

## Commentary

# NIH Director's Pioneer Awards: Could the Selection Process Be Biased against Women?

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### ABSTRACT

One of the first National Institutes of Health (NIH) Roadmap initiatives to be launched was the Director's Pioneer Award. This award was established to "identify and fund investigators of exceptionally creative abilities and diligence, for a sufficient term (five years) to allow them to develop and test far-ranging ideas." Nine excellent scientists were chosen as NIH Pioneers, but the selection of all men is at odds with the percentage of women receiving doctoral degrees for the past three decades, serving as principal investigators on NIH research grants, and achieving recognition as scientific innovators in non-NIH award competitions. The absence of women Pioneers provokes the following question: In the context of extant research on the impact of gender-based assumptions on evaluation of men and women in traditionally male fields, such as science, were there aspects about the process of nomination, evaluation, and selection that inadvertently favored men? We present evidence to suggest that women scientists would be disadvantaged by the following components of the NIH Director's Pioneer Award initiative: (1) time pressure placed on evaluators, (2) absence of face-to-face discussion about applicants, (3) ambiguity of performance criteria, given the novelty of the award, combined with an emphasis on subjective assessment of leadership, potential achievements rather than actual accomplishments, and risk taking, (4) emphasis on self-promotion, (5) weight given to letters of recommendation, and (6) the need for finalists to make a formal, in-person presentation in which the individual and not his or her science was the focus of evaluation. We offer an analysis of this process to encourage the NIH to embark on self-study and to educate all reviewers regarding an evidence-based approach to gender and evaluation.

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## INTRODUCTION

THE NATIONAL INSTITUTES OF HEALTH (NIH) is firmly committed to advancing women in biomedical careers.<sup>1</sup> As one visible example, the National Library of Medicine's current exhibition, "Changing the Face of Medicine," sincerely "honors the lives and achievements of women in medicine" and aims to "inspire a new generation of medical pioneers."<sup>2</sup> One of the first NIH Roadmap initiatives to be launched was the Director's Pioneer Award.<sup>3,4</sup> This award was established to "identify and fund investigators of exceptionally creative abilities and diligence, for a sufficient term (five years) to allow them to develop and test far-ranging ideas." NIH officials estimate that women comprised 20% of approximately 1300 initial Pioneer applicants (phase 1) and about 13% of the 240 who underwent external scientific review (phase 2). Two of the 21 finalists invited for interviews and none of the final 9 selected were women.<sup>5</sup> Given the unambiguous commitment of the NIH to increasing the participation and advancement of women scientists, their absence among the recipients of the NIH Director's Pioneer Award is striking.

Women currently receive 45% of doctoral degrees in biological sciences,<sup>6,7</sup> comprise 30% of full-time faculty at U.S. academic medical centers,<sup>8</sup> account for 20% of the Howard Hughes Medical Investigator Awards<sup>9</sup> and 50% of the MacArthur Fellows Program awards (the "genius awards"),<sup>10</sup> and successfully compete for 23% of NIH grants.<sup>11</sup> If we assume the pool of eligible applicants for the NIH Pioneer Award resembled the pool of NIH R01 applicants,<sup>5</sup> 25% of the applicant pool would be women. The probability of 20% women in the Pioneer pool vs. the expected 25% occurring by chance alone is  $p < 0.001$  (binomial test). The probability of 13% women progressing to phase 2 vs. either the expected 25% or the actual 20% is  $p < 0.01$  (binomial test). The probability of selecting 1, 2, 3, or  $\geq 4$  women exceeds that of selecting no women although the small numbers in the final pool, 10% of those interviewed and 0% of those awarded are not statistically different from either the expected 25% or the proportion of women at any other level in the review process. The nine NIH Pioneers are undoubtedly qualified for recognition. However, given the gender distribution of active scientists and acknowledged innovators, it seems unlikely

that none of the nine awardees would be a woman unless some aspect of the solicitation, evaluation, or selection process was carried out in such a way that advantaged men.

Considerable research documents how unconscious assumptions about gendered traits and behaviors lead to more favorable evaluations of men and the work performed by men than women and the work performed by women even if the work is identical and even if those involved are committed to objectivity and equity.<sup>12</sup> To understand this phenomenon, numerous scholars<sup>13-16</sup> contend that widely shared, culturally ingrained assumptions about the nature of men and women contribute to unintentional discriminatory treatment of women. These assumptions are based on behaviors that can be descriptive, in that they describe actual differences in the way men and women usually behave (e.g., women predominantly occupy supportive staff jobs, whereas men predominate in top leadership positions), or prescriptive. Prescriptive behaviors, based on descriptive behaviors, underpin unconscious beliefs about the way men and women in the abstract should and should not act. For women, prescriptive characteristics are typically in the realm of being supportive, communal, and nurturing, whereas for men, they are typically in the realm of being independent, decisive, and strong. Despite multiple examples of individual men and women whose behavior is not constrained to these gendered assumptions, the unconscious application of such assumptions to men and women as abstract groups is nearly universal.

Two important points emerge from this body of work: (1) the unconscious assumptions about the way leaders, scientists, and innovators behave align with prescriptive attributes ascribed to men far more than those ascribed to women, giving men an advantage at the outset in evaluation in these domains, and (2) both men and women pay social penalties for exhibiting behaviors that violate gender prescriptions. The latter becomes clear when we examine the pejorative descriptors that exist in our language for both men (e.g., "wimpy," "effeminate") and women (e.g., "butch," "domineering") whose behavior violates prescriptive gender norms. More relevant to the selection of NIH Pioneers is the potential for social penalties for women who may violate prescriptive gender norms in their success as excellent scientists and strong leaders.

Controlled experimental studies reveal that certain conditions can promote the activation of unconscious, gender-based assumptions in the evaluation of individuals and their work leading to more positive evaluations of men than women, particularly in positions traditionally held by men. The process of recruiting and evaluating candidates for the NIH Director's Pioneer Award<sup>4</sup> includes several elements that would be predicted to infuse positive bias toward evaluation and selection of men. These include (1) time pressure placed on evaluators, (2) absence of face-to-face discussion about applicants, (3) ambiguity of performance criteria given the novelty of the award combined with an emphasis on subjective assessment of leadership, potential achievements rather than actual accomplishments, and risk taking, (4) emphasis on self-promotion, (5) weight given to letters of recommendation, and (6) the need for finalists to make a formal in-person presentation in which the individual and not his or her science was the focus of evaluation. We review each of these in the context of research on gender and evaluation, highlighting several particularly salient studies that support the existence of unintentional, unconscious bias favoring selection of men. A consistent finding in this body of research is that the gender of the evaluator has little if any impact; that is, both men and women equally provide lower evaluations of women and the work performed by women than of men and the work performed by men. Therefore, we note here that in the NIH Pioneer Award, 60 of 64 (94%) of the reviewers were men, and 7 of 8 of those on the panel who interviewed the finalists were men,<sup>5</sup> but we do not find research to support that this overrepresentation of men among the evaluators would be responsible for additional disadvantage to women.

### TIME PRESSURE

The NIH website notes that for the Director's Pioneer initiative, "the application form is highly abbreviated and turnaround is accelerated."<sup>4</sup> NIH staff who screened applications added this initiative on to their existing institute responsibilities. Relevant to this issue is a controlled study performed by Martell<sup>17</sup> investigating the impact of time pressure and heightened attentional demand on evaluation of men and women performing identical work as police officers, a traditionally male job. In this study, 77 male and 125

female participants were asked to evaluate the performance of male or female police officers in descriptive vignettes containing pretested ineffective and effective behaviors. In the absence of time pressure or cognitive distraction (i.e., multitasking), the police officer's gender had no influence on performance evaluations. However, when time pressure and heightened attentional demand were added, male officers were consistently evaluated more favorably than female officers. Martell notes that the ability of the human brain to organize information around assumptions enables cognitive efficiency and is adaptive to successful functioning in a complex environment. It is efficient, for example, to be able to assume that because previous chairs have not collapsed, it is unnecessary to test the stability of each chair every time we sit down: we apply group assumptions about chairs to individual chairs without any conscious thought. Similarly, because most police officers are men, past experiences with police officers combined with prescriptive gendered behavioral assumptions lead to an unconscious tendency, by both male and female evaluators, to assume that men will be more competent police officers than women. The addition of time pressure and the need to multitask reduced the ability of evaluators to focus carefully on the performance of each individual police officer. The requirement for cognitive efficiency appears to have been achieved by relying on unconscious assumptions that men would be more competent police officers. This conclusion is strengthened by the finding that evaluators under time pressure and heightened attentional demand not only evaluated male police officers more favorably than women but also evaluated male police officers more favorably under these conditions than the same male police officers evaluated in the absence of distraction or time pressure.

Martell's study<sup>17</sup> is directly relevant to the NIH Director's Pioneer review process. As with police officers, the large majority of senior scientists still are men, and men occupy nearly all the publicly visible leadership positions in science. Despite the tremendous change in social roles of women over the past several decades, in 1990, elementary school students asked to draw a scientist overwhelmingly drew men.<sup>18</sup> In 2000, Rudman and Kilianski<sup>14</sup> found that both men and women in an ethnically diverse group of evaluators held implicit assumptions that men make better scientists

and other high authority figures than women. Martell<sup>17</sup> notes that when the cognitive demands are high, relying on such assumptions is efficient but will invariably favor men over women in the evaluation of work that is historically or predominantly performed by men.

### ABSENCE OF FACE-TO-FACE DISCUSSION OF CANDIDATES

Unlike most grant proposal reviews performed at NIH, the Director's Pioneer Awards did not convene a study section-type format.<sup>4</sup> Following screening by NIH staff, each application was assigned to three outside reviewers, who performed and submitted their assessments electronically without a group discussion. The findings of Wenneras and Wold<sup>19</sup> are particularly relevant to this aspect of the review process. They examined 114 applications for prestigious postdoctoral research fellowships awarded by the Medical Research Council of Sweden. The applications were evaluated by a review group comprising top Swedish scientists who presumably consider themselves objective. The authors assigned impact points to each applicant by deriving a standardized productivity metric based on the number of publications, number of first-authored publications, prestige of the journal, and number of times the paper was cited. Wenneras and Wold<sup>19</sup> found that gender was a significant predictor of the evaluators' ratings of an applicant's competence. To even the score, women needed to have 2.5 times the number of publications as their male colleagues. Furthermore, although the relationship between publications and competence was clearly linear for men, the slope of this association was flat for women, such that women with 20 impact points received the same competence score as women with 99 impact points. In multivariate regression models, the investigators examined the influence of the following factors on reviewers' assessment of competence: gender, nationality, education, scientific field, university affiliation, review committee assignment, postdoctoral experience abroad, presence of a letter of recommendation, and whether the applicant was affiliated with any member of the review committee. The most potent modifying variable in raising the evaluation of competence for women scientists in this Swedish study was whether they were affiliated with a member

of the committee. Knowing someone on the committee provided the same magnitude of advantage as being male. Such affiliation was known because it was recorded on the evaluation protocols, and this precluded that reviewer from scoring the affiliated applicant. Therefore, it was the impact of the presence of a committee member affiliated with an applicant on members who did not know this applicant that overcame the gender disadvantage in the evaluation of competence. Extrapolating the findings of Wenneras and Wold<sup>19</sup> to the NIH Pioneer Award review process, the lack of a face-to-face meeting to discuss nominees may have constituted an unintentional yet insurmountable disadvantage to women in the review process.

### AMBIGUITY OF PERFORMANCE CRITERIA

Multiple studies, largely from cognitive and social psychology, find that whenever ambiguity or uncertainty exists in evaluating performance in a traditionally male gendered job, men are consistently evaluated as being more competent and possessing more achievement-related characteristics than women performing the same work.<sup>13-16</sup> The NIH Pioneer Awards were proclaimed as "novel" and "separate and completely different," and rather than the typical grant for a detailed research proposal, the Pioneer award was described as an "idea award" in which the "procedure for assessing applicants . . . will be distinct from the traditional NIH peer review." In contrast to the usual NIH application, the Pioneer Award did not use the PHS 398 form, no scientific plan was requested from the applicants, the focus was on the individual scientist rather than proposed research, the review process varied from the standard study section format, and the program was administered directly through the Director's office.<sup>4</sup> Although this process may well have fostered the flexibility needed to identify innovative and creative researchers, the unfamiliarity of such conditions for review and award undoubtedly created ambiguities and uncertainties throughout the selection process.

The recent work of Heilman et al.<sup>20</sup> is particularly relevant because in a series of studies they reaffirm this male advantage when performance in a leadership role (assistant vice president) is ambiguous but find that the gender difference in

assessment of competence disappears when clear evidence of high performance is provided (rated “stellar” and in the “top 5%” on annual evaluations). Also relevant to the Director’s Pioneer selection process, Biernat and Fuegen<sup>21</sup> found that when reviewers of applicants for a male gendered job (mechanical engineer) were told that they would need to provide justification for their selection, women were even less likely than men to be selected. The authors speculate that this is due to the tacit assumption that more justification would be required to hire a woman than a man for such a position. A similar justification was required by nominators for the Pioneer Awards, who were instructed that their “letter will explain why the nominee should be considered exceptional,” and caution was issued that “because of the experimental nature of the program, systematic evaluation will be a critical element [in] . . . making new awards. . . .”

Neither Heilman et al.<sup>20</sup> nor Biernat and Fuegen<sup>21</sup> studied evaluation in an academic setting where it might be conjectured that scientists steeped in objectivity would adopt a more gender-blind assessment of competence. Steinpreis et al.,<sup>22</sup> however, confirmed that academia is not immune to gender bias in evaluation of work. These researchers sent identical curricula vitae with a gendered male or female name of a junior or more senior job applicant to a national sample of academic psychologists. Despite identical records, both men ( $n = 118$ ) and women ( $n = 120$ ) were more likely to vote to hire a male applicant than a female applicant and gave more positive evaluations to the research, teaching, and service achievements of a male applicant than the same accomplishments of a female applicant.

Because men continue to occupy top leadership positions in nearly every field, male advantage in performance expectation occurs for leadership in general. However, as Eagly and Karau<sup>13</sup> discuss in their review, research in controlled settings confirms that women are particularly disadvantaged when the description of leadership emphasizes prescriptive male leadership traits (e.g., strong, independent, action oriented, risk taking) over prescriptive female traits (e.g., collaborative, consensus building, relationship nurturing).<sup>13,16</sup> The need to be a risk taker is repeatedly stressed in the description of eligibility for the Director’s Pioneer Award. Although all innovative scientists consistently take calculated risks, being de-

scribed as a risk taker would generally align with male rather than female or gender-neutral descriptive and prescriptive behaviors. Specific emphasis on risk taking includes the following statements in the description of the program or the ideal Pioneer: “support for more aggressive risk taking and innovation,” “willing and able to explore ideas that were considered risky,” “foster high-risk research,” “an inclination to challenge paradigms and take intellectual risks,” “encouraging of high-risk/high-impact research.”<sup>4</sup> The URL itself for the website includes the word “highrisk.” Thus, the case could be made that the NIH placed great value on prescriptive male traits for its first group of Pioneers. The term “pioneer” itself alludes to strong, male frontiersmen.

Ideal NIH Pioneers were to have “exceptional promise,” and selection was “based on review of the individual’s potential, to make seminal contributions.” The emphasis on promise, potential and future work rather than past achievements in the absence of objective evaluation criteria would be predicted to advantage men in two ways: (1) the positive performance expectation afforded men through the unconscious assumption of greater competence consistently enhances evaluation of men over women,<sup>14–16</sup> and (2) because women scientists have historically faced additional barriers to career advancement,<sup>12,23,24</sup> men actually have had greater opportunity to become scientific leaders.

### EMPHASIS ON SELF-PROMOTION

Self-nomination for the NIH Director’s Pioneer Awards was welcome, and all applicants were required to submit a 3–5-page personal essay promoting themselves. Summarizing research on gender differences in self-promotion, Babcock and Laschever<sup>25</sup> conclude that girls and women are socialized from an early age not to self-promote. The recurrent admonition to girls not to brag or show off is so deeply embedded in gender norms of behavior, they posit, that not only is it difficult for women to engage in self-promotion, but self-promoting women are viewed negatively and susceptible to social penalties. Miller et al.,<sup>26</sup> for example, found that when students were given a written “boasting” statement, their assessment of likability of the author was much lower if they thought it was written by a woman

than if they thought the author was a man. Other research has shown that likability is an independent predictor of recommendation for advancement.<sup>20</sup> Rudman<sup>27</sup> performed a series of experiments with simulated job interviews in which students interviewed scripted actors who were self-promoting or self-effacing about their expertise at a computer game. The purpose was to select a partner, with the goal of receiving a fifty dollar prize if together they won the game. Self-promoting men were favored for hiring over self-promoting women even at the risk of losing the prize. In light of existing research, therefore, the requirement to self-promote for 3–5 pages would be predicted to be an easier task for men than for women. It is also plausible that because self-promotion violates prescriptive behavioral norms, women applicants who did so effectively would actually be put at a disadvantage in the review process.

#### WEIGHT GIVEN TO LETTERS OF RECOMMENDATION

Each applicant for the Director's Pioneer Award needed three letters of recommendation. Because the applications themselves were short, the letters presumably carried considerable weight in the review. Trix and Psenka<sup>28</sup> found significant differences in letters of recommendation written for men and for women. They evaluated 312 letters written for 103 faculty members hired at an academic medical center. Based on their evidence, if this gender difference is pervasive in academic settings, the letters for female compared with male applicants for NIH Pioneer Awards would be expected to be significantly shorter, have more references to personal life or family despite their shorter length, include more gender terms, such as "extremely intelligent and insightful woman," contain fewer standout adjectives, such as "excellent," "outstanding," or "superb," have more statements that were neutral but raised doubt (e.g., "Although I can't specifically comment on . . ."), and have more gender stereotypic adjectives (e.g., "compassionate" for women, "risk taker" for men). Any of these differences would be enough to disadvantage women competing for top leadership positions, such as the Pioneer Awards, which were specifically to target the "most competitive nominees."

#### FORMAL PRESENTATION TO JUDGE THE INDIVIDUAL AND NOT HIS OR HER SCIENCE

There is evidence to suggest that making a presentation in person to the reviewers who were constrained to judge the individual and not a specific scientific proposal would favor male applicants for the Director's Pioneer Award. As emphasized by the Institute of Medicine, the three major traits that immediately provoke unconscious assumptions, biases, or stereotypes are gender, race/ethnicity, and age because they are so visible.<sup>29</sup> Male scientists would be more likely to match the unconscious assumptions of evaluators about what a scientist, risk taker, and pioneer would look like and, thus, be afforded an immediate advantage. Evidence in support of this includes a study by Butler and Geis<sup>30</sup> that found that men and women performing as leaders from an identical script received the same competency ratings from observers, but women were more likely to evoke nonverbal indicators of negative affect (e.g., frowning, furrowed brow) and have negative adjectives attributed to their personalities. The importance of women's physical appearance in performance evaluations is supported by Heilman and Stopeck,<sup>31</sup> who found that evaluators of corporate leaders were more likely to attribute the success of attractive women to luck and unattractive women to ability. Valian<sup>12</sup> concludes that women who strive to be seen as effective leaders are afforded a narrow range of behaviors because if they appear too feminine, they risk triggering gender-based assumptions of lesser competence, and if they appear too masculine, they risk the social penalties that accompany violation of prescriptive gender norms of behavior. It stands to reason that women nominees for the NIH Pioneer Awards, compared with their male counterparts, would similarly be afforded a narrower range of behaviors to be seen as viable candidates for such a top leadership award.

#### CONCLUSIONS

The NIH is the premier research institution in the world and is comprised of individuals at all levels who value science and the use of scientific methods to find truth. Applying the results of

clinical research is increasingly emphasized as a goal in evidence-based practice.<sup>32</sup> In its definition of clinical research, the NIH includes “research conducted with human subjects . . . for which an investigator (or colleague) directly interacts with human subjects” and specifically includes “behavioral studies.”<sup>33</sup> Thus, research on the impact of unconscious assumptions on the outcome of scientific review falls within the domain of clinical research. It follows logically that the NIH would strive to make its own grant review and award process evidence based. We offer the above analysis of the NIH Director’s Pioneer Award evaluation and selection process to encourage the NIH to embark on self-study of its own review processes and consider earmarking competitive funding for research proposals that would undertake controlled and blinded investigations of scientific review. At the very least, in the spirit of evidence-based practice, the NIH should insist that the best available evidence be applied to the review process for the next round of NIH Director’s Pioneer Awards. Specifically, this could involve educating all reviewers about the existing research on gender and evaluation, emphasizing both female and male gendered prescriptive behaviors for leadership (perhaps including examples or pictures of a diverse group of men and women scientists), encouraging NIH staff and scientific reviewers to dedicate sufficient time to studying each application thoroughly, and meeting as a committee to discuss applicants. It is in the best interests of our nation to strive to assure that the most innovative science, regardless of the gender of the scientist, will receive unbiased review in the next round of the Director’s Pioneer Awards.

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