

Original Research

# Research integrity in a South African health sciences institution

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Research integrity is of interest across disciplines, although reported on more frequently by health sciences researchers. This study investigated the experiences and attitudes of academic staff and postgraduate students to scientific misconduct in a South African health sciences institution. An anonymous self-administered, structured questionnaire conducted online was addressed to academic staff and postgraduate students. While the response rate was low (11.4%), it reflects the diversity of the health sciences institution. While fabricating, falsifying, plagiarizing, or presenting results in a misleading way was self-reported as low, 9% of staff reported knowing of cases where misleading results had been presented and approximately 10% of respondents had witnessed misconduct. Authorship misconduct was concerning, with more staff (35.2%) than students (8.8%) reporting unethical pressure regarding inclusion or ordering of authors ( $p < 0.001$ ). The incidence of data altering by staff, and of clinicians who were uncertain about reporting scientific misconduct although low, is disquieting. Institutions should ensure that adequate research integrity training is provided if the standard and veracity of its science is to be upheld.

## INTRODUCTION

Scientific progress hinges on the adherence to scientific and ethical norms. To improve and expand knowledge for the advancement of society, principles of honesty and integrity are as crucial as methodological principles. The need for professional bodies to establish guidelines to ensure good scientific practice and to provide oversight, has been recognized since the 1970's.<sup>1</sup> At the Second World Conference on Research Integrity in 2010, the Singapore Statement on Research Integrity was drafted as a guide and code of conduct for researchers.<sup>2</sup> The Singapore Statement has been widely adopted, including by the University of the Witwatersrand, South Africa. Despite the extensive development and focus on norms for research integrity, cases of scientific misconduct remain a concern with issues of data manipulation and modification, plagiarism and authorship more frequently discovered, although it suggested that such misconduct may in fact be under-reported.<sup>3-7</sup>

Studies investigating motives for misconduct among academics and researchers cite the influence of “publish or perish”, be it from the research community, funding sources or institutions as a causative factor.<sup>3-5,8</sup> This narrative, however, also extends to postgraduate students. Surveys of PhD candidates' experience of research misconduct at institutions in Sweden, Denmark and Norway identified pressures concerning authorship with low reported awareness of policies governing scientific conduct.<sup>9-11</sup>

Although the principles, as presented in the Singapore Statement on Research Integrity<sup>2,12</sup> and the Montreal Statement on Research Integrity in Cross-Boundary Research Collaborations,<sup>13</sup> attempt to speak a global language, the majority of studies investigating scientific misconduct are derived from the Northern Hemisphere. While in the past there has been a paucity of studies assessing re-

search integrity in the South African context, an increase in research misconduct in South Africa<sup>14</sup> and a growing impetus in Africa to explore and address behaviors that are not aligned with research integrity has recently occurred.<sup>8,15-17</sup> This is exemplified by the release of a joint statement addressing ethical research by associated South African Government bodies including the Departments of Higher Education and Training (DHET) and Science and Technology (DST), the Council of Higher Education (CHE), the National Research Foundation (NRF) and representatives of the academic community including the Academy of Science of South Africa (ASSAf) and Universities South Africa (USAf).<sup>18</sup> This collective response to the South African research landscape highlights the need firstly, to assess knowledge of, and approaches to, research integrity and also to identify whether awareness strategies and interventions would be able to strengthen research integrity in the South African research community.<sup>18</sup>

The aim of this study was therefore to investigate perceptions of research integrity and scientific misconduct among academics and postgraduate students in the Faculty of Health Sciences, University of the Witwatersrand, South Africa, by fulfilling the following objectives:

1. Determining the attitudes and behavior of academics and postgraduates towards research misconduct
2. Evaluating 'own' and/or 'witnessed' experiences of research misconduct of academics
3. Assessing the knowledge of research misconduct of academics and postgraduates

## METHODOLOGY

### STUDY DESIGN

A cross-sectional analytical study was conducted in the Faculty of Health Sciences, University of the Witwatersrand (Wits) using a self-administered structured questionnaire (Appendix 1, Supplementary material) addressing all academic staff and postgraduate students. Human ethics clearance to undertake the study was obtained from the Human Research Ethics Committee (Medical) of the University of the Witwatersrand (HREC no: M200202).

The survey instrument was based on questionnaires from Scandinavia<sup>5,9-11,19-21</sup> for postgraduate students, researchers, and supervisors. The survey investigates self-reported practice, experiences, knowledge, and attitudes with respect to research misconduct. Several background questions were adapted to conform with the Wits context, for example academic levels specific to Wits. The survey was delivered online using the Research Electronic Data Capture (REDCap<sup>TM</sup>) system hosted at the University of the Witwatersrand. REDCap<sup>TM</sup> is a secure, web-based software platform designed to support data capture for research studies.<sup>22</sup>

### STUDY POPULATION AND SAMPLE

The population included all academic staff [full time, part time, honorary, joint staff (ie staff in posts paid by the Province of Gauteng but undertaking clinical teaching and research for Wits) and visiting staff] in the Faculty of Health Sciences, University of the Witwatersrand. Approximately 1385 staff members and 2425 postgraduate students (Masters and PhDs) were invited to participate in the study.

The Faculty of Health Sciences, University of the Witwatersrand is in the greater metropolitan region of Johannesburg, South Africa. Attached to the Faculty are several large academic platforms through which students rotate during the course of their degrees. The hospitals are staffed by clinicians, the majority of whom hold a joint appointment with the University. An important mission of the institution is the production of research by both academic staff and postgraduate students, and the Faculty of Health Sciences supports this mission through training in research methodology, scientific writing and biostatistical support.

### RECRUITING PARTICIPANTS

Recruitment of participants in the Faculty of Health Sciences commenced in March 2020, following HREC approval, but became delayed due to the emergence of the COVID pandemic. An online survey link was sent to staff and postgraduate students using REDCap's survey distribution tools to send customized email invitations. All academic staff and postgraduate students received an invitation to participate, with a personalized link to the online survey either by using email addresses provided by the Faculty of Health Sciences Human Resources division or in the case of the Schools of Clinical Medicine and Pathology, by using a public survey link emailed directly through their secretariat.

Participants were informed that all data would be treated anonymously. Answering the questionnaire indicated consent to participate in the study. Periodic reminders were circulated.

### DATA ANALYSIS

Data was exported from REDCap<sup>TM</sup> into a Microsoft Excel spreadsheet and imported to SAS 9.4 and STATA v 16.0 for analysis. Data were presented as frequencies and percentages. Comparisons between postgraduate students (PG) and staff were performed with a Chi-square test or Fisher-exact test when appropriate. For multiple 2x2 comparisons a Bonferroni correction was used. The significance level was set at  $p < 0.05$ .

## RESULTS

Of the total number of distributed questionnaires ( $n=3810$ ), 168 (12.1%) responses were received from staff and 265 (10.9%) from postgraduate students, providing an overall response rate of 11.4%. For each question a minimum of 257 responses for postgraduate students and 136 responses for staff were received.

### DEMOGRAPHICS

In relation to the demographics of the study population, more females than males responded to the survey, but a similar distribution of gender was found in both the postgraduate and staff groups ( $p=0.164$ ). Out of 115 staff members, 29.8% were also undertaking their postgraduate studies. More staff hold either a Master's degree (43.5%) or a PhD (44.0%;  $p < 0.0001$ ) than postgraduate students (37.5% had achieved a Masters). Staff had additionally spent a greater length of time in their position (Table 1) and had supervised a greater number of doctoral students than had postgraduate students ( $p < 0.0001$ ) (Table 1). Significantly more postgraduate students than staff had undertaken an ethics course during their undergraduate degree ( $p < 0.001$ ), but the majority of both groups had done so during their postgraduate degree (Table 1).

### EXPERIENCES OF PRESSURE TO COMMIT MISCONDUCT AND SELF-CONDUCT

Little pressure was experienced by both staff and postgraduate students to commit misconduct (7.2%) or unethical conduct with respect to design, analysis, results or scientific writing (Table 2). In relation to their own self-conduct, neither postgraduate students nor staff reported fabricating, falsifying, plagiarizing (FFP) or presenting results in a misleading way for up to three years (Table 3). Most respondents (staff 96.4%, PG 97.6%) had not engaged in data manipulation to confirm hypotheses after data analysis (Table 3) and had not excluded data based on the impact of the results (Table 3). Moreover, the majority of staff and postgraduate students had not reported unexpected findings as being hypothesized from the start (Table 3;  $p=0.007$ ), nor refrained from collecting data earlier than stipulated

**Table 1. Characteristics of the Wits staff and postgraduate students who responded to the survey**

Question	Category	PG (%)	Staff (%)	p-value
Gender	Female	192 (72.5)	111 (66.1)	0.164
	Male	73 (27.5)	57 (33.9)	
Academic position	Staff	N/A	115	
	PG+Staff	49	47	
	PG only	216	N/A	
Length of time in position	>15 years	3 (1.1)	50 (29.8)	<0.001
	11-15 years	12 (4.5)	34 (20.2)	
	6-10 years	36 (13.6)	40 (23.8)	
	0-5 years	214 (80.8)	44 (26.2)	
Highest degree obtained	Doctorate	8 (3.0)	74 (44.0)	<0.001
	Masters	99 (37.5)	73 (43.5)	
	UG	157 (59.5)	21 (12.5)	
Number of Doctoral students supervised	>15 students	0	4	<0.001
	11-15 students	0	6	
	6 -10 students	1 (0.4)	14 (8.3)	
	1 - 5 students	2 (0.8)	56 (33.3)	
	0 students	262 (98.9)	88 (52.4)	
Have you had lectures/courses in ethics as part of your undergraduate studies?	Yes	191 (72.6)	82 (48.8)	<0.001
	No	45 (17.1)	52 (31.0)	
	I don't remember	27 (10.3)	34 (20.2)	
Have you had lectures/courses in ethics as part of your postgraduate studies?	Yes	196 (74.8)	113 (67.3)	0.142
	No	63 (24.0)	50 (29.8)	
	I don't remember	3 (1.1)	5 (3.0)	

in the protocol because the result had already reached statistical significance. However, more staff than postgraduate students had engaged in deleting or changing data at least once or multiple times prior to data analysis (Table 3;  $p=0.042$ ).

More staff than postgraduate students felt that it was not appropriate to alter experimental data in order to present a more positive outlook of the experiment (Table 4;  $p=0.011$ ). Similarly, more staff than postgraduate students found it inappropriate to try out a variety of methods of analyses until one was found to yield results that were statistically significant (Table 4;  $p=0.035$ ).

The majority of respondents agreed that even if one is confident of one's findings, then it is not acceptable to selectively omit contradictory results and falsify or fabricate data to expedite publication (Table 4). Personal repercussions in response to scientific misconduct were reported by both postgraduate students and staff to be low (0-3%) in the last 12 months (Supplementary Table 1). Furthermore, more postgraduate students than staff felt that it was likely that less severe misconduct could be detected or result in serious consequences in their research area (Table 4;  $p=0.0035$ ).

#### WITNESSING AND AWARENESS OF MISCONDUCT

Fifteen (9%) staff members compared to three postgraduate students (1.2%) reported that they knew of cases where misleading results had been presented (Table 5;  $p=0.0002$ ). Approximately 10% of respondents had witnessed misconduct and more staff than postgraduate students (Table 5;  $p=0.023$ ) felt that they have an ethical imperative to act having witnessed misconduct, with more staff being willing to report this to a responsible official. More staff than postgraduate students were aware of individuals who had falsified (Table 5;  $p=0.016$ ) or fabricated (Table 5,  $p=0.024$ ) data at national and international level (Table 5).

#### KNOWLEDGE OF POLICIES REGARDING RESEARCH CONDUCT

There were significant differences between staff and postgraduate students with respect to knowledge of institutional policies on research misconduct. More postgraduate students than staff were aware of institutional policies on fabrication ( $p=0.002$ ) and falsification ( $p=0.001$ ) of data, and unethical pressure in relation to research ( $p=0.005$ ; Supplementary Table 2). However, the majority of staff and students were either unaware or uncertain (63.2-68.2%) of the existence of policies related to duplicating publications or information (Supplementary Table 2), while just above

**Table 2. Wits staff and postgraduate students' experiences of pressure to commit research misconduct**

Question: Have you during the last 12 months been the object of pressure to:	Category	PG n (%)	Staff n (%)	p-value
fabricate data?	Yes	3 (1.1)	1 (0.6)	0.7
	No	259 (98.5)	164 (98.2)	
	I don't remember	1 (0.4)	2 (1.2)	
falsify data?	Yes	4 (1.5)	4 (2.4)	0.87
	No	257 (98.1)	163 (97.0)	
	I don't remember	1 (0.4)	1 (0.6)	
plagiarise data?	Yes	3 (1.1)	2 (1.2)	1
	No	258 (98.5)	165 (98.2)	
	I don't remember	1 (0.4)	1 (0.6)	
plagiarise publications (in whole or in part)?	Yes	4 (1.5)	2 (1.2)	1
	No	259 (98.5)	165 (98.8)	
	I don't remember	0	0	
present results in some other misleading way?	Yes	3 (1.2)	5 (3.0)	0.144
	No	255 (98.8)	161 (96.4)	
	I don't remember	0	1 (0.6)	
Question: Have you during the last 12 months been exposed to unethical pressure concerning the:	Category	PG n (%)	Staff n (%)	p-value
design/method of your study?	Yes	9 (3.4)	8 (4.8)	0.467
	No	252 (96.2)	156 (94.0)	
	I am uncertain	1 (0.4)	2 (1.2)	
analysis of your study?	Yes	4 (1.5)	5 (3.0)	0.223
	No	258 (8.5)	160 (96.4)	
	I am uncertain	0	10.6)	
results of your study?	Yes	4 (1.5)	4 (2.4)	0.126
	No	257 (98.5)	160 (96.4)	
	I am uncertain	0	2 (1.2)	

50% of respondents were aware of policies regarding changes in design or methods of the protocol. A high percentage (86.1-93.0%) of both staff and postgraduate students were aware of the policies of plagiarism (Supplementary Table 2), with significantly high percentages of all respondents (staff [98.2%] and postgraduate students [93.8%]) acknowledging that it was inappropriate to take credit for words or writing generated by someone else (Table 4; p=0.085). Similar proportions of staff and postgraduate students had knowledge of policies on the application and use of funds (38.4%-39.8%; Supplementary Table 2). Only 30.8% of clinical staff were aware of the Health Professions Council of South Africa (HPCSA) regulations regarding research integrity (Supplementary Table 3) and more than half of them were uncertain or unaware that they should report scientific misconduct to the HPCSA (52.8%; Supplementary Table 3).

**AUTHORSHIP**

A major problem relating to research integrity which was identified repeatedly in the different segments of the responses to the survey were those pertaining to authorship.

Significantly more staff reported unethical pressure regarding inclusion or ordering of authors than did postgraduate students (Table 6; p <0.001). More staff than students added one or more authors to a manuscript on either a single occasion (staff 22.3%; PG 6.5%) or multiple occasions (staff 14.5%; PG 2.3%) (Table 6; p<0.001). Staff were more likely to acknowledge that authorship misconduct was common in an individual's particular area of research than were postgraduate students (Table 6; p<0.001). Nevertheless, more postgraduate students than staff thought that the risk of detection of authorship misconduct was higher in their area of research (Table 6; p<0.0001). Neither staff nor students omitted a contributor from the author's list who deserved authorship (Table 6). Both staff (97%) and postgraduate students (92%) acknowledged that it was not appropriate to take credit for the ideas generated by someone else (Table 6; p=0.089). Only between 41-45.7% of respondents knew about existing institutional policies for authorship (Table 6).

**Table 3. Wits staff and postgraduate students’ experiences of self-conduct in relation to research misconduct**

Question: Please answer the following questions in relation to your own personal conduct in the last 12 months. Have you yourself:	Category	PG n (%)	Staff n (%)	p-value
fabricated data?	Yes	0	0	0.392
	No	261 (100)	167 (99.4)	
	I am uncertain	0 (0)	1 (0.6)	
falsified data?	Yes	0 (0)	1 (0.6)	0.392
	No	261 (100)	167 (99.4)	
	I am uncertain	0	0	
plagiarised data?	Yes	2 (0.8)	0 (0.0)	0.792
	No	258 (98.5)	167 (99.4)	
	I am uncertain	2 (0.8)	1 (0.6)	
presented results in some other misleading way?	Yes	0 (0.0)	0 (0.0)	0.152
	No	260 (100)	165 (98.8)	
	I am uncertain	0 (0.0)	2 (1.2)	
Question: In your work as a scientist, have you engaged in any of the following behaviours in the last three years?	Category	PG n (%)	Staff n (%)	p-value
Fabricated data?	0	257 (98.8)	165 (98.2)	0.627
	Once	3 (1.2)	2 (1.2)	
	Multiple	0 (0.0)	1 (0.6)	
To confirm a hypothesis, selectively deleted or changing data after performing data analysis?	0	254 (97.6%)	161 (96.4%)	0.511
	Once	6 (2.3)	5 (3.0)	
	Multiple	0 (0.0)	1 (0.6)	
Reported an unexpected finding as having been hypothesized from the start?	0	255 (99.2)	157 (95.2)	0.007
	Once	2 (0.8)	3 (1.8)	
	Multiple	0 (0.0)	5 (3.0)	
Decided whether to exclude data after looking at the impact of doing so on the results?	0	246 (95.0)	152 (91.0)	0.006
	Once	13 (5.0)	8 (4.8)	
	Multiple	0 (0.0)	7 (4.2)	
Stopped collecting data earlier than stipulated in the protocol because the result in hand had already reached statistical significance?	0	255 (98.1)	159 (95.8)	0.208
	Once	5 (1.9)	5 (3.0)	
	Multiple	0 (0.0)	2 (1.2)	
Deleted or changed data before performing data analysis	0	256 (98.1)	156 (94.0)	0.042
	Once	5 (1.9)	7 (4.2)	
	Multiple	0 (0.0)	3 (1.8)	
Selectively modified data after performing data analysis to confirm a hypothesis?	0	255 (98.5)	164 (98.8)	0.535
	Once	4 (1.5)	1 (0.6)	
	Multiple	0 (0.0)	1 (0.6)	

**DISCUSSION**

The results show that certain actions within fabrication, falsification and plagiarism (FFP) in the Wits Faculty of Health Sciences are below what is reported worldwide.<sup>3,7,20, 23-25</sup> This is of interest in the light of there being no formal institutional training in research integrity for staff or postgraduate students.

While few postgraduate students and staff at the Wits Faculty of Health Sciences had experienced pressure to

commit misconduct or reported having themselves committed misconduct, almost 10% of respondents had witnessed misconduct in some form. More staff than postgraduate students had altered data in some way prior to analysis, although many of the respondents found it unacceptable to alter (falsify, fabricate or omit) data in order to expedite publication if they were confident of their findings. It is possible that some staff felt that if they were confident of the strength of their findings, then the data would be worthy of publication. However, the altering of data for any reason is concerning and unacceptable and

**Table 4. Wits staff and postgraduate students' behaviour towards committing research misconduct**

Question: Please rank level of agreement/disagreement	Category	PG n (%)	Staff n (%)	p-value
It is never appropriate to alter experimental data to make an experiment look better than it actually is.	Agree	241 (94.5)	164 (98.8)	0.013
	Neither	1 (0.4)	1 (0.6)	
	Disagree	13 (5.1)	1 (0.6)	
It is never appropriate to try a variety of methods of analyses until one is found that yields a result that is statistically significant.	Agree	162 (64.0)	124 (75.2)	0.035
	Neither	58 (22.9)	30 (18.2)	
	Disagree	33 (13.0)	11 (6.7)	
It is never appropriate to take credit for the words or writing of someone else.	Agree	240 (93.8)	163 (98.2)	0.085
	Neither	3 (1.2)	1 (0.6)	
	Disagree	13 (5.1)	2 (1.2)	
If you are confident of your findings its appropriate to selectively omit contradictory results to expedite publication.	Agree	38 (15.0)	30 (18.1)	0.259
	Neither	19 (7.5)	6 (3.6)	
	Disagree	196 (77.5)	130 (78.3)	
If you are confident of your findings its acceptable to falsify / fabricate data to expedite publications.	Agree	42 (16.5)	27 (16.3)	0.494
	Neither	1 (0.4)	1 (0.6)	
	Disagree	211 (83.1)	138 (83.1)	
The risk of being detected if you commit severe scientific misconduct is high in my research area.	Agree	137 (53.3)	78 (47.3)	0.007
	Neither	88 (34.2)	58 (35.2)	
	Disagree	32 (12.5)	29 (17.6)	
The risk of being detected if you commit less severe scientific misconduct is high in my research area.	Agree	109 (42.4)	43 (26.1)	0.0035
	Neither	94 (36.6)	74 (44.8)	
	Disagree	54 (21.0)	48 (29.1)	

training by the institution should be undertaken to alleviate this issue. It is possible that questions in the survey on misconduct framed with a double negation, could have been misinterpreted; therefore, those answers should be contemplated with caution. Data “fixing” may indicate the “pressure to publish” being exerted by institutions on academics/researchers in order to increase institutional metrics and rankings<sup>26</sup> and is congruent with previous findings which showed that misconduct, when carried out to promote publication, is acceptable to younger researchers.<sup>9,10,27</sup> Almost 60% of scientists in a UK survey reported being “tempted or pressured to compromise their integrity and standards around scientific practices and reporting”.<sup>28</sup> It is suggested that scientists are coming under this increased pressure to grow bibliographic parameters for funding, appointments, tenure and promotion,<sup>29</sup> and that these “publish or perish” pressures are becoming increasingly associated with research misconduct.<sup>30,31</sup> Publication pressure may act as a psychological stressor associated with risky behaviour and could manifest as scientific misconduct in the academic environment,<sup>32</sup> as could academic culture and career stage.<sup>33</sup> Scientific misconduct has also been linked to the rise of managerialism or corporatization of governance in higher education systems, where performance management aimed at enhancing funding acquisition and research output may instead negatively affect research integrity.<sup>34,35</sup>

Efforts to understand the etiology of research misconduct point to unravelling perceptions thereof within in-

stitutions, between academic ranks and fields, as well as within cultural or national settings.<sup>3,31,36</sup> For example, studies indicate that retracted publications due to plagiarism or fake-peer review were more likely to be from China and India, whereas publications retracted due to data manipulation were more likely to be from the US, Germany, the UK, Japan and China.<sup>31,37,38</sup>

Interestingly, biomedical scientists experience or witness more questionable research practices than do scientists in other fields of research.<sup>29</sup> Concerns have been raised particularly in the health sciences fields that clinician scientists who also have clinical duties may sacrifice quality and rigor in the pursuit of increasing publication output.<sup>29</sup> In the present study, some staff members knew of cases where misleading results had been presented. While we did not interrogate further what these cases may be, we note the influence of websites including RetractionWatch and a plethora of retractions of Covid-19 related papers during the boom of 2020.<sup>39,40</sup> While the reasons for retraction are numerous, certainly identification of questionable research practices is a prime factor.

Questionable research practices or data “fixing” in any form may also be indicative of subjugating science for personal ego,<sup>26</sup> resulting in poor science. This undermines the scientific communities’ advancement of ethical research, as well as public trust in the research.<sup>41</sup> This is of particular importance in the current environment where scientific fraud may fuel conspiracy theories that ultimately impact human health (e.g. vaccine hesitancy).<sup>42,43</sup> Personality

**Table 5. Wits staff and postgraduate students' experiences towards witnessing misconduct**

Question	Category	PG n (%)	Staff n (%)	p-value
Do you know about anyone in your department who during the last 12 months has presented results in a misleading way?	Yes*	3 (1.2)	15 (9.0)	<0.001
	No	251 (97.3)	147 (88.0)	
	I am uncertain	4 (1.6)	5 (3.0)	
If you witness someone committing misconduct you have an ethical obligation to act.	Agree	208 (81.6)	148 (89.7)	0.023
	Neither	35 (13.7)	16 (9.7)	
	Disagree	12 (4.7)	1 (0.6)	
If you had witnessed a co-worker or peer committing misconduct you would be willing to report that misconduct to a responsible official.	Agree	180 (70.9)	127 (76.5)	0.147
	Neither	56 (22.0)	28 (16.9)	
	Disagree	18 (7.1)	11 (6.6)	
If you had witnessed a supervisor or PI committing research misconduct you would be willing to report that misconduct to a responsible official.	Agree	171 (67.6)	122 (73.9)	0.041
	Neither	62 (24.5)	29 (17.6)	
	Disagree	20 (7.9)	14 (8.5)	
<b>Question. Have you heard of anyone at national or international level during the past 12 months who has:</b>	<b>Category</b>	<b>PG n (%)</b>	<b>Staff n (%)</b>	<b>p-value</b>
fabricated data?	Yes	42 (16.0)	41 (24.4)	0.024
	No	207 (78.7)	124 (73.8)	
	I am uncertain	14 (5.3)	3 (1.8)	
falsified data?	Yes	40 (15.3)	41 (24.6)	0.016
	No	208 (79.4)	123 (73.7)	
	I am uncertain	14 (5.3)	3 (1.8)	

\*p=0.002, yes vs. no (Bonferroni correction)

traits such as Machiavellianism and narcissism have been identified as being associated with scientific misconduct, and narcissism associated with misconduct was found to be more prevalent among scientists of higher academic rank.<sup>29</sup> It is possible that in the 21<sup>st</sup> Century personal advantage and status has become far more important than the advance of science.<sup>26</sup> Recruitment of influential authors, rather than for involvement in study design, offer considerable rewards, as does gifting authorship to clinicians on large multicenter clinical trials.<sup>26</sup>

In the current study, the non-negligible incidence of data altering by staff is of concern. While the percentage was low, it must be considered if this level of data manipulation is indeed acceptable or indicates a lack of accountability where policies on research misconduct exist. This may also suggest a lack of effectiveness of policies on research integrity,<sup>44</sup> or poor integration of these policies from the senior levels through to more junior academics and PhD candidates, as identified in the Netherlands.<sup>36</sup> In the current study interestingly, more postgraduate students than staff knew of existing institutional policies on misconduct, while institutional policies on plagiarism and application for funding were better known by staff and postgraduate students. Issues on plagiarism and applications for funding are well marketed by the institution (Wits). In the current study, 63-68% of Wits' staff and postgraduate students were either unaware or uncertain of institutional policies related to misconduct. Similar low reported awareness of policies governing scientific conduct have been reported in Norway<sup>9,45</sup> and Denmark.<sup>11</sup> In Croatia, supervi-

sors were found to have attitudes to research misconduct more in alignment with accepted norms than did students.<sup>41</sup> However, in the Netherlands it was found that junior researchers perceived their supervisors as less committed to engaging in discussion regarding research integrity.<sup>36</sup>

Wits has adopted an integrated approach to academic integrity in 2022, releasing the Wits Framework for Academic Integrity.<sup>46</sup> However, it must be acknowledged that policy alone cannot alter institutional culture.<sup>45</sup> Open discussion is essential not only to clearly demarcate what scientific misconduct is, but also to promote a culture of accountability. As part of the Wits Framework for Academic Integrity,<sup>46</sup> potential penalties for misconduct include sanctions appropriate to the circumstance, supportive actions including psycho-social counselling or career counselling, and in more serious cases, disciplinary action, following adherence with the required labour law practices of the country. However, while the document was circulated to academic staff, no training was provided.

Of concern in the present study is the low percentage of clinical staff who are aware of the Health Professions Council of South Africa (HPCSA) regulations on research integrity and of even greater concern, the low percentage of clinicians who were unaware or uncertain that they should report scientific misconduct to the HPCSA. As clinical research involves patients' lives<sup>44</sup> and misconduct threatens the safety of clinical practice for patients,<sup>47</sup> ethical standards must be upheld, particularly in the South African context. Historically, racial discrimination in South Africa

**Table 6. Wits staff and postgraduate students' experiences of inappropriate authorship**

Question:	Category	PG n (%)	Staff n (%)	p-value
Have you during the last 12 months been exposed to unethical pressure concerning inclusion or ordering of authors?	Yes	23 (8.8)	58 (35.2)	<0.001
	No	234 (89.7)	100 (60.6)	
	I am uncertain	4 (1.5)	7 (4.2)	
Question: In your work as a scientist, have you engaged in any of the following behaviors in the last three years:	Category	PG n (%)	Staff n (%)	p-value
Added one or more authors to a report who did not qualify for authorship (honorary author)?	0	237 (91.2)	105 (63.3)	<0.001
	Once	17 (6.5)	37 (22.3)	
	Multiple	6 (2.3)	24 (14.5)	
Omitted a contributor from the author's list, who deserved authorship?	0	258 (99.2)	162 (97.6)	0.409
	Once	1 (0.4)	3 (1.8)	
	Multiple	1 (0.4)	1 (0.6)	
Question: Please rank level of agreement/disagreement	Category	PG n (%)	Staff n (%)	p-value
Authorship misconduct (inappropriate authorship) is common in my area of research.	Agree	50 (19.4)	79 (48.2)	<0.001
	Neither	87 (33.7)	37 (22.6)	
	Disagree	121 (46.9)	48 (29.3)	
The risk of being detected if you commit authorship misconduct is high in my research area.	Agree	120 (46.7)	37 (22.7)	<0.001
	Neither	80 (31.1)	57 (35.0)	
	Disagree	57 (22.2)	69 (42.3)	
It is never appropriate to take credit for the ideas generated by someone else.	Agree	234 (92.5)	161 (97.0)	0.089
	Neither	5 (2.0)	0 (0.0)	
	Disagree	14 (5.5)	5 (3.0)	
Do you have knowledge of a written Wits policy about handling of scientific authorship?	Yes	105 (41.0)	75 (45.7)	0.443
	Uncertain	54 (21.1)	27 (16.5)	
	No	97 (37.9)	62 (37.8)	

was institutionalized, with access to health care used as an instrument of the apartheid regime.<sup>48</sup> The lack of knowledge of research integrity is crucial for clinical staff who should subscribe to uphold ethical standards for patient care.<sup>49</sup> A scoping review of publications in major research databases determined that in cases involving research integrity or ethics, while falsification and fabrication of data were most frequently identified, other violations included problems with informed consent and patient safety.<sup>50</sup> Such data highlight the importance of reiterating the ethics of patient care and the ethics of research, with respect to clinicians.

In quantifying questionable research practices, it has been suggested that figures reported are underestimated due to difficulty in detecting such practices.<sup>3,30</sup> In the current study in a health sciences environment, both staff and postgraduate students agreed that severe misconduct had a high risk of being detected, while more postgraduates than staff thought that there was still a risk of detection for less severe misconduct. While this bodes well for regulatory mechanisms in our context, disciplinary differences have been noted in research ethics and research integrity cases, with a predominance of studies in the biomedical field believed to be due to their familiarity or awareness of the impact of research misconduct.<sup>50</sup> In the current study, more staff (89.7%) than postgraduate students (81.6%) be-

lieved that there was an ethical imperative to report misconduct and also knew of individuals who had falsified or fabricated data at national and international level. However, the willingness to report to an official once misconduct had been detected decreased markedly (67.6% PG - 76.5% staff). This may be as a result of negative attitudes to whistle blowing.<sup>3</sup> Radulovic and Uys<sup>51</sup> reported that South African students who feared retaliation were less likely to report severe scientific dishonesty. In addition, the culture of bullying which has been reported in the Wits Faculty of Health Sciences<sup>52</sup> may also dissuade academics and students from reporting these instances. At an institutional level Wits has developed a policy document on the prevention and eradication of bullying (2021).<sup>53</sup> However, there is insufficient understanding of the impact of bullying on research pressures including gift authorship for example, and fear of victimization in cases of reporting research misconduct. It has been highlighted that in addition to developing policies on research misconduct, procedures and suitable channels must be in effect to ensure protection for whistleblowers in their academic careers in both high-income and low-income countries.<sup>25,37,54</sup> Moreover, institutions need to recognize that postgraduate students and early career academics remain the most vulnerable groups of the academic hierarchy<sup>55</sup> and thus may be more likely to either succumb to pressures to commit misconduct and are less



likely to potentially report misconduct for fear of victimization. Institutional policies should be supported by training of staff and postgraduate students in order to invigorate the awareness of research integrity and to strategically embed research integrity within the institutional culture.

The rather low response rate (11.4 %) indicates that non-response bias has to be taken into account. However, the demographic characteristics of the respondents correspond well with the institutional average as the respondents to the research integrity survey were from all levels of the academic staff complement in the FHS, and combined with the postgraduate students, reflected the diversity of the FHS. However, in the present study more females (66%) than males (34%) responded to the survey, which is slightly higher than the rate of the staff population of 58% females and 41% males.<sup>52</sup> Additionally, bias from non-responders has been shown to be less challenging in questionnaires on attitude surveys<sup>56</sup> and while interests (or fear) may bias participation, this is only likely where participation is correlated with survey content.<sup>57</sup> As the details of the content were not revealed, one would expect many blank or incomplete responses in the case of such a bias. Moreover, the response rate to the survey was in the same range as in other studies directed to staff in the Wits Faculty of Health Sciences.<sup>52</sup> It was also higher than in other studies investigating attitudes.<sup>58</sup> Additionally, that the majority of respondents had undertaken an ethics course as part of their postgraduate degree, suggested a familiarity with ethics in research.

## AUTHORSHIP

A key factor in research is the acknowledgement of co-authors, and thus a breach in the integrity of authorship is a breach between authors, editors and readers. Our results are in line with studies in Scandinavia in corresponding studies.<sup>45,59</sup> As less than half of the respondents were aware of the policy on authorship, this may be a contributing factor to the authorship misconduct identified as a major problem at Wits. Staff reported pressure to include or “reorder” authors on one or more occasions. However, significantly less staff than postgraduate students thought that detection of authorship misconduct was possible in their area of research.

Inappropriate authorship practices appear to be common.<sup>44,60-63</sup> In both an Iranian<sup>60</sup> and an European<sup>61</sup> study, respondents admitted to “gift” authorship and in some cases reciprocal “gift” authorship (where gift authorship is the practice of naming senior academics as authors when they have not contributed to the study<sup>62</sup>). “Ghost” authorship (which refers to the practice of leaving out a person e.g. a student, who has done most of the work<sup>62</sup> occurred less frequently than “gift” authorship in a study of 6000 authors.<sup>65</sup> However, “gifting” was found to be as high as 11% among Japanese physicians.<sup>44</sup> At Wits anecdotally (personal communications) many staff have reported pressure to use “gift” authorship, and they are generally afraid to formally report these issues. While adherence to the recommendations of the International Committee of Medical

Journal Editors<sup>64</sup> is expected at Wits, that academic advancement may be hindered if “gift” authorships are not made, is a constant concern which requires investigation. Emphasis on authorship misconduct should be formulated by the institution, and should be introduced not only as part of research integrity training, but also during postgraduate research training courses and supervisor training courses.

## CONCLUSION AND FUTURE RESEARCH

While falsification, fabrication and plagiarism did not appear to be of major concern in the Wits FHS, this study identified firstly, an understanding of research integrity principles and secondly, an awareness of breaches in research integrity at national and international level. There was particular emphasis placed by staff on authorship misconduct. Although low, the incidence of data altering by staff, and of clinicians who were uncertain about reporting scientific misconduct, is especially concerning. The latter attitudes could give rise to further misconduct which would be both detrimental to science and to patient care. Institutions should aim to foster work environments where pressure to publish (through incentives and to gain promotion) are not fueled by misconduct. In order to better understand the culture of research integrity in health sciences institutions, future research should investigate the impact of challenges to authority in a strongly hierarchical environment, as well as the effects of managerialism on the quality of research output and associated research pressures that may ensue. While research integrity policies are in place in institutions, the support of these policies by training and developing safe reporting lines is essential for both staff and postgraduate students in order to uphold the standard and integrity of science.

## CONFLICT OF INTEREST

The authors declare no conflicts of interest

## ETHICS APPROVAL

Human ethics clearance to undertake the study was obtained from the Human Research Ethics Committee (Medical) of the University of the Witwatersrand (HREC no: M200202).

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## SUPPLEMENTARY MATERIALS

### **Supplementary Table**

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