



Beyond General Deficiency: Structural Imbalance in Research Integrity Awareness and Training Preferences of Medical Staff

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Purpose: Research integrity is a critical component of medical education and ethical research practice. However, evidence suggests that medical professionals often demonstrate inadequate awareness of its core principles. This study examines the awareness of research integrity and corresponding training preferences among medical staff at a large tertiary hospital, with implications for continuing medical education curriculum development.

Methods: A cross-sectional survey of 517 physicians, nurses, pharmacists, and technicians measured knowledge of guidelines, perceptions of misconduct consequences, and training preferences. The instrument validity and reliability were confirmed (I-CVI: 0.857–1.000; S-CVI/Ave: ≥ 0.976 ; Cronbach's α : 0.881–0.937). Data analysis employed descriptive statistics, correlation, and multivariate regression.

Results: Overall awareness was limited (median awareness rate: 31.1–32.7%), with significant structural disparities: higher familiarity with publication-related norms such as duplicate submission (score: 1594) and authorship (1567), but poorer understanding of research ethics (1486) and institutional policies (1506). Training demand was modest (median demand rate: 13.0%), with highest preference for applied topics including statistical application (1203) and ethics regulations (1215). Case-based and online formats were most desired. Research ability (evaluation), which depends on research experience, was an independent factor influencing both awareness ($\beta = 0.462\text{--}0.473$, $p < 0.001$) and training demand ($\beta = 0.411$, $p < 0.001$).

Conclusion: This study identifies a clear structural imbalance in research integrity awareness among medical staff: technical proficiency in research methods is not matched by foundational ethical reasoning. Moreover, staff preferences for training are diverse, favoring tiered, digital, and case-based formats. To address this gap, an integrated, innovative, and layered educational approach is needed—one that blends ethics with methodological training through scenario-driven modules and flexible online platforms. Such a model will enhance continuing professional development in academic integrity, provide evidence for institutional ethics policies, and contribute to global efforts to strengthen research governance in medical practice.

Keywords: research integrity, medical staff, awareness survey, training needs, influencing factors

Introduction

Research integrity serves as a fundamental and multidimensional cornerstone of medical research, with a direct impact on scientific progress, patient safety, and public trust.¹ This global consensus is supported by key international frameworks—such as the Singapore Statement on Research Integrity, the UNESCO Recommendation on Science and Scientific Researchers, and the European Code of Conduct for Research Integrity—which outline universal principles for responsible research conduct.^{2,3} Recent progress has been made in the governance of research integrity in China, exemplified by the 2023 revision of China's Measures for Ethical Review of Life Sciences and Medical Research, which introduced more comprehensive and detailed ethical-review requirements. This reflects a national shift toward “ethics first” and proactive governance, especially after high-profile incidents such as the CRISPR-babies case.^{4–7} Internationally, East Asian

nations and global health institutions are likewise strengthening policies, institutional management, and training to curb research misconduct and foster a culture of integrity.^{8,9}

Although many institutions have established research integrity policies and committees, studies indicate that these efforts are often reactive, compliance-driven, and lack depth in professional education.^{10–12} A structural imbalance persists: technical compliance is emphasized over intrinsic ethical awareness and moral commitment. Moreover, most training is episodic and didactic, with limited engagement or long-term impact.^{10,13} Few investigations have systematically assessed healthcare professionals' actual awareness, attitudes, and specific training needs, particularly in large tertiary hospitals.

Recent evidence shows that well-designed, continuous, and tailored training—especially when integrated into mandatory induction and professional development—significantly improves ethical sensitivity among healthcare professionals.^{13–15} By systematically evaluating the awareness and training needs of healthcare professionals in major research hospitals, institutions can bridge the gap between policy and practice, contributing to both national and international efforts to foster a robust culture of research integrity.^{11–13}

This study therefore employs a questionnaire-based survey to investigate the current state of research integrity awareness and training preferences among healthcare professionals at our hospital. It further examines how demographic and career-specific factors shape these perceptions and needs. The findings are expected to provide evidence-based insights that can guide the design of tailored research integrity education and management strategies—both within our institution and in other comparable healthcare settings.

Materials and Methods

The study protocol was approved by the Scientific Research Ethics Committee of the 960th Hospital of the Chinese People's Liberation Army. The study was conducted between September 2024 and May 2025 in accordance with the principles of the Declaration of Helsinki. Potential participants were invited on a voluntary basis. A link to the study's questionnaire was distributed by research secretaries across various clinical departments. All participants provided electronic informed consent by affirmatively selecting an “I Agree” option on a digital form before gaining access to the survey instruments.

Study Participants

The study included healthcare professionals employed at our hospital. Inclusion criteria were: (1) possession of a medical, nursing, technical, or pharmaceutical license; (2) at least one of the following: having published an academic paper (any authorship position), obtained patent authorization (any inventor position), led a research project, or participated in a research project; and (3) voluntary participation. Exclusion criteria were: (1) a prior record of research misconduct; (2) incomplete survey responses.

Sample size was estimated using G*Power software.¹⁶ Parameters were set as follows: power (1- β err prob) = 0.80, significance level (α err prob) = 0.05, effect size (f^2) = 0.15, and test family = *F*-tests (multiple linear regression: fixed model, R^2 deviation from zero).

Questionnaire Design and Sample Size

A preliminary questionnaire was developed based on national regulations^{17–23} through panel discussions with seven senior experts in medical research integrity from our hospital, none of whom had a history of academic misconduct. The questionnaire consisted of: demographic information (11 items), awareness of regulatory points (18 items), perception of misconduct severity (12 items), perception of causes of misconduct (8 items), training content needs (12 items), and preferred training methods (6 items). Except for demographics, all 56 items used a 5-point Likert scale.²⁴

Validity and Reliability Assessment

Content validity was evaluated by experts using the item-level content validity index (I-CVI) and scale-level content validity index (S-CVI). Items with I-CVI < 0.79 were removed. The questionnaire was considered valid if the scale-level

content validity index based on universal agreement ($S-CVI/UA \geq 0.8$) and that based on the average calculation method ($S-CVI/Ave > 0.9$).²⁵

A pre-survey involving at least 40 participants was conducted.²⁶ Cronbach's α was calculated for the five main sections; a value ≥ 0.8 indicated acceptable reliability.²⁷ If no modifications were made after the pre-survey, data from these participants were included in the final analysis.

Survey Administration and Screening

An online questionnaire was created using the Wenjuanxing platform (<https://www.wjx.cn/>). Eligible medical staff were invited to scan a QR code and complete the survey anonymously on their mobile devices. To ensure data quality, the following responses were excluded: (1) questionnaires with a total completion time of less than 3 minutes; (2) questionnaires in which all items in any one of the five main sections had identical answers.

Statistical Analysis

Quantitative data are presented as median (25th and 75th percentiles). Categorical data are expressed as frequency (percentage or proportion). Research capability was scored as follows: serving as a journal reviewer or grant panel member = 5; leading a research project = 4; publishing an SCI paper as first/corresponding author = 3; publishing a paper in a Chinese statistical source journal as first/corresponding author = 2; none of the above = 1 (only the highest score was considered for individuals with multiple achievements). Total scores for each domain were calculated by summing the scores of their respective items. The rate of awareness, endorsement, or demand for each item was calculated as the percentage of questionnaires with a score of 4 or 5 (on the 5-point Likert scale) divided by the total number of valid responses.

Data were analyzed using SPSS 27.0 (IBM, USA). The Kruskal–Wallis test and the chi-square test were applied to analyze differences in continuous/ordinal and categorical data, respectively. Spearman correlation and Kappa consistency tests were used to evaluate correlation and agreement between ordinal variables. A multiple linear regression model was developed using a forward stepwise method to evaluate research integrity awareness. A p -value < 0.05 was considered statistically significant.

Results

Validity and Reliability of the Questionnaire

Seven experts from medical, pharmaceutical, nursing, technical, and statistical disciplines were invited to evaluate the validity of the questionnaire. Among them, six (86%) held doctoral degrees and five (71%) held senior professional titles. Additionally, a pre-survey with 43 valid responses was conducted. The validity indices ($I-CVI$, $S-CVI/UA$, $S-CVI/Ave$) and the reliability index (Cronbach's α) all met the pre-defined requirements for the study (Table 1).

Table 1 Validity and Reliability of the Questionnaire

	Number of Items	Validity (n=7)			Reliability (n=43)
		I-CVI	S-CVI/UA	S-CVI/Ave	Cronbach's α
Individual Perceptions					
Regulatory Points	18	0.857 to 1.000	0.833	0.976	0.928
Impact of Misconduct	12	0.857 to 1.000	0.917	0.988	0.937
Causes of Misconduct	8	0.857 to 1.000	0.875	0.982	0.901
Training Needs					
Training Content	12	0.857 to 1	0.833	0.976	0.924
Training Methods	6	1.000	1.000	1.000	0.881

Abbreviations: I-CVI, item-level content validity index; S-CVI/UA, scale-level content validity index based on universal agreement; S-CVI/Ave, scale-level content validity index based on averaging method.

Basic Characteristics of the Study Participants

A total of 629 questionnaires were collected. After excluding 112 invalid responses, 517 valid questionnaires were retained, yielding an effective response rate of 82.2%. A power analysis using G*Power software indicated that a minimum sample size of 251 was required for multiple linear regression involving 56 Likert-scale items. The actual sample size exceeded this requirement. Frequency distributions of participant characteristics—including profession, gender, age, education level, professional title, and research capability—showed broad representation of the medical staff population (Table 2).

Table 2 Distribution of Participant Characteristics and Unadjusted Cumulative Scores of Research Integrity Awareness Across Subgroups

Stratification Indicators	n (%)	Awareness of Regulatory Points		Perception of Misconduct Severity		Demand for Training Content	
		Median with IQR	p	Median with IQR	p	Median with IQR	p
Department							
Clinical	361 (69.8%)	53(40,68)	0.452	23(17,30)	0.224	12(9,17)	0.372
Ancillary / Support	156 (30.2%)	54(40,68)		25(18,29)		12(9,17)	
Profession							
Physician	120 (23.2%)	56(44,69)	0.061	25(18,31)	0.298	13(11,18)	< 0.001
Nurse	264 (51.1%)	52(39,66)		23(17,29)		12(9,17)	
Pharmacist	58 (11.2%)	54(40,59)		23(18,27)		13(10,18)	
Technician	75 (14.5%)	54(39,68)		24(17,30)		10(8,13)	
Age							
≤30 years	78 (15.1%)	51(37,67)	< 0.001	21(17,30)	< 0.001	11(8,15)	0.005
31–40 years	291 (56.3%)	52(39,59)		22(16,27)		12(9,16)	
41–50 years	124 (24.0%)	59(49,72)		26(21,32)		13(9,18)	
>50 years	24 (4.6%)	58(52,69)		25(21,31)		14(11,19)	
Gender							
Male	150 (29.0%)	55(42,68)	0.148	25(18,30)	0.089	12(10,17)	0.128
Female	367 (71.0%)	53(39,67)		23(17,29)		12(9,16)	
Education							
College	51 (9.9%)	42(36,59)	< 0.001	18(16,28)	< 0.001	11(8,14)	0.002
Bachelor	320 (61.9%)	52(38,62)		22(17,28)		12(9,16)	
Master	101 (19.5%)	57(46,70)		26(19,30)		13(11,18)	
Doctor	45 (8.7%)	60(56,73)		26(24,32)		15(10,18)	
Job Title							
Junior	203 (39.3%)	47(37,58)	< 0.001	20(16,27)	< 0.001	12(8,16)	< 0.001
Intermediate	228 (44.1%)	54(42,67)		24(18,29)		12(10,16)	
Associate Senior	76 (14.7%)	65(53,72)		28(23,32)		16(11,19)	
Senior	10 (1.9%)	56(42,73)		25(21,31)		19(12,25)	
Position							
Staff	462 (89.4%)	53(39,66)	< 0.001	23(17,29)	0.002	12(9,17)	0.019
Mid-level Manager or above	55 (10.6%)	59(51,72)		26(22,31)		14(11,18)	
Time in Service							
≤5 years	87 (16.8%)	51(37,67)	< 0.001	21(17,30)	0.002	12(8,17)	0.013
6–10 years	65 (12.6%)	53(40,67)		23(16,30)		13(10,17)	
11–15 years	193 (37.3%)	52(39,59)		22(16,26)		12(9,16)	
16–20 years	112 (21.7%)	56(43,70)		26(19,31)		13(10,18)	
≥21 years	60 (11.6%)	59(45,73)		25(19,32)		13(10,19)	

(Continued)

Table 2 (Continued).

Stratification Indicators	n (%)	Awareness of Regulatory Points		Perception of Misconduct Severity		Demand for Training Content	
		Median with IQR	p	Median with IQR	p	Median with IQR	p
Prior Training Experience							
Yes	221 (42.7%)	55(42,69)	< 0.001	24(18,30)	0.277	13(10,17)	0.147
No	296 (57.3%)	52(39,65)		23(17,28)		12(8,17)	
Research Ability (self-rated)							
Poor	135 (26.1%)	53(38,61)	< 0.001	22(17,28)	< 0.001	12(9,17)	0.004
Fair	173 (33.5%)	52(39,61)		23(17,28)		12(9,16)	
Moderate	129 (25.0%)	51(40,59)		21(16,27)		12(9,16)	
Good	59 (11.4%)	68(57,73)		29(25,32)		15(11,19)	
Strong	21 (4.1%)	70(53,74)		30(25,32)		16(11,21)	
Research Ability (evaluation)							
Poor	137 (26.5%)	38(35,51)	< 0.001	17(15,24)	< 0.001	9(8,13)	< 0.001
Fair	235 (45.5%)	53(42,60)		23(17,28)		12(9,16)	
Moderate	55 (10.6%)	58(55,68)		26(23,32)		13(11,18)	
Good	37 (7.2%)	59(55,74)		26(23,32)		16(10,20)	
Strong	53 (10.3%)	71(68,74)		32(29,33)		17(15,20)	

Notes: P-values calculated by Kruskal-Wallis test comparing median scores across subgroups.

Awareness of Research Integrity and Training Needs

Rates of Awareness, Endorsement, and Demand

The results (Table 3) indicated that the median rates of awareness of key regulatory points, recognition of the severity of misconduct, and acknowledgment of possible reasons for misconduct were between 31.1% and 32.7%, reflecting an overall low level of understanding. This suggests considerable ambiguity among respondents regarding core concepts of research integrity. In contrast, the median demand rate for training content was only 13.0%, indicating limited initiative among medical staff to seek out training despite their knowledge gaps.

Cumulative Scores of Items

Cumulative scores were calculated for items across the five dimensions. Table 4 presents the three items with the highest and lowest scores.

Individual Cumulative Scores

Individual cumulative scores were computed for awareness of regulatory points, recognition of misconduct severity, and training content demand. Difference analysis revealed significant variations in these three cumulative scores across different demographic

Table 3 Awareness of Research Integrity and Training Needs

Content	Number of Items	Median	Minimum	Maximum
Individual Perceptions				
Regulatory Points	18	32.7%	29.4%	35.6%
Impact of Misconduct	12	32.4%	29.4%	35.8%
Causes of Misconduct	8	31.1%	29.2%	32.7%
Training Needs				
Training Content	12	13.0%	10.1%	13.9%
Training Methods	6	34.2%	32.5%	36.4%

Notes: The rate for each item was calculated as the percentage of questionnaires with a score of 4 or 5 (on the 5-point Likert scale) divided by the total number of valid responses.

Table 4 Unadjusted Cumulative Scores of Research Integrity Awareness and Training Needs by Item

Category	Top 3		Bottom 3	
	Item	Score	Item	Score
Regulatory Points	No duplicate submission	1594	Ethical guidelines awareness	1486
	Standards for proper authorship	1567	Requirements for collaborative research	1497
	Norms for citing others' work	1558	Institutional research integrity policies	1506
Impact of Misconduct	Career advancement	1526	Personal reputation	1469
	Medical development	1516	Academic fairness	1496
	Discipline development	1515	Institutional reputation	1506
Causes of Misconduct	Belief in low detection risk	1566	Insufficient time and energy	1497
	Lack of research competence	1555	Academic/career pressure	1498
	Inadequate punishment	1550	Unclear definition of misconduct	1530
Training Content	Regulations on tech ethics	1215	Scope of inappropriate authorship	1024
	Basics and application of medical statistics	1203	Responsibilities in peer review	1110
	Mechanisms for research output distribution	1196	Handling procedures for academic misconduct	1115
Training Methods	On-site lectures	1571	Mini-program for online learning	1539
	Online lectures	1568	Electronic learning materials	1546
	WeChat message notification	1567	Printed learning materials	1549

and professional strata (Table 2). Correlation analysis demonstrated a significant positive relationship between research capability level and all three cumulative scores (Figure 1). Multiple linear regression identified research ability (evaluation) as an independent influencing factor for both awareness of regulatory points and recognition of misconduct severity. Department type, age, and research ability (evaluation) were independent influencing factors for training content demand (Table 5).

Discussion

This study systematically investigated the current status of research integrity awareness, training needs, and key influencing factors among medical staff in our hospital, yielding several enlightening findings.

Overall Low Level and Structural Imbalance in Awareness

The results indicate that the overall awareness/endorsement rate of research integrity among medical staff in our hospital was approximately 30% (31.1–32.7%), which is consistent with other Chinese studies,^{28,29} collectively revealing a concerning gap in

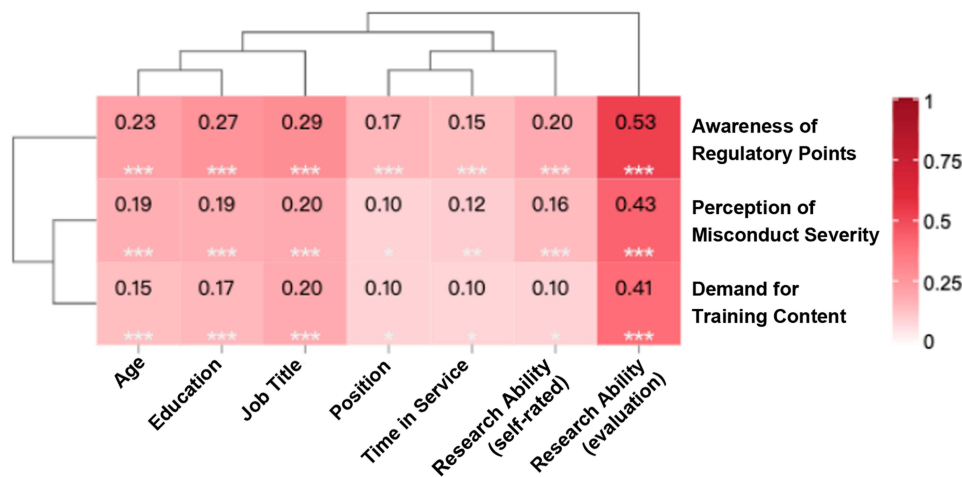


Figure 1 Heatmap of Spearman Correlation between Personal Characteristics and Research Integrity Awareness & Training Needs. Results of Spearman correlation analysis. Values represent correlation coefficients. Research ability positively correlated with both awareness and training demand, while age showed modest associations. *0.01 < p < 0.05, **0.001 < p < 0.01, ***0.0001 < p < 0.001.

Table 5 Multiple Linear Regression Analysis of Factors Associated with Research Integrity Awareness and Training Needs (n=517)

Dependent Variable	Model Information				Independent Variables						
	R ²	Adj. R ²	F	p		B	Std. B (95% CI)		t	p	VIF
Awareness of Regulatory Points	0.273	0.270	96.514	<0.001	Gender	1.229	0.064	(-0.261, 2.719)	1.621	0.106	1.108
					Research ability (evaluation)	5.761	0.499	(4.862, 6.659)	12.602	<0.001	1.108
Perception of Misconduct Severity	0.225	0.222	74.569	<0.001	Gender	0.289	0.031	(-0.457, 1.035)	0.761	0.447	1.108
					Research ability (evaluation)	2.598	0.464	(2.148, 3.048)	11.341	<0.001	1.108
Demand for Training Content	0.207	0.200	33.347	<0.001	Department type	-2.209	-0.115	(-3.841, -0.578)	-2.661	0.008	1.199
					Age	-0.977	-0.105	(-1.767, -0.186)	-2.426	0.016	1.197
					Prior Training Experience	0.265	0.036	(-0.320, 0.850)	0.891	0.373	1.082
					Research ability (evaluation)	2.794	0.386	(2.211, 3.377)	9.417	<0.001	1.086

knowledge of research integrity. More notably, this study uncovered a “structural imbalance” in awareness. For instance, staff showed higher familiarity with concrete regulations directly related to publication, such as “duplicate submission” and “authorship”, but lower awareness of more fundamental and overarching principles such as “research ethical standards”, “norms for collaborative research”, and even “institutional management policies” (Table 3). This may reflect a “test-oriented” or “utilitarian” tendency,²⁶ where medical professionals are more concerned with specific behaviors that may lead to manuscript rejection or public sanctions, while paying less attention to the ethical foundation and institutional environment that underpin healthy scientific research. Moreover, the perception of misconduct consequences focused more on practical interests such as “career advancement” rather than deeper values like “personal reputation” and “academic fairness”, further supporting this observation.

Pragmatism–Oriented Training Needs

Despite the generally low level of awareness, the median “high demand rate” for training was only 13.0%. Although medical staff recognize their knowledge gaps, heavy clinical workloads and limited time may hinder strong motivation for systematic training. Alternatively, current training formats and content may fail to effectively stimulate engagement.

Regarding specific needs, medical staff demonstrated a strong pragmatism, consistent with other reports.^{8,30} There was highest demand for skill-based training that directly enhances research output efficiency and quality, such as “data management and analysis”, while interest in theoretical content such as “regulation interpretation” was relatively low. These findings suggest that future education on research integrity should avoid empty exhortation and mere recitation of rules, and instead integrate ethical norms closely with practical research skill development, embedding integrity within research methodology training. This aligns with the principles of Adult Learning Theory (Knowles),³¹ which emphasizes the importance of relevance and self-directed learning, particularly among professionals who are more motivated by practical application than theoretical knowledge. Additionally, the strong preference for case-based and online formats reflects a desire for flexible, experiential, and just-in-time learning opportunities.

Experience and Education as Key Factors for Improving Awareness

Multiple linear regression results reaffirmed key pathways for enhancing research integrity awareness. Consistent with similar studies,^{32,33} research ability and years of practice were significant positive predictors. From the perspective of the Theory of Planned Behavior (Ajzen),³⁴ these factors may strengthen perceived behavioral control and reinforce positive attitudes toward research integrity, thereby increasing the likelihood of ethical conduct. However, this also highlights that junior and intermediate title holders, those with bachelor’s or master’s degrees, and young staff with less research experience constitute the group with the weakest awareness. Early, systematic, and targeted interventions for this group are essential for their healthy career development and for improving the overall research ecology of the institution.

Implications and Recommendations

Based on the above, we propose the following recommendations to effectively enhance research integrity among medical staff in our hospital:

First, move away from a “one-size-fits-all” training model and develop tiered training modules tailored to staff with different professional titles, education levels, and research experience. For early-career staff, focus on basic norms and ethical awareness; for senior staff, address more advanced content such as identifying complex academic misconduct and managing team-based research integrity.

Second, integrate research integrity education closely with research skill training, and develop competency-based integrity curricula, such as high-quality “integrity + skill” courses, including “Academic Writing and Submission in Compliance with Standards” and Responsible Data Management and Sharing.

Third, while enhancing education, it is essential to improve the hospital’s research integrity management system, clarify investigative procedures and sanctions for misconduct, and ensure the system has “teeth.” This aligns with institutional culture frameworks in research integrity, which stress that clear policies and consistent enforcement are necessary to establish a culture of integrity. Meanwhile, foster a culture of research integrity that values rigor and rejects exaggeration through measures such as recognizing exemplary practices and regularly organizing seminars on academic ethics, thereby internalizing integrity as a conscious action among all medical staff.

Limitations

This study was conducted in a single tertiary hospital, which may limit the generalizability of the findings to other types or regions of healthcare institutions. Data were collected via a self-report questionnaire, which is susceptible to social desirability bias, meaning respondents may have provided answers they perceived as “correct” rather than reflecting their true beliefs. Furthermore, as a cross-sectional study, it reveals correlations rather than causation; for example, it remains unclear whether higher research capability leads to greater integrity awareness, or vice versa. Future multi-center and longitudinal studies are needed to obtain more generalizable and causal inferences.

Conclusion

This study systematically evaluated the current state of research integrity awareness and training needs among medical staff in a large tertiary hospital. The findings reveal an overall limited level of understanding (approximately 30% awareness rate) regarding research integrity, accompanied by a structural bias emphasizing publication techniques over ethical principles. Training needs were highly concentrated on practical skills that directly enhance research capabilities, with a clear preference for flexible and innovative formats such as case-based and online learning modalities. Multiple regression analysis confirmed that extensive research experience, higher academic degrees, and senior professional titles are key positive factors associated with greater research integrity awareness. Future research should include qualitative inquiries to deepen understanding of motivational drivers and longitudinal studies to evaluate the long-term impact of targeted integrity training programs.

Data Sharing Statement

The original data are available from the corresponding author upon reasonable request.

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Disclosure

The authors report no conflicts of interest in this work.

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