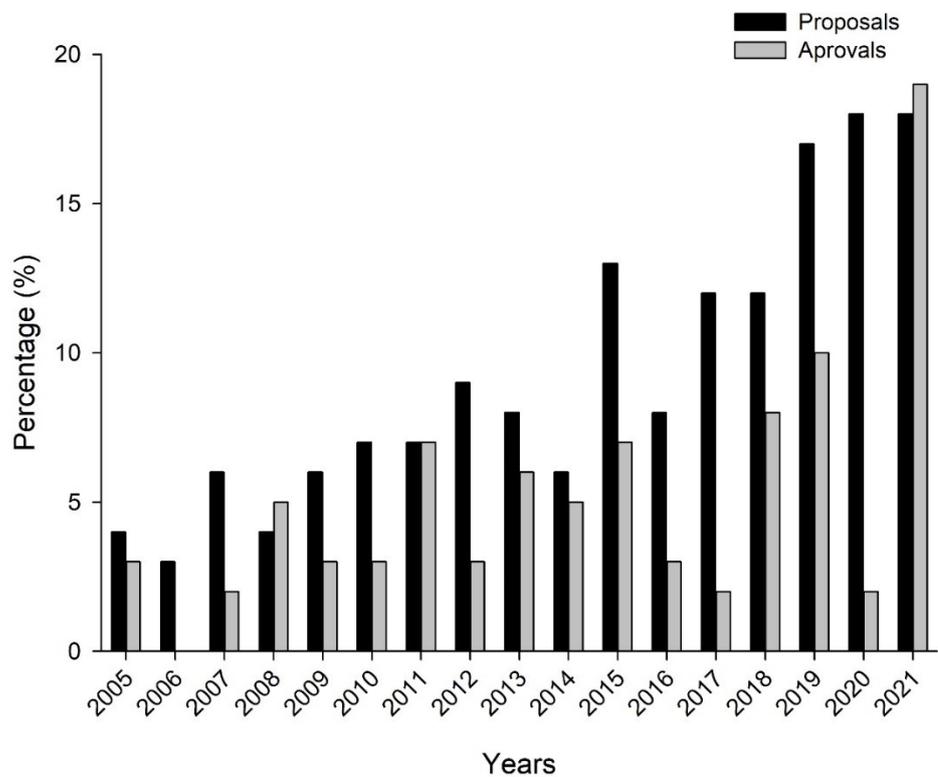
Figure 1 - Percentage of PQ scholarship proposals and approvals from the physics area with women as proponents throughout the years.



Source: own elaboration

Figure 2 represents the percentage of proposals and approvals of PQ Scholarship for men in the nursing area throughout the years. We highlighted the minority sex, given that women are the majority in this area. It is noticeable that the number of male proposals is in constant growth since 2015, which does not occur with the proposals from women in physics as shown in Fig. 1, which remain almost constant, with very little fluctuation. The percentage of male researchers submitting proposals has been clearly increasing in this area: 6% in 2007, 13% in 2015, and rising to 18% in 2020 and in 2021. But the percentage of PQ Scholarships granted for men does not follow the same trend as the proposals, as the percentages oscillate significantly: 3% in 2009, 7% in 2015, 2% in 2017, 10% in 2019, falling again to 2% in 2020, but rising to 19% in 2021. No ascendant curve can be seen in the approvals. There is data fluctuation, just as it happens with women in physics, as Figure 1 demonstrates.

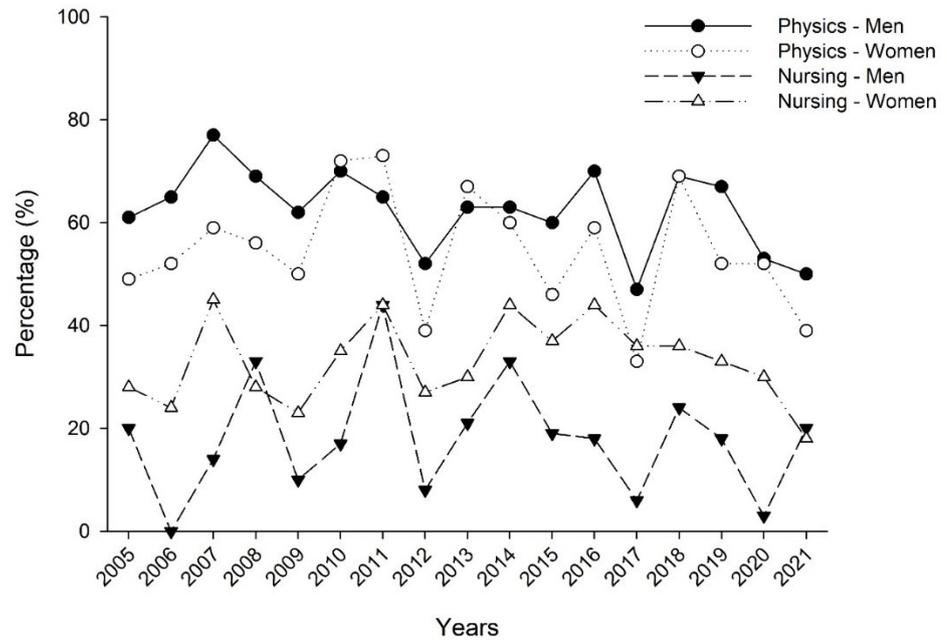
Figure 2 - Percentage of PQ scholarship proposals and approvals from the nursing area with men as proponents throughout the years.



Source: own elaboration

Figure 3 shows the approval percentage by sex of the PQ Scholarship in the physics and nursing areas throughout the years. This percentage consists in the number of approved fellowships of a given sex divided by the number of proposals from this same sex. It is noteworthy that the approval rate of male researchers in physics is much higher than that of women in most years. In the case for nursing, however, the percentage of approval for female researchers is superior to the male percentage in every year analyzed. There are only three instances where the approval percentage of women was different in this area: it was inferior to men in 2008 and in 2021, and equal in 2011.

Figure 3 - Percentage of PQ Scholarship approvals by sex in the physics and nursing areas.



Source: own elaboration

DISCUSSION

The goal of this study was to analyze the evolution of the PQ Scholarship from CNPq throughout time in relation to men and women in the fields of physics and nursing. The results demonstrated that, in physics, women are still underrepresented in the proposals and approvals. On the other hand, a growth proposal occurred for male proponents in the nursing area since 2017, but the percentage of approvals did not follow the same trend. In this section, the main conclusions will be discussed and related to the literature on gender and minorities in academia.

An important discovery was that there was no evolution in the percentage of PQ Scholarship proposals or approvals for women in physics throughout the 17 years analyzed. In our findings, female researchers in physics corresponded to 13% of all proposals in the field and 11% of all approvals in 2021. Territorial segregation, as presented by Schiebinger (1999), is clearly noticeable as men are still a majority within this field of knowledge. Comparing with the numbers in the graduate programs in Brazil, women were only 15.5% of the total 2,111 professors in physics graduate programs in 2019 (CAPES, 2019). These data are important because one can only compete for this scholarship category by being a professor acting in graduate programs advising Master's and Ph.D. level students. Therefore, even though women are 15.5% as potential grant recipient, in the submissions they are only 12% and only 11% as grant recipients. They are in a smaller number than the size of the community which would be capable of receiving this scholarship.

Women are 51% of the Brazilian population (IBGE, 2021), 57% of undergraduates in Brazilian universities (AREAS *et al.*, 2021), but only 32% of undergraduate students of the exact sciences (which include physics, chemistry and mathematics). The percentage is even smaller in the board of undergraduate professors in these areas: less than 25% in the four years analyzed by Barbosa *et al.* (2022). Historically, the presence of the female sex in the so-called “hard sciences” is diminutive. It is inevitable to question the reason for this. There are many factors involved. Ambition is one of them. Studies demonstrate that the level of ambition between women and men in the beginning of their career is the same. When there is an institutional environment favorable to gender diversity, women yearn for career progression in the same intensity as men. However, when there is not a positive organizational culture which values diversity, women are driven from the paths of leadership (ABOUZHR *et al.*, 2017). In this sense, the institutional metaphors of “old boys’ networks”, “boys’ clubs” and “gatekeepers” (AMERY *et al.*, 2015) represent accurately the universe of physics. It is as if female researchers did not belong to that context, being viewed as strangers/outsideers. Men have a kind of capital accumulation from being a man (BOURDIEU, 1997), which is added to the perspective of belonging to the system and being in power (BARTHELEMY *et al.*, 2016).

Another factor worth highlighting in this discussion is harassment. Harassment in science is real (BRITO *et al.*, 2021). However, this behavior remains obscured by reasons as fear, resignation, and shame. Research with women in academia have indicated that more than half of them already suffered harassment (BELL; KOENIG, 2017), and it impacts on psychological health, productivity, and work (KLONOFF; LANDRINE, 1995; MCDONALD *et al.*, 2020). Frequently, career discouragement or abdicating to apply for research funding has an episode of harassment in the background of their academic path. The studies by Barthelemy *et al.* (2016) demonstrate that microaggressions and hostile sexism are manifestations of harassment reported by physics professors. Being a woman in an institutional environment dominated by men where “old boys’ networks” are identified and suffering harassment – whichever its kind – can have devastating consequences for their academic career.

Regarding the “scissors effect”, the higher you ascend in the scientific-academic career, the lower the female sex presence is in Brazil, women are 54% of students at the Master’s and Ph.D. levels (BARBOSA *et al.*, 2022) but only 41% of the coordinators for graduate courses (AREAS *et al.*, 2021). Studies already revealed that, in science, women receive less funding than their male counterparts (SOLLY, 2019). Our results verified that this also happens in the research scholarship system of this Brazilian funding agency. Female researchers are, in every field of knowledge, a minority amid Research Productivity fellows through CNPq, being only 35% of all active scholarships in 2020.

The composition of the physics Judging Committee partly explains the low number of research scholarships for women. CNPq committees are responsible for judging scholarship categories. Their members are chosen through voting by the scientific community and ratified by the Deliberative Council of the agency. Data from Areas *et al.* (2021) demonstrate that only 31% of members of all committees are women. In the Assessing Committee of physics and Astronomy (CA-FA), composed by twenty researchers, women were 20% of their members in 2019, and 30% both in 2020 and 2021. Thus, the trend to prioritize male demand is clear, as

most of its members are men. There is a domination of the majority (HOFSTRA *et al.*, 2020). In this configuration, both territorial segregation and hierarchical segregation (SCHIEBINGER, 1999) toward women can be seen, for the members of these committees are researchers possessing research scholarships in the most elevated levels.

In this sense, it is notorious: the more female physicists advance in the academic path (as undergraduate, master, Ph.D., and then researcher), the smaller the already diminutive number becomes in the highest levels (SAITOVITCH *et al.*, 2015). Amid the Nobel Prize in physics, chemistry, or medicine there are only 17 women since in 2019, in contrast with 572 men, according to data from UNESCO (2017). Another example of this scenario can be seen in the Brazilian Physics Academy (SBF). In its 55 years of existence, the first time a woman was elected president was in July 2021, and half of the board of directors is composed by women in this administration. It was a considerable advance, since over 70% of SBF partners are men (Folha de S. Paulo, July 7, 2021)

Another significant point in the results was that male researchers in nursing proposals for PQ Scholarships have gradually increased throughout time. In 2006, for example, men were 3% of the total proposals in the field, rising to 18% in 2021. There is clearly an ascendant curve in the percentage of proposals. In 2019 there were 1,357 male nursing professors, representing 14.8% of total (CAPES, 2019). Thus, the 18% of submissions is larger than the 14.8% presence in the field suggesting initiative-taking attitude of the men in nursing. According to Santos *et al.* (2021), male academics tend to develop riskier efforts. As we saw, ambition is influenced by organizational culture. When the professional environment does not advance in sex diversity, women tend to withdraw, but not men (ABOUZHR *et al.*, 2017). They insist and take chances. Hence, even in scenarios where they are the minority, they feel comfortable to ask for more since, historically and culturally, they were trained to take more chances. It is as if they felt protected by the privilege of being men, recalling to Bourdieu's (1997) scientific capital idea.

Research demonstrates an increase in the number of men entering the profession in the last years, but nursing still is traditionally considered a female profession (KRONBERG *et al.*, 2018). Although the number of PQ Scholarship proposals from male nursing researchers increased, this did not incur in an increase of grants for them. Likewise, in the physics area, this fact can be a reflex of the composition of the Judging Committee, which are women. Four researchers compose the Nursing Assessing Committee (CA-EF). Women were 100% of its members in 2019, and men represented 25% in 2020 and 2021. This configuration reiterates the majority prevalence (HOFSTRA *et al.*, 2020) and the concepts of horizontal and vertical exclusions (SCHIEBINGER, 1999).

Regarding the percentage of approval by sex in the findings of this investigation, differences between the areas were identified:

i) Regarding the sex of the majority, the percentage of approval between male physicists is above 60%, except for four years when it was below this value: 52% in 2012, 47% in 2017, 53% in 2020, and 50% in 2021. Noticeably, this percentage was of 77% in 2007. However, amid female researchers in nursing, it did not surpass 45%, in 2007, staying on average 33% throughout the years. It had its lowest approval rate in 2021, with 18%. This can be explained by their field characteristics: physics is the greatest area of knowledge in CNPq in numbers of research

scholarships, traditionally funded and established since the beginning of scientific careers in Brazil. It can be said that nursing is still an area in ascension and expansion.

ii) On minority sex, women in physics had their approval percentage greater than men in three occurrences: 72% in 2010, while men had 70%; 73% in 2011, while men had 65%; and 67% in 2013, where men had 63%. It is noteworthy that, besides that fact, they kept being a minority in the area. The male sex in nursing, however, had a higher approval rating in only two records: 33% in 2008, while women then had 28%; and 20% in 2021, where women had 18%.

On the other hand, there are similarities which can be noticed in these data:

i) In the years when CNPq had a global budget reduction of the Call for the Research Productivity scholarship, beginning in 2017 (1 Rodapé), the percentage of approval for the majority sex in both areas was below the average of the previous years. Thus, physics had an abrupt decline in its rates in 2017, with an approval percentage of 47% for men. It kept these lower numbers in the forthcoming years, reaching 50% in 2021. Likewise, in nursing, approval rates for women were in 36% in 2017 and 2018, 33% in 2019, 30% in 2020, and only 18% in 2021.

ii) In both areas of knowledge, the approval percentage by sex was equal in only one record: in physics, men and women had an approval rate of 69% in 2018; in nursing, both sexes had an approval rate of 44% in 2011.

CONCLUSION

This investigation reaches a few conclusions. One of them is that the stereotypes maintain themselves in both areas: caring women and smart men. Women are the majority in nursing and men in physics. These differences in sex are more anchored in the historically established social aspects than in biology. Women are associated with characteristics as welcoming, friendly, and emotionally supportive. Related to men are traces such being independent, competitive, and aggressive. The differences in family and professional roles occupied by men and women constitute the basis for the stereotypes and the expectations of behaviors regarding sex (KRONBERG *et al.*, 2018). In this sense, these stereotypes are responsible by many of the difficulties women experience when attempting to remain in an area traditionally seen as “a man’s profession” or men in a field seen as “a woman’s profession”.

The most important conclusion is that the minority group remains a minority throughout the years. The dominion of the majority is clearly noticeable, be it male or female. Hofstra *et al.* (2020) observed that scientific advancements of the minority group are disregarded. Those who are part of a minority have less success in their career. In this case, they are granted fewer research scholarships. In both analyzed areas, the minority sex remains a minority throughout the years. In physics, male physicists belong to the system and perpetuate their permanence. In nursing, on the contrary, female nursing researchers are in power and are benefited by the system (BARTHELEMY *et al.*, 2016). There is no space for the entrance of the minority sex in neither case. It is a trend for majorities to perpetuate themselves.

Part of this unbalance of the majority could be reversed in the Committee judging processes. Studies indicate that scientific evaluation committees aware of a prejudicial bias regarding minority groups tend to judge more fairly. Prejudice becomes no longer implicit, and the outlook toward this matter becomes more mindful (CALAZA *et al.*, 2021; RÉGNER *et al.*, 2019). When prejudice regarding sex is not perceived, the configuration of the scientific field does not change. It is fundamental to have this awareness, as well as a more equitable composition of men and women in the judging committees, in order for sex differences no longer being so evident in the academic areas.

Pesquisadores bolsistas de produtividade brasileiros em física e enfermagem sob uma lente de gênero: 17 anos de dados

RESUMO

Este artigo explora o cenário de gênero nas propostas e nas concessões da bolsa de produtividade de pesquisa de um órgão de fomento brasileiro (Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq) nas áreas de física e enfermagem. Os dados para esta investigação foram fornecidos pela agência financiadora e referem-se ao número total de propostas e de concessões da bolsa, de 2005 a 2021. Nas análises descritivas dos dados, avaliou-se o percentual de distribuição da bolsa em relação ao sexo dos pesquisadores. Os resultados revelaram que, na física, as mulheres são minoria nas propostas e nas concessões sem evolução significativa ao longo do tempo. Por outro lado, na enfermagem, o percentual de propostas de homens (grupo sub-representado) aumentou, mas as concessões não seguiram a mesma tendência. Com base nos achados, conclui-se que grupos sub-representados, sejam mulheres ou homens, permaneceram nessa posição ao longo dos anos, sem mudanças significativas.

PALAVRAS-CHAVE: Bolsa de pesquisa. Minorias. Preconceito de gênero. Estereótipos de gênero.

Becarios brasileños de productividad en física y enfermería bajo una perspectiva de género: 17 años de datos

RESUMEN

Este artículo explora el escenario de género con respecto a la propuesta y concesión de una beca de productividad en investigación de una agencia de financiación brasileña (Conselho Nacional de Desenvolvimento Científico y Tecnológico – CNPq) en los campos de física y enfermería. Los datos de esta investigación fueron proporcionados por la agencia financiadora y se refieren al número total de propuestas de subvenciones y concesiones de 2005 a 2021. En los análisis de datos descriptivos, se evaluó el porcentaje de distribución de subvenciones en relación con el sexo de los investigadores. Los resultados revelaron que, en física, las mujeres son minoría en propuestas y concesiones sin una evolución significativa en el tiempo. En enfermería, por el contrario, aumentó el porcentaje de propuestas de hombres (el colectivo infrarrepresentado), pero las concesiones no siguieron la misma tendencia. Con base en los hallazgos, es que los grupos subrepresentados, concluyeron si mujeres u hombres, en esta posición a lo largo de los años, se mantuvieron sin cambios significativos.

PALABRAS CLAVE: Beca de Investigación. Minorías. Prejuicio de género. Estereotipos de género.

NOTAS

1 Global budget of CNPq calls for PQ scholarship: R\$ 165.000.000,00 in 2017; R\$334.070.400,00 in 2018; R\$335.005.200,00 in 2019; R\$ 294.300.000,00 in 2020; and R\$ 200.000.000,00 in 2021. Data available at the CNPq Portal.

REFERENCES

- ABOUZHR, Katie; KRENTZ, Matt; TAPLETT, Frances Brooks; TRACEY, Claire; TSUSAKA, Miki. Dispelling the Myths of the Gender “Ambition Gap”. Boston Consulting Group, 2017. Available at: <https://www.bcg.com/en-br/publications/2017/people-organization-leadership-change-dispelling-the-myths-of-the-gender-ambition-gap>. Accessed on: Aug. 22, 2021.
- AMERY, Fran; BATES, Stephen; JENKINS, Laura; SAVIGNY, Heather. Metaphors on Women in Academia: A Review of the Literature, 2004–2013. IN: **Advances in Gender Research**. Bingley: Emerald Group Publishing Limited, v. 20, p. 245–267, 2015. Available at: <https://www.emerald.com/insight/content/doi/10.1108/S1529-212620150000020022/full/html>. Accessed on: Sept. 20, 2021.
- AREAS, Roberta; ABREU, Alice R. de P.; SANTANA, Ademir E.; BARBOSA, Marcia C.; NOBRE, Carlos. Gender and the Scissors Graph of Brazilian Science: From Equality to Invisibility. **OSF Preprints**, Jul. 15, 2021. Available at: <https://osf.io/m6eb4/>. Accessed on: Apr. 21, 2022.
- BARBOSA, Marcia C.; AREAS, Roberta; ABREU, Alice R. de P.; SANTANA, Ademir E.; NOBRE, Carlos. Androcentrism in the Scientific Field: Brazilian Systems of Graduate Studies, Science and Technology as a Case Study. **Anais da Academia Brasileira de Ciências**, 2022 (accepted). Available at: <https://osf.io/8x2uz/>. Accessed on: Jul. 22, 2021.
- BARBOSA, Marcia C.; LIMA, Betina. Mulheres na Física do Brasil: por que tão poucas? E por que tão devagar? IN: YANNOULAS, S. C. **Trabalhadoras: análise da feminização das profissões e ocupações**. Brasília: Abaré, p. 38-53, 2013.
- BARTHELEMY, Ramón S.; MCCORMICK, Melinda; HENDERSON, Charles. Gender discrimination in physics and astronomy: Graduate student experiences of sexism and gender microaggressions. **Physical Review Physics Education Research**, v. 12, n. 2, 2016. Available at: <https://journals.aps.org/prper/abstract/10.1103/PhysRevPhysEducRes.12.02011>. Accessed on: Aug. 02, 2021.
- BELL, Robin E.; KOENIG, Lora S. Harassment in science is real. **Science**, v. 358, n. 6368, p. 1223, 2017. Available at: <https://www.science.org/doi/10.1126/science.aar6134>. Accessed on: Aug. 11, 2021.

BOURDIEU, Pierre. **Les usages sociaux de la science**: pour une sociologie clinique du champ Scientifique. Versailles: Editions Quae, 1997.

BRITO, Carolina; BARBOSA, Marcia C.; PAVANI, Daniela B.; COSTA, Angelo B.; NARDI, Henrique C. **Harassment in Brazilian universities**: how big is this problem? The Federal University of Rio Grande do Sul (UFRGS) as case study. *Anais da Academia Brasileira de Ciências*. In press. 2021.

CAPES. **Dados abertos CAPES - Docentes da Pós-Graduação Stricto Sensu no Brasil**, 2019. Available at: <https://dadosabertos.capes.gov.br/dataset/2017-a-2020-docentes-da-pos-graduacao-stricto-sensu-no-brasil>. Accessed on: Aug. 13, 2021.

CALAZA, Karin C.; ERTHAL, Fátima C. S.; PEREIRA, Mirtes G.; MACARIO, Kita C. D.; DAFLON, Verônica T.; DAVID, Isabel P. A.; CASTRO, Helena C.; VARGAS, Maria D.; MARTINS, Laura B.; STARIOLO, Jasmin B.; VOLCHAN, Eliane; OLIVEIRA, Leticia de. Facing Racism and Sexism in Science by Fighting Against Social Implicit Bias: A Latina and Black Woman's Perspective. **Front. Psychol**, v. 12, 2021. Available at: <https://doi.org/10.3389/fpsyg.2021.671481>. Accessed on: Apr. 21, 2022.

CARLI, Linda L.; ALAWA, Laila; LEE, Yoon Ah; ZHAO, Bei; KIM, Elaine. Stereotypes About Gender and Science: Women ≠ Scientists. **Psychology of Women Quarterly**, v. 40, n. 2, p. 244–260, 2016. Available at: <https://journals.sagepub.com/doi/10.1177/0361684315622645>. Accessed on: Aug. 12, 2021.

CNPq. **Mapa de Investimentos**, 2019. Available at: <http://memoria2.cnpq.br/bolsistas-vigentes>. Accessed on: Oct. 29, 2019.

CNPq. **Mapa de Investimentos**, 2020. Available at: <http://memoria2.cnpq.br/bolsistas-vigentes>. Accessed on: Dec. 01, 2020.

CNPq. **Chamadas de Bolsa PQ**, 2021. Available at: http://memoria2.cnpq.br/web/guest/chamadas-publicas?p_p_id=resultadosportlet_WAR_resultadoscnpqportlet_INSTANCE_0ZaM&filtro=encerradas&buscaModo=textual&tmp=1630608855082. Accessed on: Sept. 20, 2021.

FRIETSCH, Rainer; HALLER, Inna; FUNKEN-VROHLINGS, Melanie; GRUPP, Hariolf. Gender-specific patterns in patenting and publishing. **Research Policy**, v. 38, n. 4, p. 590-599, 2009. Available at: <https://doi.org/10.1016/j.respol.2009.01.019>. Accessed on: Sept. 25, 2021.

GASTON, Nicola. **Why science is sexist?** Bridget Williams Books, 2015.

HOFSTRA, Bas; KULKARNI, Vivek V.; MUNOZ-NAJAR GALVEZ, Sebastian; HE, Bryan; JURAFSKY, Dan; MCFARLAND, Daniel A. The Diversity-Innovation Paradox in Science. **Proceedings of the National Academy of Sciences of the United States of America (PNAS)**, v. 117, n. 17, p. 9284-9291, 2020. Available at: <https://www.pnas.org/doi/full/10.1073/pnas.1915378117>. Accessed on: Jun. 04, 2021.

IBGE. **População**. Available at: <https://www.ibge.gov.br/>. Accessed on: Aug. 24, 2021.

KARASIK, Rona J.; BERKE, Debra L.; SCHEER, Scott D. Caring for Aging Parentes: managing the Personal and Professional in Academia. IN: ANDERSON, Erin K.;

SOLOMON, Catherine R. **Family-Friendly Policies and Practices in Academe**. Lanham: Lexington Books, p. 69-88, 2015.

KLONOFF, Elizabeth A; LANDRINE, Hope. The Schedule of Sexist Events: A Measure of Lifetime and Recent Sexist Discrimination in Women's Lives. **Psychology of Women Quarterly**, v. 19, n. 4, p. 439-472, 1995.

KRONBERG, Suzanne; BOURET, Josephine R.; BRETT, Anne L. Lived experiences of male nurses: Dire consequences for the nursing profession. **Journal of Nursing Education and Practice**, v. 8, n. 1, p. 46-53, 2018. Available at: <https://doi.org/10.5430/jnep.v8n1p46>. Accessed on: Aug. 03, 2021.

LOPES, Maria Margaret; DE SOUSA, Lia G. P.; SOMBRIO, Mariana M. de O. A construção da invisibilidade das mulheres nas ciências: a exemplaridade de Bertha Maria Júlia Lutz (1894-1976). **Gênero**, Niterói, v. 5, n.1, p. 97-109, 2004.

MACHADO, Leticia S.; PERLIN, Marcelo; SOLETTI, Rossana C.; ROSA E SILVA, Livia K.; SCHWARTZ, Ida V.; SEIXAS, Adriana; RICACHENEVSKY, Felipe K.; NEIS, Alessandra T.; STANISCUASKI, Fernanda. Parent in Science: the impact of parenthood on the scientific career in Brazil. Paper presented at the annual meeting for the Society of IEEE/ACM 2nd International Workshop on Gender Equality in Software Engineering (GE). **Montréal**, May 25-31, 2019. Available at: <https://ieeexplore.ieee.org/document/8819567>. Accessed on: May 03, 2022.

MCDONALD, Lisa; BARRIAULT, Chantal; MERRITT, Thomas. Effects of gender harassment on science popularization behaviors. **Public Understanding of Science**, v. 29, n. 7, p. 718-728, 2020. Available at: <https://doi.org/10.1177/0963662520946667>. Accessed on: Sept. 23, 2021.

MOSS-RACUSIN, Corinne A.; DOVIDIO, John F.; BRESOLL, Victoria L.; GRAHAM, Mark J.; HANDELSMAN, Jo. Science faculty's subtle gender biases favor male students. **Proceedings of the National Academy of Sciences of the United States of America (PNAS)**, v. 109, n. 41, p. 16474-16479, 2012. Available at: <https://doi.org/10.1073/pnas.1211286109>. Accessed on: Sept. 28, 2021.

NIELSEN, Mathias W.; ALEGRIA, Sharla; BÖRJESON, Love; ETZKOWITZ, Henry; FALK-KRZESINSKI, Holly J.; JOSHI, Aparna; LEAHEY, Erin; SMITH-DOERR, Laurel; WOOLLEY, Anita W.; SCHIEBINGER, Londa. Gender diversity leads to better science. **Proceedings of the National Academy of Sciences of the United States of America (PNAS)**, v. 114, n. 8, p. 1740-1742, 2017. Available at: <https://doi.org/10.1073/pnas.1700616114>. Accessed on: Jul. 20, 2021.

OLIVEIRA, Amurabi; MELO, Marina F. de; RODRIGUES, Quemuel B. de; PEQUENO, Mayres. Gênero e desigualdade na academia brasileira: uma análise a partir dos bolsistas de produtividade em pesquisa do CNPq. **Configurações**, n. 27, p. 75-93, 2021. Available at: <https://doi.org/10.4000/configuracoes.11979>. Accessed on: Oct. 05, 2021.

RÉGNER, Isabelle; THINUS-BLANC, Catherine; NETTER, Agnès; SCHMADER, Toni; HUGUET, Pascal. Committees with implicit biases promote fewer women when they do not believe gender bias exists. **Nature Human Behaviour**, v. 3, no. 11, p. 1171-1179, 2019. Available at: <https://doi.org/10.1038/s41562-019-0686-3>. Accessed on: May 05, 2022.

REUBEN, Ernesto; SAPIENZA, Paola; ZINGALES, Luigi. How stereotypes impair women's careers in science. **Proceedings of the National Academy of Sciences of**

the United States of America (PNAS), v. 111, n. 12, p. 4403–4408, 2014. Available at: <https://doi.org/10.1073/pnas.1314788111>. Accessed on: Aug. 15, 2021.

SAITOVITCH, Elisa M. B.; BARBOSA, Marcia C.; FUNCHAL, Renata Z.; PINHO, Suani T. R.; SANTANA, Ademir E. Gender Equity in the Brazilian Physics Community at Present Day. Gender equity in the brazilian physics community at the present time. **AIP Conference Proceedings**, v. 1697, n. 41, p. 060007, 2015.

SANTOS, João M.; HORTA, Hugo; AMÂNCIO, Lígia. Research agendas of female and male academics: a new perspective on gender disparities in academia. **Gender and Education**, v. 33, n. 5, p. 1–19, 2020. Available at: <https://doi.org/10.1080/09540253.2020.1792844>. Accessed on: Mar. 30, 2021.

SCHIEBINGER, Londa. **Has Feminism Changed Science?** Cambridge: Harvard University Press, 1999.

SOLLY, Meilan. Women in Science Receive Less Grant Money Than Their Male Peers. **Smithsonian magazine**, March 07, 2019. Available at: <https://www.smithsonianmag.com/smart-news/women-science-receive-less-grant-money-their-male-peers-180971649/>. Accessed on: Sept. 08, 2021.

UNESCO. **Cracking the code: girls' and women's education in science, technology, engineering and mathematics (STEM)**. Paris, 2017.

WITZE, Alexandra. Sexual harassment is rife in the sciences, finds landmark US study. **Nature**, v. 558, p. 352-353, 2018. Available at: <https://www.nature.com/articles/d41586-018-05404-6>. Accessed on: May 05, 2022.

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