An Update to Scientific Decision Making: The Academy of Nutrition and Dietetics' Scientific Integrity Principles

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ABSTRACT

In 2015, the Council on Research published their vision for scientific decision making, which provided nutrition and dietetics practitioners and practitioners-in-training key information on the Academy of Nutrition and Dietetics' newly developed scientific integrity principles. Given that it has been 7 years since the original publication, it was believed the original six principles should be revisited and updated. From the Subcommittee on Scientific Integrity Priciples under the Council on Research, the 2015 principles were evaluated and updated with new literature and best practices for maintaining scientific integrity principles. After this review process, four new/updated principles were approved by the Council on Research. These include: 1) the ethical conduct of research and protection of human subjects, 2) funder's influence on the research question/methodology/education content and conflicts of interest, 3) review of research-related materials, and 4) maintain and promote a culture of scientific integrity. Moreover, it became clear that newer topics, including diversity, equity, and inclusion should be woven throughout the principles. This article presents the newly updated principles and resources related to scientific integrity principles. We envision that this document can be used by the Academy of Nutrition and Dietetics to educate members and serve as a guide to incorporate these principles into all research practices and at all levels of dietetics practice.
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THE SCIENTIFIC INTEGRITY process is the backbone of any organization that funds and/or supports research activities by and for its members (see Figure 1 for a definition of research activities). In 2015, the Academy of Nutrition and Dietetics (Academy) released a vision for scientific decision making.[1] The 2015 document presented six key scientific integrity principles (SIP) to Academy members as well as highlighted existing resources and outlined next steps to ensure alignment with SIP. In the interim, the Academy has updated, and revised policies related to SIP and created groups under the Council on Research that focus on these issues. Namely, the Scientific Integrity Principles Subcommittee has been charged to work with Academy units (eg, Dietetic Practice Groups [DPGs]) and committees to increase awareness regarding the conduct of research and adherence to SIP. The subcommittee also developed training/education related to SIP. Furthermore, the Academy's Board of Directors has recently updated a 5-year Strategic Plan that includes diversity and inclusion as one of four focus areas[2] and specifies impact goals focused on diversifying membership and the profession and improving cultural competence and humility. Given that it has been 7 years since the last publication and with support from the Council on Research, the current subcommittee revisited the 2015 principles. In review, it was determined that some principles should and could be combined, whereas other topics needed to be addressed (eg, diversity and inclusion) and incorporated. This resulted in four new/updated principles (see Figure 2). Hence, this document provides an updated guide to scientific decision making at the Academy while incorporating the topics of inclusion, diversity, equity, and access (IDEA) (see Figure 1 for definitions). It is important to note that the topic of IDEA in research is crucial to cover comprehensively to appropriately address the barriers and facilitators that influence diversity in research. However, the authors of this article will focus on IDEA as it relates to the four new principles. Future publications led by the Academy's Council on Research will include a deeper dive on the topic of IDEA in research to adequately discuss the systemic issues that occur in research and offer some potential solutions for moving forward.

To date, there is currently no universally accepted definition of scientific integrity utilized by organizations; however, a Scientific Integrity Consortium organized by the North American Branch of the International Life Sciences Institute agreed to use the current definition from the US Department of the Interior. The Department of the Interior defined scientific integrity as "the condition that occurs when persons…. adhere to accepted standards, professional values, and practices of the relevant scientific community…. Adherence to these standards ensures objectivity, clarity, and reproducibility, and utility of scientific and scholarly activities and assessment and helps prevent bias, fabrication, falsification, plagiarism,

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Term	Definition
Research activities	Dietetics research encompasses a broad domain that may range from basic nutrient function investigations to applied practice assessments such as tracking patient outcomes or quality improvement projects.[3] All areas of research involve systematic collection, organization, and analysis of information to contribute to generalizable knowledge about a topic or area.[4]
Diversity and inclusion[a]	Recognizing, respecting, and including differences in ability, age, creed, culture, ethnicity, gender, gender identity, political affiliation, race, religion, sexual orientation, size, and socioeconomic characteristics in the nutrition and dietetics profession.[5]
Equity[a]	The absence of avoidable, unfair, or remediable differences among groups of people, whether those groups are defined socially, economically, demographically, or geographically, or by other means of stratification.[5]
Access (to health care and/or services)[a]	To be able to have timely availability to personal health services to receive the best possible health outcomes.[6] This can vary based on various sociodemographic factors, including race, ethnicity, economic status, disability status, and sexual orientation.[5,7]
[a]Indicates that definition is included in the Academy of Nutrition and Dietetics' Definition of Terms List under the Diversity and Health Equity section.	

Figure 1. Definition of key terms.

outside interference, censorship…."[8] This definition guided the update to the Academy's SIP. Academy members, registered dietitian nutritionists, and nutrition and dietetics technicians, registered and their international equivalents, are encouraged to use these updated principles when issues of scientific integrity are encountered in their own workplace and/or practice.

PRINCIPLE I: ETHICAL CONDUCT OF RESEARCH AND PROTECTION OF HUMAN SUBJECTS

Research conducted by Academy members or funded by the Academy, or the Academy Foundation should be held to the highest ethical standards. Strengthening scientific integrity throughout the research process by focusing on continuous researcher training in ethics, inclusion, diversity, equity, and access, and conduct is imperative to maintain this standard.

What Is Research?

The Code of Federal Regulations defines research as "a systemic investigation, including research development, testing and evaluation, designed to develop or contribute to generalizable knowledge."[4] Specifically, ethical research is the cornerstone of this process and is guided by SIP. Broadly, federal policy for the protection of human subjects or the "Common Rule" guides our actions in conducting research. *The Belmont Report*, written in 1979 by the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research,[9] provides researchers with the basic ethical principles in human subject research. These principles are the foundation of the training in the ethical conduct of research conducted through the Collaborative Institutional Training Initiative (CITI) program.[10] However, beyond *The Belmont Report*, ethical research must systematically include methods and processes for inclusion and retention of vulnerable and underrepresented subjects while also including diversity among researchers. Research has shown that individuals are more likely to participate in research if they can establish a sense of trust and identify with the researchers involved[11] and thus to achieve equitable inclusion within studies, an increase in diverse researchers is needed. This is in line with the Academy's IDEA action plan and, specifically, goal two to "increase recruitment, retention, and completion of nutrition and dietetics education and leadership at all levels for underrepresented groups."[12] Ensuring that we have a diverse dietetics workforce will advance the representation from underrepresented groups in all settings, including research.

Types of Research Training

The CITI program is utilized by individuals as well as numerous organizations, including colleges and universities, health care organizations, technology and research organizations, and governmental agencies. Training through the CITI program is essential for nutrition and dietetics practitioners and practitioners-in-training wishing to engage in research because it provides the specific knowledge content required in carrying out ethical research, and universal training is crucial to maintaining scientific integrity. Within the CITI training, there are multiple examples of unethical methods conducted by researchers. Some of these studies include methods that have ultimately undermined the current ability to recruit diverse subjects into clinical trials (eg, Tuskegee[13]). Whereas CITI training has long included these examples, it is important to apply these considerations by implementing techniques for diversifying both researchers and subjects in nutrition-related studies. In addition, the Academy's Nutrition Research Network has created virtual self-study modules on research ethics designed specifically for nutrition and dietetics practitioners.[14,15] This Research Ethics Training (RET) mirrors the main concepts from the CITI program but is delivered in a shorter format and includes examples specific to nutrition

Principle		Description
I	Ethical conduct of research and protection of human subjects	Research conducted or funded by the Academy, or its foundation should be held to the highest ethical standards. Strengthening SIP throughout the research process with a focus on training in ethics and conduct
II	Funder's influence on research question/ methodology/education content and conflicts of interest	The influence of the funder on the research question, methodology, and resulting educational content must be disclosed. All scientific activities should have a clear and complete identification of the funding source and the possible influence it may have on all aspects of the project
III	Review of research-related materials	Strive to identify ways to strengthen the review process of manuscripts, abstracts, grants, policy statements, and publications. Furthermore, to minimize bias by editors, reviewers, committee member, and anyone else who reviews any Academy-related research-related materials
IV	Maintain and promote a culture of scientific integrity	Provide universal SIP training for Academy members to support and maintain culture of scientific integrity

Figure 2. The Academy of Nutrition and Dietetics' (Academy) scientific integrity principles (SIP).

and dietetics. This program was successfully piloted[14] and is now available to nutrition and dietetics practitioners, Academy members, and the public. Please note, it is imperative that one reviews their institution's policies on conducting research through the research office to determine whether the Academy's RET will meet their requirements.

Although CITI and the Academy's RET mention the importance of cultural competence and special protections to vulnerable populations, these tend to be described more broadly (eg, the Department of Health and Human Services provides additional protection to pregnant women, fetuses, and neonates; prisoners; and children).[10,14] There is a need to expand the conversation related to research ethics based on IDEA principles. This can include discussion about recruitment and retention of vulnerable populations with differences based on geographic location, culture, race, ethnicity, ability status, and sexual orientation. Another important addition would be a module on implicit bias of researchers. Implicit bias is defined as "holding positive or negative feelings, associations, or beliefs about others on an unconscious level which differs from their conscious and adapted views."[5] Being aware of any potential biases is an integral part of research ethics as these can unconsciously shape the way researcher's conduct research. This is in alignment with goal four of the IDEA action plan to "advance food and nutrition research, policy, and practice through a holistic IDEA lens."[12] Specifically, this relates to the strategy that states that research protocols should include antibias practices.

Responsible conduct of research (RCR) training is another requirement of anyone holding funding from US governmental agencies. This training focuses on awareness and application of established professional norms.[16] RCR training is defined as the practice of scientific investigation with integrity.[16] When engaged in research, it is important to be cognizant of what constitutes research misconduct; defined as fabrication, falsification, or plagiarism in proposing, performing, or reviewing research or in reporting research results.[17] Common themes reviewed in RCR training include education on the responsibilities of researchers, data management, peer review, conflict of interest, and what constitutes research misconduct. Ultimately, this training should empower researchers to uphold these standards for themselves and others.[18] Incorporating these best practices assists in maintaining scientific integrity and should be considered by anyone engaged in research activities.

How to Receive Research Approval

Engagement in many forms of research will require approval from your organization's institutional review board. The Academy has resources available to guide members in this process.[19] Institutional review boards are tasked with reviewing all human subjects research and determining whether risks to subjects are minimized, their rights and welfare are protected, the opportunity for research subjects to participate is equitable, informed consent is sought before enrollment in the study, and finally, that the research activity is reviewed regularly. Selection of research subjects is an important consideration because many articles have recently highlighted the lack of diversity in recruitment of research subjects in clinical trials.[20] The Food and Drug Administration Drug Trials Snapshots program showed that clinical trials in cardiovascular drug research during 2015-2016 had very limited enrollment of African Americans, representing only 2.5% of the study population.[21] This lack of diversity has a direct influence on persisting health inequities. Hence, a greater focus on recruitment of diverse populations is essential as ethical research moves forward.[22] Indeed, the Food and Drug Administration has provided recent guidance on inclusive clinical trial practices such as

Examples of conducting research

- Nutrition Research Network research projects
- Evidence Analysis Library systematic reviews
- Aggregating data within the Academy Health Informatics Infrastructure
- Surveys by marketing, membership, committees, and dietetic practice and member interest groups
- Quality-improvement projects
- Program evaluation by the Academy Foundation
- Studies from academic, clinical, or private-public partnership groups and individuals
- Studies from nutrition students and dietetic interns

Examples of funding scientific activities

- Grants to graduate students, independent researchers and Academy researchers by the Academy Foundation, dietetic practice groups, and member interest groups
- Academy contracts with research organizations to conduct surveys and professional evaluations

Examples of disseminating science (to the public and the profession)

- Academy spokespeople media contacts
- Academy Position Papers or Consensus Reports
- Continuing professional education opportunities approved by the Center for Lifelong Learning, including Food & Nutrition Conference & Expo™ and dietetic practice group meetings/conferences and newsletter articles
- Publication and presentation of research findings conducted or funded by the Academy
- Development of evidence-based nutrition practice guidelines by the Evidence Analysis Library
- Development and provision of nutrition education for the public (eg, www.eatright.org)
- Academy groups' newsletters that publish research
- Utilizing research evidence to advance policy initiatives for the profession
- Science-based webinars/presentations for registered dietitian nutritionists or the public
- Food & Nutrition Conference & Expo™ abstract submissions

Figure 3. Examples of areas of scientific activity currently associated with the Academy of Nutrition and Dietetics (Academy) (adapted from reference 1).

broadening inclusion criteria, fostering community engagement at all stages of research, highlighting the need to include women in equal numbers for sex comparisons as well as racial and ethnic minorities allowing for data analysis by race and ethnicity. Furthermore, they highlight enrollment and retention practices that researchers can use to enhance inclusiveness.[23] The topic of inclusive recruitment practices in research aligns with the IDEA Action Plan Goal 3 to "cultivate organization and professional values of equity, respect, civility, and anti-discrimination."[12] Researchers adhering to the SIP should strive to create an inclusive environment in all levels of research, including when planning on what populations will be included and recruited and methods for recruitment and retention of diverse and underrepresented research populations.

Research involving animals, which requires Institutional Animal Care and Use Committee approval as well as quality improvement projects should adhere to the same principles and disclosure of conflicts of interest as those conducting other types of research.

PRINCIPLE II. FUNDER'S INFLUENCE ON RESEARCH QUESTION/METHODOLOGY/ EDUCATION CONTENT AND CONFLICTS OF INTEREST

The influence of the funder on the research question, methodology, and resulting educational content must be disclosed. All scientific activities should have a clear and complete identification of the funding source so the possible influence it may have on all aspects of the project may be determined.

An overarching theme of ethical research is disclosure of the potential influence of funding sources on research questions, methodology, and educational content. Clear guidelines for funding disclosures and conflicts of interest can help to limit potential bias and all scientific activities should have transparency about specific roles that funding sources may have on all aspects of a project. Knowledge of research funding details enable all nutrition and dietetics practitioners and practitioners-in-training to consider financial aspects when interpreting the results and applications of studies.[24]

It is essential that Academy members clearly understand what is defined as a scientific activity so that they know how and when to apply SIP when considering project funding sources. In addition, researchers must do their due diligence to evaluate and mitigate any conflicts of interest (actual or perceived) that may arise from funding agencies along with any potentially discriminating practices from the organization before accepting research funding. Education about interpreting, and reporting, funding disclosures and conflicts of interest is beneficial because many nutrition and dietetics practitioners may be unaware that they are involved in aspects of research and other scientific activities.[24]

What Does the Academy Mean by Scientific Activities?

Scientific activities go beyond just conducting research because they encompass actions associated with funding projects and disseminating results and creating educational programs for professionals and the public. The various categories may include any of the following:

- Developing a research protocol and study design,
- Generating new data (eg, gathering patient/client survey data),.
- Aggregating existing data (eg, pulling information from an existing database),
- Distributing scientific information (eg, providing information to the public as a nutrition expert), and
- Quality improvement projects (eg, collecting institutional electronic clinical quality measures data on malnutrition using tools developed by the Academy[25]).

Figure 3 provides more examples of areas of scientific activity currently associated with the Academy. Because most DPGs do engage in scientific activities, they are required to comply with the Academy's SIP.[26] A set of frequently asked questions and case studies are available to help determine participation and requirements for compliance and to define "What is scientific activity?"[15,27,28]

Who Funds Scientific Activities?

Scientific research and development funding in the United States generally comes from four main types of organizations:

- **Government** The federal government has been a principal supporter of nutrition research in the United States. Whereas more than 10 federal departments and agencies offer funding, their annual investments have plateaued or even declined over recent years.[29]
- **Nonprofit and professional groups** Foundations, including the Academy Foundation, and a wide range of interest groups provide grants and funding for study of nutrition-related issues.
- **Public–private research partnerships (PPP)** Nonprofit and for-profit PPP collaborations provide expertise, financial, and other resources from government, academia, and industry, to stimulate innovation in investigations concerned with food, nutrition, and health (refer to Rowe and colleagues[30] for an in-depth discussion on these partnerships).
- **Industry** Funding from food- and health-related companies is often needed because nutrition research is expensive and to date, nonprofit and professional sources have not supplied support to the same extent as industry.[31] Financial relationships among industry, scientific investigators, and academic institutions may produce both benefits and concerns because undetected and unmitigated conflicts of interset can have a negative influence on the integrity of nutrition research.[32]

Because of the considerable role that industry funding has in food and nutrition research, and the prospect that it will continue to increase, attention to industry financial interests is particularly relevant.[31] For-profit businesses such as food manufacturers may have inherent conflicts of interest with researchers, clinicians, and educators studying the influence of food on health and well-being.[33] These real and perceived funder and researcher conflicts of interest may challenge the public's perception of research credibility and trust in the research itself. Members of the public and even the research community are increasingly skeptical about studies supported by commercial funding.[34] Rigorous transparency and disclosure of industry support is more important than ever because funding sources have become de facto indicators of research bias and they are a topic of interest that is discussed widely, particularly within the realms of social media.[35]

There has been mixed evidence from studies assessing whether industry sponsorship of studies biases results, quality, and the agenda of research studies. A 2017 Cochrane review presented a positive association between manufacturing company sponsorship of drug and device studies and research outcomes that was identified as a "funding effect." The industry-sponsored studies reported more favorable outcomes compared with studies having other sources of sponsorship.[36] A positive funding effect was also evident in an analysis of research articles published in top nutrition journals in 2018. It was reported that 13.4% of studies disclosed some connection to the food industry and those identified studies were more likely to have findings that supported industry interests.[37]

In contrast, there was no significant industry funding effect reported in a 2016 systematic review and meta-analysis.[38] Another study that suggested no funder effect was an analysis of nutrition practice-related research report quality ratings recorded in the Academy Evidence Analysis Library. This assessment concluded that the quality of these reports could not be predicted from the funding source because reports with industry backing were no more likely to receive a neutral or negative quality rating than those funded by other sources.[39]

Similar to considerations about industry funding influence, it is a matter of concern whether transactions between public and private sectors can accomplish nutrition and business goals without interfering conflicts of interest. It is believed that PPPs, which are composed of numerous collaborators, may have decreased risk of disproportionate influence from any one partner.[30] A workshop for PPP representatives in 2014 developed guidelines to ensure integrity in the conduct of food and nutrition research collaborations among public, nonprofit, and private sectors. These guidelines were approved by the Academy and several other nutrition organizations to be applied when collaborating with PPPs.[40]

Funding Source Transparency Essential for All Aspects of Scientific Activity

Developing the Research Question. Any influence funders have on developing study research questions and methodologies must be disclosed. A primary source of sponsor bias can be identified in the first step of conducting research, in which the purpose

of the study and the questions are designed. Funders may preferentially sponsor targeted research aims and data collection methods that are anticipated to provide answers to support their corporate interests rather than objective unbiased results based on scientific, social, and ethical perspectives.[36] A scoping review that explored the influence of industry sponsorship on research agendas across different health-related fields found that corporate interests tend to drive research to focus on products, processes, or activities associated with increasing commercial profits rather than toward questions that may be more appropriate for supporting nutrition and public health.[41]

Publication of Research. Authors should feel confident that they have freedom to publish results of studies when and where they choose regardless of outcomes or the interests of funders. Clear guidelines such as those developed by the International Committee of Medical Journal Editors, have been designed to mitigate any influence of funders on data analysis and interpretation or to select which findings to present or focus on or whether any should be withheld.[42] When financial and material support for scientific activities is transparently and completely reported in published articles, readers can reasonably make informed decisions about conflicts of interest and validity of the work.[43]

Professional or Practice Education. Financial contributions for professional or practice education may provide support for such activities as conferences, meetings, and continuing professional education programs as well as for developing position and practice papers.[1] Disclosure is of critical importance in areas where professional education and funders intersect. Studies suggest that practitioners may be unduly swayed by industry interests at sponsored programs and events, even when they are not aware of it.[44] To promote objectivity in continuing medical education, the Accreditation Council for Continuing Medical Education (ACCME) has developed strategies to mitigate the conflicts of interest in educational programs. The ACCME Standards have been adopted by other accrediting bodies, including the Academy's credentialing agency, the Commission on Dietetic Registration. Primarily, the education content must be free of marketing or sales of products or services and the ACCME requires a signed disclosure form that could be a helpful template for any group who wants to develop a disclosure policy for speakers.[45]

Education for the Public. The aim of responsible nutrition education is to communicate evidence-based nutrition information to the general public, patients, and clients, as well as to various other constituencies such as schools, health-related organizations, policymakers, and even funders. As with professional education, sponsorship of public nutrition education may involve conflicts of interest. To help keep the public trust in evidence-based educational activities and to ensure equitable access for all groups, funders should not be able to control the goals, content, or populations served.[46] Content contributors and presenters must disclose any relationships that may present a potential conflicts of interest in a way that is understandable to the public. Sample presenter disclosure forms and guidelines are available from the ACCME or the Academy.[45,47]

PRINCIPLE III: REVIEW OF RESEARCH-RELATED MATERIALS

Strive to identify ways to strengthen the review process of manuscripts, abstracts, grants, policy statements, and publications. Furthermore, to minimize bias by editors, reviewers, committee members, and anyone else who reviews any research-related materials related to the Academy or for other organizations.

Best Practices when engaging in Research Activities

Authors of manuscripts, grants, abstracts, or other research-related work are to uphold ethical standards related to their conductance of research and be able to verify the authenticity of their work.[24] Both retrospective and prospective research have risk of bias and need to be intentional in including demographic information that will provide data on different populations, specifically those who are underrepresented or vulnerable.

When conducting scoping or systematic reviews, this process begins as early as the review of literature to ensure that authors are not engaged in reporting bias or selective dissemination of research findings.[48] In particular, systematic reviews should be guided by a written protocol before beginning the process. Use of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement,[48] an evidence-based resource containing a 27-item checklist, can help minimize selection and reporting bias. Similarly, when conducting prospective studies where subjects are recruited, selection or participant bias can influence research outcomes. Selection bias occurs when the inclusion criteria or expectations of participation automatically exclude some part of your population from participation. Bias can also occur during data analysis and/or interpretation by choosing methods that preferentially result in favorable conclusions.[49] Finally, publication bias can occur because some journals favor manuscripts with favorable outcomes as opposed to negative findings.[49] In summary, bias can occur at any stage during a research study and in all types of studies, thus authors should be mindful of this throughout the entire research process.

The International Committee of Medical Journal Editors have provided guidelines,[42] which has been adopted by hundreds of journals, to guide authors in following best practices and ethical standards in the conduct and reporting of their research in medical journals. In addition, many journals, including *The Journal of the Academy of Nutrition and Dietetics* are members of the Committee on Publication Ethics (COPE). COPE is "committed to educating and supporting editors, publishers and those involved in publication ethics with the aim of moving the culture of publishing towards one where ethical practices become a normal part of the publishing culture."[50] Adherence to standards such as those endorsed by COPE are important for journals to adopt and a necessary consideration when deciding where to publish your research activities.

In addition, any dissemination of research activities, including publications, must also include considerations for inclusive language as well as careful discussions regarding associations

between health outcomes and race and ethnicity that may be influenced by systemic and structural issues that can underlie health inequities.[51] For more information on different IDEA terms that should be considered and potentially included in any research dissemination, please refer to the Academy's definition of terms list, which includes terminology related to diversity and health equity.[5]

Best Practices when Reviewing Research Activities

Whereas SIP is critical for authors to follow, there is also responsibility on the part of reviewers. Peer review of research-related materials is an integral part of the scientific method. The review process should be rigorous, transparent, and free of bias. Bias can influence the peer review process at multiple points; for example, influence editorial decisions to send articles for peer review, during selection of the peer reviewers, and/or include impediments encountered during the review process and publication of the study. An analysis by Lerback and Hanson[52] provided evidence that fewer women are suggested and therefore, invited to review than men. Beyond biases in sex/gender, biases can include making judgments on the country of origin, authors, and/or institution, personal beliefs and viewpoints on the proposed model used in the experiments, or misinterpretation such that the findings of the article are interpreted differently.[53] Any and all of these may contribute to peer review bias. Bias may also be unconscious in nature. Unconscious bias has been defined as an implicit attitude, stereotype, motivation, or assumption that can occur without one's knowledge, control, or intention.[54] Hence, training of reviewers is critical so that they may understand their role in the process as well as journal requirements. Editors and/or organizations should seek to recruit a broad and diverse array of authors, reviewers, and editorial staff that can support the process of limiting editorial unconscious bias or implicit bias. Utilizing a double-blind review process or open review can minimize these potential issues.[55] with some journals going as far as utilizing a triple-blind peer review that also blinds the authors' identity to editors during the submission process.[53] *The Journal of the Academy of Nutrition and Dietetics* currently utilizes a double-blind review process.[56] Whereas current recommendations suggest more blinding or an open review as producing less bias, more study in this area is warranted to better understand the prevalence of bias in the review process. Similar to the potential bias that can occur with researchers themselves, bias can also be introduced in the review stage of research. This aligns with Goal 4 of the IDEA Action Plan to ensure there are antibias policies in place to cover all parts of research.[12]

Academy members engaging in research must inform themselves of implicit biases and be self-aware

Resource	Description
Academy diversity plan[2]	The 5-year Strategic Plan updated in April 2021 specifies impact goals focusing on diversifying membership
Academy research training[15]	Steps to Developing a Research Project: Resources to Help. This includes links to SIP frequently asked questions and case studies
Accreditation Council for Continuing Medical Education[45]	Accreditation Council for Continuing Medical Education Relevant Financial Relationship Policy and Disclosure Form to mitigate conflict of interest in funded educational programs
Clinical trial diversity[23]	The Food and Drug Administration has provided recent guidance on inclusive clinical trials: Enhancing the Diversity of Clinical Trial Populations—Eligibility Criteria, Enrollment Practices, and Trial Designs Guidance for Industry
Collaborative Institutional Training Initiative[10]	Collaborative Institutional Training Initiative program provides specific knowledge content required in carrying out ethical research
Committee on Publication Ethics[50]	Committee on Publication Ethics aims to move the culture of publishing toward one where ethical practices become a normal part of the publishing culture
Identifying bias[58]	Tools to identify bias and to recruit a more diverse group of reviewers. For instance, Harvard University has an online implicit association test: Project Implicit
Institutional review board[19]	Engagement human research will require approval from your organization's institutional review board
International Committee of Medical Journal Editors[42]	International Committee of Medical Journal Editors guidelines for authors of manuscripts to ensure they are following best practices and ethical standards in the conduct and reporting of research
Journal of the Academy of Nutrition and Dietetics[56]	*Journal of the Academy of Nutrition and Dietetics* guidelines for authors editorial policy for avoiding potential conflicts of interest and applying SIP to published materials

Figure 4. Key resources list for applying scientific integrity principles (SIP) to research activities.

because this can help to reduce bias. Unconscious bias tends to center around a few common themes such as gender bias, bias for or against authors from a geographical area, language bias, bias for or against authors from specific institutions, and bias against researchers at the beginning of their research career.[57] Many journals have introduced tools and methodology to identify bias. For instance, Harvard University has an online implicit association test[58] designed to help individuals identify their own unconscious bias. It should be recognized that it is not clear whether or not these tools are effective at minimizing bias and their effectiveness in reducing the negative influence of bias should be further examined. However, these tools can help make reviewers aware of their own biases and works to ensuring a more equitable and fair review process.

PRINCIPLE IV. MAINTAIN AND PROMOTE A CULTURE OF SCIENTIFIC INTEGRITY

Provide universal SIP training for Academy members to support and maintain culture of scientific integrity.

The obligation to ensure scientific integrity is a responsibility that involves all members of the dietetics profession, including clinicians, students, educators, preceptors, dietetic interns, and researchers, who cooperate and interact in a culture that bases decisions and actions on well-supported science, policy, and practice principles.[59]

We envision that this document can be used by the Academy as a set of guiding principles to educate members and as a model to incorporate SIP into a variety of research activities at all levels of dietetics practice. Because the importance of disclosure of conflicts of interest is a theme that runs throughout this article, the principles framework and resources (See Figure 4 for links) ensure that research and education can be translated into transparent and equitable policies, procedures, and standards throughout the Academy. The principles may be applied as a basis for:

- A comprehensive scientific integrity policy,
- Defining the scope of scientific activities ,
- A framework to review and update current policies and create new ones in alignment with these principles, and
- Aligning research activities within the Academy/Commission on Dietetic Registration Code of Ethics for the Nutrition and Dietetics Profession.[60]

CONCLUSIONS AND SUGGESTIONS FOR BEST PRACTICES

Scientific integrity is a responsibility for all who participate in research activities. The concept of SIP is not static and thus, one must be willing to revisit this important topic periodically to ensure you are kept abreast of any new evidence or updates. An important update for SIP applications is to increase attention to IDEA training, evaluation, and collaboration. Whereas diverse representation is a goal for every part of the research process, there is a lack of empirical evidence on the best way to do this. Therefore, more work is needed in this area while still maintaining careful considerations when starting a new research project. This includes advancing the research related to IDEA and nutrition and dietetics, which can lead to best practices in SIP. Transparency and disclosure policies must be developed to provide guidance in which all stakeholders—funders, professional organizations, journals, academic institutions, and researchers—act together to conduct valid and informative research, provide educational opportunities for the profession and the public, and protect against financial conflicts while facilitating productive relationships.

References

1. Tappenden KA, Tappenden KA, Elliott CH, et al. A unifying vision for scientific decision making: the Academy of Nutrition and Dietetics' Scientific Integrity Principles. *J Acad Nutr Diet*. 2015;115(9):1486-1490.
2. Academy of Nutrition and Dietetics. Academy of Nutrition and Dietetics Strategic Plan. Accessed March 10, 2021. https://www.eatrightpro.org/-/media/eatrightpro-files/leadership/bod/strategic-plan/strategic-plan-april-2021__.pdf?la=en&hash=D6579FAC713B360B58730C2EFB06C51A6788B5CE
3. Academy of Nutrition and Dietetics. Making the case for research; Published 2016. Accessed September 2, 2021. https://www.eatrightpro.org/research/philosophy-and-structure/making-the-case-for-research
4. Protection of Human Subjects. Part 46.102 Definitions; Published 2021. Accessed March 10, 2021. https://ecfr.federalregister.gov/on/2021-03-10/title-28/chapter-I/part-46/section-46.102
5. Academy of Nutrition and Dietetics. Definitions of terms list; Published 2021. Accessed February 28, 2022. https://www.eatrightpro.org/-/media/eatrightpro-files/practice/scope-standards-of-practice/academydotlist.pdf?la=en&hash=ABB5F066CB33E3CD5B5998F460937A1265E897E6
6. Institute of Medicine Committee on Monitoring, Access to Personal Health Care Services. *Access to Health Care in America*. National Academies Press; 1993.
7. Office of Disease Prevention and Health Promotion. Access to health services; Published 2019. Accessed February 28, 2022. https://www.healthypeople.gov/2020/leading-health-indicators/2020-lhi-topics/Access-to-Health-Services
8. Nek R, Eisenstadt AR. *Review of Federal Agency Policies on Scientific Integrity*. Institute for Defense Analyses; 2016.
9. *The Belmont Report: Ethical Principles and Guidelines for the Protection of Human Subjects of Research*. The National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research; 1979.
10. Collaborative Institutional Training Initiative Program. The trusted standard in research, ethics, and compliance training. Accessed March 10, 2021. https://about.citiprogram.org/
11. Sierra-Mercado D, Lázaro-Muñoz G. Enhance diversity among researchers to promote participant trust in precision medicine research. *Am J Bioethics*. 2018;18(4):44-46.
12. Academy of Nutrition and Dietetics. *IDEA hub*. Accessed July 7, 2022. https://www.eatrightpro.org/practice/practice-resources/diversity-and-inclusion
13. Darcell PS, Katherine JM, Pamela J, Jonathan H, Emeobong M, Dorothy E. More than Tuskegee: understanding mistrust about research participation. *J Health Care Poor Underserved*. 2010;21(3):879-897.
14. Hand RK, Lawless ME, Deming N, Steiber AL. Development and pilot testing of a human subjects protection training course unique to registered dietitian nutritionists. *J Acad Nutr Diet*. 2014;114(12):2009-2016.
15. Academy of Nutrition and Dietetics. Steps to developing a research project: resources to help; Published 2018. Accessed March 10, 2021. https://www.eatrightpro.org/research/projects-tools-and-initiatives/nutrition-research-network/steps-to-developing-a-research-project-resources-to-help
16. National Institutes of Health. Update on the requirement for instruction in the responsible conduct of research. Accessed March 10, 2021. https://grants.nih.gov/grants/guide/notice-files/NOT-OD-10-019.html

17. *Public Health Service Policies on Research Misconduct; Final Rule. 42 Federal Register* Parts 50 and 93; 2005.

18. National Institutes of Health, Office of Intramural Research. *Responsible conduct of research training*. Accessed March 31, 2021. https://oir.nih.gov/sourcebook/ethical-conduct/responsible-conduct-research-training

19. Academy of Nutrition and Dietetics. *Institutional review board*. Accessed March 10, 2021. https://www.eatrightpro.org/-/media/eatrightpro-files/research/irb-fact-sheet.pdf?la=en&hash=24A913CAB785378F41B7FDDC89BC01465D9AF775

20. Knepper TC, McLeod HL. When will clinical trials finally reflect diversity? *Nature*. 2018;557(7704):157-159.

21. Ortega RF, Yancy CW, Mehran R, Batchelor W. Overcoming lack of diversity in cardiovascular clinical trials. *Circulation*. 2019;140(21):1690-1692.

22. Oh SS, Galanter J, Thakur N, et al. Diversity in clinical and biomedical research: a promise yet to be fulfilled. *PLOS Med*. 2015;12(12). 2015;e1001918.

23. US Dept of Health and Human Services, Food and Drug Administration, Center for Drug Evaluation and Research, Center for Biologics Evaluation and Research. *Enhancing the Diversity of Clinical Trial Populations — Eligibility Criteria, Enrollment Practices, and Trial Designs: Guidance for Industry*. National Academies Press; 2020.

24. Kretser A, Murphy D, Bertuzzi S, et al. Scientific integrity principles and best practices: recommendations from a Scientific Integrity Consortium. *Sci Engineer Ethics*. 2019;25(2):327-355.

25. Academy of Nutrition and Dietetics. Electronic Clinical Quality Measures (eCQMs). Accessed February 28, 2022. https://www.eatrightpro.org/practice/quality-management/quality-initiatives/malnutrition-quality-improvement-initiative

26. Academy of Nutrition and Dietetics. Academy guidelines for corporate sponsors; Published 2018. Accessed September 1, 2021. https://www.eatrightpro.org/about-us/advertising-and-sponsorship/about-sponsorship/academy-guidelines-for-corporate-sponsors

27. Academy of Nutrition and Dietetics. Scientific integrity principles: mini case study examples; Published 2019. Accessed June 15, 2021. https://www.eatrightpro.org/-/media/eatrightpro-files/research/sip-mini-case-studies.pdf?la=en&hash=BB6FC451A0E808633F9FC1CC567CAF72089E1401

28. Academy of Nutrition and Dietetics. Scientific integrity principles: scientific activities including research FAQs. Accessed June 15, 2021. https://www.eatrightpro.org/-/media/eatrightpro-files/research/sip-faq.pdf?la=en&hash=03A4749DC37D49766F3FFAD29B43B02E92487C7C

29. Fleischhacker SE, Woteki CE, Coates PM, et al. Strengthening national nutrition research: rationale and options for a new coordinated federal research effort and authority. *Am J Clin Nutr*. 2020;112(3):721-769.

30. Rowe S, Alexander N, Kretser A, et al. Principles for building public-private partnerships to benefit food safety, nutrition, and health research. *Nutr Rev*. 2013;71(10):682-691.

31. Kroeger CM, Garza C, Lynch CJ, et al. Scientific rigor and credibility in the nutrition research landscape. *Am J Clin Nutr*. 2018;107(3):484-494.

32. Bekelman JE, Li Y, Gross CP. Scope and impact of financial conflicts of interest in biomedical research: a systematic review. *JAMA*. 2003;289(4):454-465.

33. Cullerton K, Adams J, Forouhi N, Francis O, White M. What principles should guide interactions between population health researchers and the food industry? Systematic scoping review of peer-reviewed and grey literature. *Obes Rev*. 2019;20(8):1073-1084.

34. Besley JC, McCright AM, Zahry NR, Elliott KC, Kaminski NE, Martin JD. Perceived conflict of interest in health science partnerships. *PLOS ONE* 2017;12(4):e0175643.

35. Myers EF. Nutrition research integrity: to believe or not to believe? That is the question. *Nutr Today*. 2016;51(5):251-258.

36. Lundh A, Lexchin J, Mintzes B, Schroll JB, Bero L. Industry sponsorship and research outcome. *Cochrane Database Syst Rev*. 2017;2(2):Mr000033.

37. Sacks G, Riesenberg D, Mialon M, Dean S, Cameron AJ. The characteristics and extent of food industry involvement in peer-reviewed research articles from 10 leading nutrition-related journals in 2018. *PLOS ONE*. 2020;15(12):e0243144.

38. Chartres N, Fabbri A, Bero LA. Association of industry sponsorship with outcomes of nutrition studies. *JAMA Intern Med*. 2016;176(12):1769.

39. Myers EF, Parrott JS, Cummins DS, Splett P. Funding source and research report quality in nutrition practice-related research. *PLoS ONE*. 2011;6(12):e28437.

40. Alexander N, Rowe S, Brackett RE, et al. Achieving a transparent, actionable framework for public-private partnerships for food and nutrition research. *Am J Clin Nutr*. 2015;101(6):1359-1363.

41. Fabbri A, Chartres N, Scrinis G, Bero LA. Study sponsorship and the nutrition research agenda: analysis of randomized controlled trials included in systematic reviews of nutrition interventions to address obesity. *Public Health Nutr*. 2017;20(7):1306-1313.

42. International Committee of Medical Journal Editors. Roles and responsibilities of authors, contributors, reviewers, editors, publishers, and owners; Published 2014. Accessed January 21, 2021. http://www.icmje.org/recommendations/browse/roles-and-responsibilities/

43. Fontanarosa P, Bauchner H. Conflict of interest and medical journals. *JAMA*. 2017;317(17):1768.

44. Steinbrook R. Financial support of continuing medical education. *JAMA*. 2008;299(9):1060-1062.

45. Accreditation Council for Continuing Medical Education. CME relevant financial relationship policy and disclosure form. Accessed June 22, 2021. https://www.aafp.org/dam/AAFP/documents/cme/accreditation/cme-financial-relationship-policy-and-disclosure-form.pdf

46. Koch P, McCarthy J, Raffel C, Gray HL, Guerra LA. Expanding and enhancing food and nutrition education in New York City Public Schools: an examination of program characteristics and distribution. *Nutrients*. 2020;12(8):2423.

47. Academy of Nutrition and Dietetics. Duality of interest disclosure for speakers and presenters; Published 2018. Accessed October 10, 2021. https://www.eatrightpro.org/leadership/academy-policies/overview/duality-of-interest-disclosure-for-speakers-and-presenters

48. Drucker AM, Fleming P, Chan A-W. Research techniques made simple: assessing risk of bias in systematic reviews. *J Invest Dermatol*. 2016;136(11):e109-e114.

49. Simundic A-M. Bias in research. *Biochemia Medica. 2013:12-15*.

50. Committee on Publication Ethics. About COPE; Published 2008. Accessed September 1, 2021. https://publicationethics.org/about/our-organisation

51. Flanagin A, Frey T, Christiansen SL. Updated guidance on the reporting of race and ethnicity in medical and science journals. *JAMA*. 2021;326(7):621.

52. Lerback J, Hanson B. Journals invite too few women to referee. *Nature*. 2017;541(7638):455-457.

53. Haffar S, Bazerbachi F, Murad MH. Peer review bias: a critical review. *Mayo Clin Proc*. 2019;94(4):670-676.

54. National Institutes of Health, National Institute of Allergy and Infectious Diseases. Making a conscious effort to address unconscious bias in peer review; Published 2019. Accessed September 2, 2021. https://www.niaid.nih.gov/grants-contracts/unconscious-bias-peer-review

55. Tomkins A, Zhang M, Heavlin WD. Reviewer bias in single- versus double-blind peer review. *Proc Natl Acad Sci*. 2017;114(48):12708-12713.

56. Journal of the Academy of Nutrition and Dietetics. Guide for authors; Published 2021. Accessed September 1, 2021. https://www.elsevier.com/journals/journal-of-the-academy-of-nutrition-and-dietetics/2212-2672/guide-for-authors

57. IOP Science. Implicit bias in peer review; Published 2018. Accessed April 1, 2021. https://publishingsupport.iopscience.iop.org/questions/implicit-bias/

58. Project Implicit. Implicit Association Test; Published 2019. Accessed April 1, 2021. https://implicit.harvard.edu/implicit/takeatest.html

59. Wager L. Why we need a journal on research integrity and peer review. Accessed June 15, 2021. https://blogs.biomedcentral.com/bmcblog/2015/09/28/journal-research-integrity-peer-review/

60. Academy of Nutrition and Dietetics. What is the Code of Ethics; Published 2018. Accessed September 2, 2021. https://www.eatrightpro.org/practice/code-of-ethics/what-is-the-code-of-ethics

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