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A Preprogram Appraisal of Factors Influencing Research Productivity among Faculty at College of Medicine, University of Lagos

Folasade Tolulope Ogunsola, Oluwakemi Ololade Odukoya¹, Bolanle Banigbe², Sikeade Olawumi Caleb-Adepoju³, Olalekan Folarin³, Bosede Bukola Afolabi⁴, Njideka Ulunma Okubadejo⁵, Wasiu Lanre Adeyemo⁶, Alani Sulaimon Akanmu⁷, Akinniyi Osuntoki⁸, Prosper Okonkwo², Robert Murphy⁹, Phyllis Kanki¹⁰

Departments of Medical Microbiology and Parasitology, ¹Community Health and Primary Care, ²AIDS Prevention Initiative of Nigeria, ³BRAINS Initiative, College of Medicine, Departments of ⁴Obstetrics and Gynaecology, ⁵Internal Medicine, ⁶Oral and Maxillofacial Surgery, ⁷Haematology and Blood Transfusion, and ⁸Department of Biochemistry, College of Medicine, University of Lagos, Lagos, Nigeria, ⁹Center for Global Health, Feinberg School of Medicine, Northwestern University, Chicago, IL, ¹⁰Department of Immunology and Infectious Diseases, Harvard TH Chan School of Public Health, Boston, MA, USA

Abstract

Background: A defining feature of any university is its dedication to scholarly activities, leading to the generation of knowledge and ideas. Research productivity is a measure of achievement of a scholar. The number of research publications in peer-reviewed journals is an important criterion for assessing productivity and prestige in the academia. **Aims and Objectives:** This cross-sectional descriptive study assessed the level of research productivity (RP) among junior faculty at the College of Medicine, University of Lagos, and investigated factors affecting their research output prior to the implementation of a 5-year training grant funded by the National Institutes of Health. **Methods:** Seventy junior faculty members attended a pre-program training, and the self-reported number of peer-reviewed publications (PRPs) was used as an indicator. Intrinsic and extrinsic factors influencing RP among the attendees were assessed and ranked. **Results:** The majority (42/70, 60%) of the respondents had <10 PRPs. The median (interquartile range) number of PRPs was 7 (3–18). A desire for the development of their personal skills, contribution to society, and personal research interests topped the list of intrinsic factors influencing RP. Work flexibility, research autonomy, and scholarly pursuits were the bottom three. A desire for promotion, respect from peers, and increased social standing were the top three extrinsic factors, while monetary incentives, employment opportunities, and the need to attend conferences were the lowest three. The top barriers to RP were lack of resources and lack of mentoring. Perceived older age, lack of time, and motivation were the lowest three barriers. Older age and professional cadre were associated with increased RP ($P < 0.05$). **Conclusion:** Among the participants, research output appears to be motivated primarily by a desire for personal development, promotion, and respect from peers. Lack of access to resources was the main barrier to increased RP. These factors may need to be considered when developing programs designed to promote RP.

Keywords: Barriers, extrinsic, intrinsic factors, publications, research productivity, researchers

Résumé

Contexte: Une caractéristique déterminante de toute université est son dévouement aux activités savantes, menant à la génération de connaissances et d'idées. La productivité de la recherche est une mesure du rendement d'un chercheur. Le nombre de publications de recherche dans des revues à comité de lecture est un critère important pour évaluer la productivité et le prestige de l'académie. **Buts et objectifs:** Cette étude descriptive transversale a évalué le niveau de productivité de la recherche (RP) parmi les professeurs débutants du Collège de médecine de l'Université de Lagos et a examiné les facteurs affectant leurs résultats de recherche avant la mise en œuvre d'une subvention de formation de 5 ans, financé par les National Institutes of Health. **Méthodes:** Soixante-dix facultés juniors ont suivi une formation préalable au programme et le nombre

Address for correspondence: Dr. Oluwakemi Ololade Odukoya,
College of Medicine, University of Lagos, Lagos, Nigeria.
E-mail: drolukemiodukoya@yahoo.com

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autodéclaré de publications évaluées par des pairs a été utilisé comme indicateur. Les facteurs intrinsèques et extrinsèques influençant la RP chez les participants ont été évalués et classés. Résultats: La majorité (42/70, 60%) des répondants ont utilisé moins de 10 publications évaluées par des pairs. Le nombre médian (intervalle interquartile) de PRP était de 7 (3–18). Le désir de développer leurs compétences personnelles, leur contribution à la société et leurs intérêts personnels en recherche figuraient en tête de liste des facteurs intrinsèques influençant la productivité de la recherche. La flexibilité du travail, l'autonomie de recherche et les activités universitaires étaient les trois derniers. Un désir de promotion, le respect des pairs et une position sociale accrue étaient les trois principaux facteurs extrinsèques, tandis que les incitations monétaires, les possibilités d'emploi et la nécessité d'assister à des conférences étaient les trois plus faibles. Les principaux obstacles à la productivité de la recherche étaient le manque de ressources et le manque de mentorat. L'âge avancé perçu, le manque de temps et la motivation étaient les trois obstacles les plus bas. L'âge avancé et les cadres professionnels étaient associés à une augmentation de la RP ($P < 0,05$). **Conclusion:** parmi les participants, les résultats de la recherche semblent être principalement motivés par un désir de développement personnel, de promotion et de respect de la part des pairs. Le manque d'accès aux ressources était le principal obstacle à l'augmentation de la productivité de la recherche. Ces facteurs peuvent devoir être pris en compte lors de l'élaboration de programmes conçus pour promouvoir la productivité de la recherche.

Mots-clés: Obstacles, extrinsèques, facteurs intrinsèques, publications, productivité de la recherche, chercheurs

INTRODUCTION

Research is the core mission of academic medicine.^[1] Greater research productivity (RP) is associated with better clinical care, enhanced research opportunities, appointments, promotions, and greater researcher prestige in the field.^[2,3] Furthermore, RP has the potential to affect teaching and student quality and contributes to genuine indigenous and sustainable development.^[2,3] Research plays a major role in institutional rankings.^[4] Universities all over the world therefore impart a significant emphasis on promoting RP among faculty.

RP is low among faculty in low- and middle-income countries (LMIC) compared to their counterparts in high-income countries (HIC). A gross mismatch exists between research output and disease burden, as LMICs bear a disproportionately higher burden of disease.^[5] The 1990 Commission on Health Research for Development stated that strengthening research capacity in LMICs is “one of the most powerful, cost-effective, and sustainable means of advancing health and development.”^[6] Nevertheless, at the turn of the millennium, LMICs accounted for 85% of the world's population, 92% of the global disease burden, but only 10% of global funding for health research.^[7] Recognition of this gap led to renewed calls for the development of increased health RP in LMICs.^[8] This in turn led to increasing international collaborations and stronger foreign support and investments in the research capacity of LMIC.^[8,9]

The intrinsic and extrinsic factors influencing RP among faculty in resource-limited settings remain unclear. Assessing RP and the factors that influence it may provide institutional administrators with pertinent information useful for developing and designing programs that enhance the research culture and promote RP among their faculty.

In 2015, the National Institutes of Health, United States of America (USA), funded a 5-year project Building Research and Innovation in Nigeria's Science (BRAINS), designed to build research capacity and promote RP among academic staff of the College of Medicine of the University of Lagos (CMUL).

This study set out to assess the preprogram levels of RP among junior academic staff at the CMUL prior to the implementation of the project and determine the intrinsic and extrinsic factors influencing their RP with a view to incorporating the findings in the implementation of programs and policies to enhance RP at the CMUL.

METHODS

Study setting, design, and population

The CMUL is located in Idi-Araba in Lagos State, Nigeria. The CMUL has three faculties consisting of 32 departments with 212 junior faculty members as of August 2016. A junior faculty member was defined as full-time faculty at the rank of senior lecturer and below. A cross-sectional descriptive study was conducted among full-time eligible and consenting faculty members. Visiting scholars were excluded from the study. A preimplementation training program was conducted prior to the initiation of the 5-year BRAINS project.

Data collection tools and techniques

A structured questionnaire was designed to elicit information on RP and the self-reported intrinsic and extrinsic factors influencing it. The tool was administered in-person to participants who attended the training prior to the implementation of the BRAINS project. Attempts were made to reach eligible junior faculty who did not opt to attend the training by sending an electronic link of the same survey to their e-mail addresses.

Study measures and data analysis

RP was measured by asking respondents to list their individual total number of peer-reviewed publications (PRPs). We assessed intrinsic and extrinsic factors influencing RP by asking respondents how strongly they agreed or disagreed that a given factor motivated their RP with responses on a 5-point Likert scale.^[8] Barriers to RP were assessed in the same manner. Data were cleaned, entered, and analyzed using SPSS® version 17.0 (SPSS Inc., Chicago, USA). The number of PRPs was skewed and therefore presented as medians and interquartile ranges (IQRs). RP was graded as high if the

Table 1: Sociodemographic and work-related characteristics

Variable (n=70)	Frequency (%)
Age group	
30-39	28 (40.0)
40-49	37 (52.9)
50-59	5 (7.1)
Gender	
Male	37 (52.9)
Female	33 (47.1)
Highest qualification	
Masters qualification	19 (27.1)
Doctorate/fellowship	51 (72.9)
Current professional cadre	
Assistant lecturer	15 (21.4)
Lecturer II	12 (17.1)
Lecturer I	27 (38.6)
Senior lecturer	16 (22.9)
Has administrative responsibilities	
Yes	42 (60.0)
No	28 (40.0)

number of PRPs was above the median and as low if equal to or below the median. A bivariate analysis was conducted to determine the factors associated with good RP among the respondents. $P < 0.05$ was considered statistically significant. Intrinsic and extrinsic factors influencing RP were scored and summed up. The factors with the top three scores were considered to be the strongest motivators of high RP among the respondents. Similar analyses were conducted for the barriers to RP. Participation in the study was voluntary, and the information obtained was treated with confidentiality. Faculty were free to decline to participate without penalty.

RESULTS

Sociodemographic characteristics

Of the 70 respondents who participated in the survey, the majority, 65/70 (92.9%), were <50 years of age; there were slightly more males (37/70, [52.9%]) and almost three-quarters (51/70, [72.9%]) had either a postgraduate doctorate or fellowship as their highest level of educational qualification [Table 1].

Research and publication history

The median (IQR) number of total PRPs was 7 (3–18). The median (IQR) number of first author PRPs was 2 (1–6). The majority of the respondents 42/70 (60.0%) had <10 PRPs. Almost a quarter (17/70, [23.9%]) did not have any PRPs in an international journal [Table 2].

Factors associated with research productivity

A desire for the development of their own personal skills (72.9% strongly agreed), a contribution to society (68.6% strongly agreed), and personal research interests (62.0% strongly agreed) topped the list as the intrinsic factors that influenced RP among

Table 2: Publication history

Variable (n=70)	Frequency (%)
Total number of publications	
None	2 (2.9)
1-9	40 (57.1)
10-19	13 (18.7)
20-29	9 (12.8)
30-39	6 (8.5)
Mean (SD)	11.1 (10.9)
Median (IQR)	7 (3-18)
Number of first-author publications	
None	11 (15.7)
1-5	38 (54.3)
6-10	15 (21.4)
>10	6 (8.6)
Mean (SD)	3.9 (4.6)
Median (IQR)	2 (1-6)
Number of publications in Nigerian journals	
None	10 (14.3)
1-5	35 (50.0)
6-10	17 (23.8)
>10	8 (11.3)
Mean (SD)	5.0 (5.1)
Median (IQR)	3 (2-7)
Publications in international journals	
None	17 (23.9)
1-5	30 (42.3)
6-10	13 (18.3)
>10	10 (14.1)
Mean (SD)	3 (0.5-10)
Median (IQR)	1 (0-3)

SD=Standard deviation, IQR=Interquartile range

the respondents. Work flexibility (10.0% strongly agreed), research autonomy (18.6% strongly agreed), and the desire for scholarly pursuits (41.4% strongly agreed) were the lowest three factors [Table 3]. A desire for promotion (72.8% strongly agreed/agreed), peer recognition (61.4% strongly agreed/agreed), and increased social status (47.2% strongly agreed/agreed) were the top three extrinsic factors that influenced RP, while monetary incentives (14.3% strongly agreed/agreed), employment opportunities (12.9% strongly agreed/agreed), and the need to attend conferences (30.0% strongly agreed/agreed) were the lowest three extrinsic factors [Table 4]. The top barriers to research were a lack of resources (financial and nonfinancial; [57.1% and 32.9% strongly agreed, respectively]) and a lack of mentoring (42.9% strongly agreed). Older age (0% strongly agreed), a lack of time (0% strongly agreed), and a lack of inner motivation (2.9% strongly agreed) were the bottom three perceived barriers [Table 5]. Increasing age and professional cadre were associated with increased RP ($P < 0.01$) [Table 6]. After controlling for gender, professional cadre, level of education, and having additional administrative responsibilities, a multiple linear regression analysis showed that faculty aged 40–49 years were 6.4 times more likely to have higher RP compared with those younger

Table 3: Intrinsic factors motivating research productivity

Intrinsic factor (<i>n</i> =70)	Frequency (%)					Total score
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
Development of personal skills	1 (1.4)	2 (2.9)	0 (0.0)	16 (22.9)	51 (72.9)	324
Contribution to society	1 (1.4)	0 (0.0)	1 (1.4)	20 (28.6)	48 (68.6)	324
Personal interest	1 (1.4)	0 (0.0)	2 (2.9)	27 (32.4)	40 (62.0)	319
Personal responsibility	1 (1.4)	0 (0.0)	2 (2.9)	27 (38.6)	40 (57.1)	319
Contribution to knowledge	0 (0.0)	1 (1.4)	5 (7.1)	24 (34.3)	40 (57.1)	313
Personal enjoyment	0 (0.0)	1 (1.4)	4 (5.7)	30 (42.9)	35 (50.0)	309
Inner sense of achievement	1 (1.4)	1 (1.4)	3 (4.3)	39 (55.7)	26 (37.1)	298
Complexity of research	0 (0.0)	2 (2.9)	9 (12.9)	30 (42.9)	29 (41.4)	296
Desire for scholarly pursuits	1 (1.4)	3 (4.3)	4 (5.7)	33 (47.1)	29 (41.4)	296
Autonomy of research	1 (1.4)	3 (4.3)	19 (27.1)	34 (48.6)	13 (18.6)	265
Work flexibility	4 (5.7)	9 (12.9)	28 (38.6)	23 (32.9)	7 (10.0)	231

Table 4: Extrinsic factors motivating research productivity

Extrinsic factor	Frequency (%)					Total score
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
Desire for promotion	6 (8.6)	7 (10.0)	6 (8.6)	43 (61.4)	8 (11.4)	250
Peer recognition	6 (8.6)	10 (14.3)	11 (15.7)	33 (47.1)	10 (14.3)	241
Increased social status	8 (11.4)	17 (24.3)	12 (17.1)	27 (38.6)	6 (8.6)	216
Respect/admiration from students	11 (15.7)	16 (22.9)	8 (11.4)	29 (41.4)	6 (8.6)	213
Desire for awards	10 (14.3)	16 (22.9)	13 (18.6)	23 (32.9)	8 (11.4)	213
Conference attendance	13 (18.6)	24 (34.3)	12 (17.1)	18 (25.7)	3 (4.3)	184
Improved employment opportunities	21 (30.0)	28 (40.0)	12 (17.1)	6 (8.6)	3 (4.3)	152
Monetary incentives	26 (37.1)	28 (40.0)	6 (8.6)	9 (12.9)	1 (1.4)	137

Table 5: Perceived barriers to research productivity

Variable	Frequency (%)					Total score
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	
Lack of personal funds	6 (8.6)	1 (1.4)	6 (8.6)	17 (24.3)	40 (57.1)	294
Lack of adequate mentoring	3 (4.3)	6 (8.6)	16 (22.9)	15 (21.4)	30 (42.9)	283
Lack of nonfinancial resources	2 (2.9)	9 (12.9)	10 (14.3)	26 (37.1)	23 (32.9)	269
Lack of university funds	2 (2.9)	7 (10.0)	18 (25.7)	21 (30.0)	22 (31.4)	263
Poor organizational research culture	4 (5.7)	5 (7.1)	16 (22.9)	35 (50.0)	10 (14.3)	252
Lack of research skills	9 (12.9)	17 (24.3)	11 (15.7)	23 (32.9)	10 (14.3)	218
Heavy teaching load	12 (17.1)	26 (37.1)	15 (21.4)	12 (17.1)	5 (7.1)	182
Family responsibilities	11 (15.7)	30 (42.9)	11 (15.7)	15 (21.4)	3 (4.3)	179
Lack of social skills	29 (41.4)	24 (34.3)	10 (14.3)	7 (10.0)	0 (0.0)	135
Lack of inner motivation	38 (54.3)	25 (35.7)	3 (4.3)	2 (2.9)	2 (2.9)	115
The time-consuming nature of research	37 (52.9)	27 (38.6)	5 (7.1)	1 (1.4)	0 (0.0)	110
Perceived older age	41 (58.6)	22 (31.4)	7 (10.0)	0 (0.0)	0 (0.0)	106

than 40 years (adjusted odds ratio: 6.415, 95% confidence interval- 1.79–23.01, $P < 0.01$) [Table 7].

DISCUSSION

Career advancement is traditionally dependent on a faculty member's RP, which may be evaluated using their self-reported number of PRPs. This study suggests that research output among researchers at the CMUL as measured by the number of PRPs may be low. Similar studies in Nigeria and

other parts of Africa have reported similar levels of RP and are at variance with the research output of academic faculty in HIC who produce more than 97% of the worlds' research output.^[10-13] For instance, a study among faculty at the Makerere University College of Health Sciences, Uganda, reported a PRP per capita of 2.1.^[13] These findings have important implications for policy and planning as they highlight the need for university management to intensify efforts to improve RP and output among the researchers at CMUL and other institutions in LMIC

Table 6: Factors associated with research productivity

Variable	Research productivity		Total	χ^2/P
	Low	High		
Age group				
30-39	22 (78.6)	6 (21.4)	28 (100.0)	Fisher's exact $P<0.001$
40-49	12 (32.4)	25 (67.6)	37 (100.0)	
50-59	2 (40.0)	3 (60.0)	5 (100.0)	
Gender				
Male	21 (56.8)	16 (43.2)	37 (100.0)	$\chi^2=0.892, P=0.345$
Female	15 (45.5)	18 (54.5)	33 (100.0)	
Highest qualification				
Masters or less	15 (78.9)	4 (21.0)	19 (100.0)	$\chi^2=7.906, P=0.005$
Doctorate/fellowship	21 (41.2)	30 (58.8)	51 (100.0)	
Current professional cadre				
Lecturer II or lower	18 (66.7)	9 (33.3)	27 (100.0)	$\chi^2=4.086, P=0.043$
Lecturer I and above	18 (41.9)	25 (58.1)	43 (100.0)	
Administrative responsibilities				
Yes	20 (47.6)	22 (52.4)	42 (100.0)	$\chi^2=0.610, P=0.435$
No	16 (57.1)	12 (42.9)	28 (100.0)	

Table 7: A multivariate analysis of the factors associated with research productivity among researchers at College of Medicine, University of Lagos

Variable	AOR	95% CI	P
Age group (years)			
<40*	1		
40-50	6.415	1.788-23.009	0.004
>50	5.427	0.562-49.006	0.146
Gender			
Male*	1		
Female	1.276	0.373-4.363	0.697
Highest educational qualification			
Masters or less*	1		
Doctorate/fellowship	3.795	0.620-23.213	0.149
Current professional cadre			
Lecturer II or lower*	1		
Lecturer I and above	1.353	0.285-6.431	0.704
Has administrative responsibilities			
No*	1		
Yes	1.577	0.511-4.861	0.428

*Reference category. AOR=Adjusted odds ratio, CI=Confidence interval

in Africa. The mean number of publications among surgical residents in the USA prior to the start of an academic career was 5.3.^[14] Studies among residents in the USA report figures similar to researchers who hold full-time academic positions at the CMUL.^[14-16]

The belief that research contributes to societal development and the desire to develop personal research knowledge and skills top the list of intrinsic factors motivating research among this sample of researchers. This is similar to findings among Chinese researchers who were also intrinsically motivated by personal interest, scholarly improvements, and contribution to society.^[8] Personal career development was also the main

factor driving RP among researchers in Kenya and university librarians in Nigeria.^[17,18] Researchers in this study seem highly motivated to conduct research in this environment.

In this study, monetary incentives were very low on the list of extrinsic motivators. Financial rewards were also rated low as an extrinsic motivator for research among Chinese researchers.^[8] However, a similar study among dental researchers in the USA cited financial remuneration as a key factor motivating research.^[19] This seems quite surprising as researchers in LMIC like Nigeria and China may be receive comparatively lower incomes than their HIC counterparts.

As noted in this study, lack of access to financial and nonfinancial resources for research is a significant barrier to RP. An investigative study of RP among academic faculty in Nigerian federal universities also cited funding as a main challenge.^[20] Advances in medical research improve health, save lives, promote economic growth, and spur innovation. Medical research is however only possible because of investments by governments, industry, foundations, and academic institutions.^[21] Available data show that Nigeria spends only 0.2% of its gross domestic product on research and development.^[22] For Nigeria to remain competitive and increase involvement in the global debates on health-care policy, a national commitment to research funding is critical.

Several studies have lamented on the lack of female researchers in medical research and gender disparities in research and publications in favor of men.^[23-25] We however observed no gender differences in the research output of this sample of researchers at the CMUL, nor did family life seem to be a major barrier for either female or male researchers in this environment.

This study has some limitations, so its findings need to be interpreted with caution. First, RP, often determined by the

number of PRPs, is a simple and well-known measure that may be used to evaluate research output.^[26-28] PRPs as tangible outputs of research in professional journals are central to scholarly activity and recognition; however, simply counting the number of publications reveals little about the relevance of scholarship or the impact of an individual's research contributions on a field.^[29] However, it does represent one of the simplest and straightforward measures of RP, particularly in resource-limited settings, and was used in this study.^[27,28] Furthermore, PRPs in this study, along with the intrinsic and extrinsic factors and barriers, were assessed by self-report, and may be subject to responder bias.

Second, only a small percentage of the junior faculty at the CMUL opted to attend the training and successfully completed the surveys. The response to the electronic survey was very poor. This low response rate may signify a lack of interest in attending this type of training or in completing such surveys or a general lack of research interest among the study population. This may affect the external validity of our findings. It also signifies that we may not have captured the barriers to RP among a large proportion of possibly under-motivated and/or time constrained researchers at the CMUL.

Finally, the cross-sectional nature of the study does not allow for causal inferences, and the findings are from only one institution and may not be generalizable to other institutions within Nigeria. Nevertheless, this is one of the first few studies to assess RP among a sample of researchers at the CMUL within the past decade. It was conducted prior to the implementation of the BRAINS project, and its findings serve as a useful baseline measure of RP among the target population.

CONCLUSIONS AND RECOMMENDATIONS

A desire for personal development, the need for promotion, and respect from peers were the primary motivators for research output among this sample of junior researchers. Lack of access to resources was the main barrier to increased RP. These factors may need to be considered in the development of programs designed to promote RP. A research environment that encourages publications in internationally relevant journals should be encouraged. Programs that provide an early start to academic publication and mentoring right from the undergraduate and early postgraduate years may need to be prioritized.

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Conflicts of interest

There are no conflicts of interest.

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