

# Interventions That Affect Gender Bias in Hiring: A Systematic Review

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## Abstract

### Purpose

To systematically review experimental evidence for interventions mitigating gender bias in employment. Unconscious endorsement of gender stereotypes can undermine academic medicine's commitment to gender equity.

### Method

The authors performed electronic and hand searches for randomized controlled studies since 1973 of interventions that affect gender differences in evaluation of job applicants. Twenty-seven studies met all inclusion criteria. Interventions fell into three categories: application information, applicant features, and rating conditions.

### Results

The studies identified gender bias as the difference in ratings or perceptions of men and women with identical qualifications. Studies reaffirmed negative bias against women being evaluated for positions traditionally or predominantly held by men (male sex-typed jobs). The assessments of male and female raters rarely differed. Interventions that provided raters with clear evidence of job-relevant competencies were effective. However, clearly competent women were rated lower than equivalent men for male sex-typed jobs unless evidence of communal qualities was also provided. A commitment to the value of credentials before review of applicants and women's presence at above 25% of the applicant

pool eliminated bias against women.

Two studies found unconscious resistance to "antibias" training, which could be overcome with distraction or an intervening task. Explicit employment equity policies and an attractive appearance benefited men more than women, whereas repeated employment gaps were more detrimental to men. Masculine-scented perfume favored the hiring of both sexes. Negative bias occurred against women who expressed anger or who were perceived as self-promoting.

### Conclusions

High-level evidence exists for strategies to mitigate gender bias in hiring.

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The success of female physicians is recognized and celebrated both in popular television series such as "ER," "Providence," and "Strong Medicine" and by the National Library of Medicine.<sup>1</sup> Despite explicit support for gender equity in academic medicine, however, female physicians advance more slowly toward seniority than do male physicians, earn

less than male physicians in similar positions, and have not entered the ranks of leadership at rates predicted by their proportional presence in academic medicine for the past 30 years.<sup>2–4</sup>

Physicians are committed to evidence-based practice.<sup>5</sup> Studies with random assignment of participants to an intervention or control group, in particular, provide high levels of evidence in informing physician decision making.<sup>5,6</sup> Decades of social cognitive research exists on how gender stereotypes lead to assumptions—both implicit (unconscious) and explicit (conscious)—that consistently impede women's advancement in historically male-dominant fields.<sup>7,8</sup> The success of a job applicant in obtaining a position is a major determinant of that person's ability to advance in any career. To facilitate the adoption of evidence-based employment practices in academic medicine, we performed a systematic review of studies with randomized controlled designs that investigated the impact of an intervention on the activation and application of gender bias in hiring settings.

## Method

### Study selection

The studies we selected met the following inclusion criteria: random assignment of participants to the intervention or control group, assumption by participants of the role of personnel decision makers evaluating applicants for employment, publication after 1972 (the year that Congress passed the Title IX Amendment<sup>1</sup> to the Civil Rights Act), blinding of participants to the intervention, the presence of both men and women in the contrived applicant pool and the participant (rater) groups, and comparison of the impact of an intervention on ratings of male and female applicants with identical qualifications. We excluded studies that

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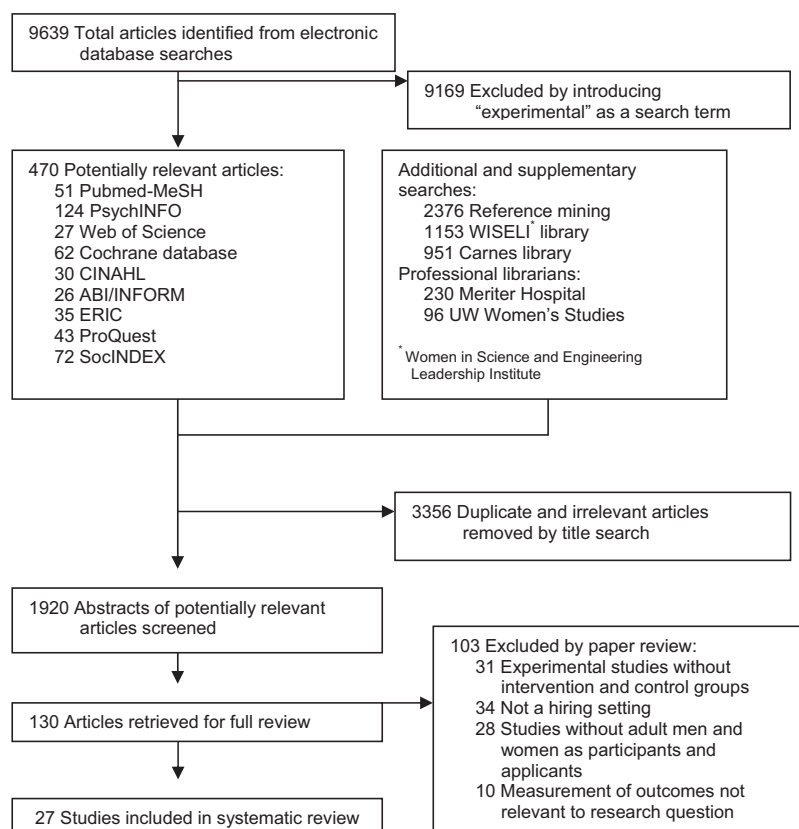
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assessed bias only by reaction time or accuracy in matching gender-linked stereotypic words or pictures, studies in which the participants were stated to be less than 18 years old, studies with only women in the applicant pool (e.g., pregnant and nonpregnant participants), and studies that did not specifically indicate random assignment of the intervention. We also excluded dissertations, letters, and abstracts. Although searches had no language restriction, all studies identified were in English. When the presence of an inclusion criterion was in doubt, the authors achieved resolution through consensus. This effort usually involved distinguishing between an intervention that had an impact on gender bias and one that simply documented gender bias in a different hiring setting (e.g., jobs supervising men or women<sup>9</sup>).

### Data sources and search strategy

The authors electronically searched the following sites from 1973 (when possible) to June 2008: PubMed, PsychINFO, Web of Science (including Social Science Citation Index), Cochrane Library, CINAHL, ProQuest, ABI/INFORM (U.S. and international articles on business and management), ERIC, and SocINDEX. Terms entered from the Medical Subject Headings (MeSH) of the National Library of Medicine were Human, Female, Prejudice, and Stereotype(s). Other terms entered individually or in combination were Gender, Women, Hire/hiring, Bias, Sex roles, Sex, Discrimination, and Research. The authors narrowed database searches using the term Experimental to identify studies with randomized controlled designs. Professional librarians performed supplemental searches of ProQuest, PubMed, and Women's Studies International. Additional reference mining included selected author searches, hand searches of bibliographies of retrieved studies and meta-analyses, and review of files of senior faculty who study gender and leadership. The search was considered saturated when relevant articles reappeared in multiple searches. The authors identified and reviewed abstracts from citations through each of the above searches ( $N = 1,920$ ) and retrieved and examined articles that seemed to meet inclusion criteria (Figure 1). Because of the heterogeneity in interventions and outcomes, the data were not pooled.



**Figure 1** Search strategy and final selection of studies for inclusion in systematic review. UW, University of Wisconsin; WISELI, Women in Science and Engineering Leadership Institute.

### Data extraction

We three authors independently reviewed in detail 130 studies. One of us (B.L.), a statistician, evaluated articles for quality and effectiveness of controls, validity checks on interventions, and appropriateness of statistical tests. We scored articles for quality by using a modified Jadad numerical system of one to four points (a point was allowed for single blinding).<sup>10</sup> Inclusion required a score of at least 2. After verification of inclusion criteria, we extracted the following information: author, year, and country in which study was performed; intervention; outcome variables; study design; demographic information on study participants (i.e., gender and race-ethnicity); the construct measured; results; and the  $P$  values of statistical procedures.

When an article described more than one experiment, we included only those substudies that met our inclusion criteria. If more than one of the substudies in a given paper met the criteria, we reviewed each one but still counted the citation as one study. Twenty-seven studies met all inclusion criteria. See the Appendix (<http://links.lww.com/ACADMED/A1>).

The Jadad score was 3 for 4 of the studies<sup>11–14</sup> and 2 for the other 23 studies.

## Results

### Overview of selected studies

Participants in 18 of the 27 studies were college students. Other studies used business (MBA) or graduate students (3 studies and 1 substudy),<sup>15–18</sup> managers,<sup>12,19,20</sup> adult workers,<sup>21,22</sup> and members of human resource associations.<sup>14</sup> Twenty-three studies were conducted in the United States: 3 at specified universities,<sup>11,13,17</sup> 7 in identified regions,<sup>12,14,19–21,23,24</sup> and 13 at unspecified locations. Two studies were conducted in the Netherlands<sup>25,26</sup> and 2 in Germany.<sup>27,28</sup> Participants in all studies were categorized by gender; 11 had descriptors of age (means or ranges),<sup>13,14,17,19,21,23,27–31</sup> and 2 provided some description of race and ethnicity.<sup>21,23</sup> Whites made up 72% to 90% of participants in these two studies. Studies established applicant gender visually by photograph<sup>19,28,29,32–36</sup> or video,<sup>13,21,37</sup> designation of sex on the application,<sup>18,24</sup> in-person interview,<sup>27,37</sup> and/or the use of gendered names and pronouns (modifications of the Goldberg paradigm<sup>38</sup>).<sup>11,12,14–18,22–32,34</sup> Twenty-four studies<sup>11–13,15,16,18–30,32,34–37,39</sup> examined

gender bias in decision making with regard to applicants for “male sex-typed jobs,” the term applied in much of this research to positions historically or predominantly occupied by men and/or assumed to require stereotypically male traits. Such positions included mechanical engineer,<sup>11,24</sup> assistant vice president for financial affairs,<sup>18</sup> chair of a district’s association of physicians,<sup>25,26</sup> sales manager for a heavy-machinery company,<sup>12</sup> high-ranking chief executive officer,<sup>21</sup> and police officer.<sup>22,39</sup> Twelve studies<sup>12–14,17,21,24,27,30,33,34,36,39</sup> examined outcomes for female sex-typed jobs (e.g., nurse,<sup>39</sup> dental receptionist,<sup>12</sup> and day care worker<sup>24</sup>) or gender-neutral jobs (e.g., copy editor,<sup>24</sup> assistant trainee,<sup>21</sup> and compensation analyst<sup>14</sup>). One study<sup>13</sup> manipulated the sex-typing of a neutral job (computer lab manager) by emphasizing the requirement of either stereotypic male traits (i.e., technically skilled and able to work under pressure) or stereotypic female traits (i.e., helpfulness and sensitivity to coworkers). Studies confirmed job sex-typing with pretested scales<sup>11,22–24,26–29,35</sup> or previous studies<sup>12–17,19–22,25,27,28,30–34,36,37</sup> that used, for example, job sex-typing inventories.<sup>40–44</sup> Twenty-three studies used ANOVA,<sup>11–27,29,30,32–34,36,37</sup> MANOVA,<sup>14,16,19,35</sup> or ANCOVA<sup>28,36</sup> to compare main effects of the intervention and other independent variables and to test for interactions with gender on the dependent variables of interest. These comparisons were followed by individual comparisons of findings for male and female applicants with previously planned contrasts or appropriate post hoc tests. The remaining study used the chi-square test.<sup>31</sup>

All but one study<sup>24</sup> confirmed that male applicants are evaluated more positively than female applicants for employment in male sex-typed jobs. See the Appendix (<http://links.lww.com/ACADMED/A1>). It was easier for men than for women with identical qualifications to be recommended for advancement in the job-acquisition process, such as being granted an interview or being hired. Other than in a few comparisons within six studies,<sup>11,22,24,28,33,37</sup> male and female participants did not differ in their ratings. Interventions fell into one of three categories (List 1): varying the information provided to raters in the written application (12 studies); changing the behavior, scent, or appearance of the applicant (9 studies); or altering the

## List 1

### Three categories of interventions on gender bias in hiring settings as found in a review of 27 published reports from 1973 to 2008\*

#### Information provided to raters in application

- Job-relevant individuating information (educational background,<sup>16,17,24</sup> past work experience,<sup>33</sup> scholastic standing,<sup>24,33</sup> personality,<sup>30</sup> performance ability<sup>29</sup>)
- Gender stereotypic, counterstereotypic, or neutral individuating information<sup>12,13,16,30,33,34</sup>
- Parental status<sup>17,18,23</sup>
- Ambiguous or explicit gender<sup>34</sup>
- Marital status<sup>17</sup>
- Life philosophy statements<sup>13</sup>
- Employment discontinuities<sup>14</sup>

#### Applicant behavior, scent, or appearance

- Physical attractiveness<sup>19,28,32,33,36</sup>
- Interview style (self-promoting or self-effacing speech and mannerisms<sup>37</sup>; direct, self-confident [agentive] interview style<sup>13</sup>)
- Masculine or feminine appearance<sup>28</sup>
- Masculine, feminine, or no perfume<sup>27</sup>
- Expression of anger<sup>21</sup>

#### Conditions under which raters assessed applicants

- Threat of accountability<sup>11</sup>
- Order of rating separate qualifications and providing summary judgments<sup>32</sup>
- Priming with counterstereotypic information<sup>35</sup>
- Proportion of women in the applicant pool<sup>15</sup>
- Evaluation after counterstereotype training, with or without distraction or filler task<sup>25</sup>
- Evaluation after counterstereotype training, before or after trait rating task<sup>26</sup>
- Employment equity directives<sup>20,39</sup>
- Attentional demand during evaluation<sup>28</sup>
- Commitment to value of credentials before or after reviewing applicants<sup>22</sup>

\* The categories were (1) varying the information provided to raters in the application ( $n = 12$ ), (2) changing the behavior, scent, or appearance of the applicant ( $n = 9$ ), and (3) altering the conditions under which raters assessed applicants ( $n = 10$ ).

conditions under which raters assessed applicants (10 studies). Four studies had interventions in two of the categories.<sup>13,28,32,33</sup>

#### Information provided to raters in written applications

Six of the 12 studies in this group assessed the impact on bias against female applicants for a male sex-typed job of providing clear evidence of job-related competence (relevant educational or work background,<sup>16,17,24,33</sup> high scholastic standing,<sup>24,33</sup> job-congruent personality characteristics,<sup>30</sup> or designation as a “finalist in the job competition” by “a panel of experts”<sup>29</sup>). Such individuating information was effective in reducing<sup>24,30,33</sup> or eliminating<sup>16,17,29</sup> hiring bias. Other studies assessed the impact of matching gender-stereotypic, gender-counterstereotypic, or gender-neutral traits of applicants with job sex-type.<sup>12,13,16,30,33,34</sup> For example, Futoran

and Wyer<sup>34</sup> selected traits shown to be gender-linked on the Bem Sex Role Inventory<sup>40</sup> (i.e., aggressive, competitive, industrious, and outgoing for males, and appreciative, considerate, gentle, and helpful for females) to describe male, female, or gender-ambiguous candidates for jobs that normative occupational data studies have shown to be considered to require stereotypic male or female traits. Both an applicant’s gender and traits influenced job suitability ratings. Heilman<sup>16</sup> found that including positive but job-irrelevant information about female applicants (e.g., having a biology/political science degree rather than a business/economics degree when applying for a lower management position) resulted in lower ratings than did the absence of such information. Glick and colleagues<sup>12</sup> provided individuating information that

established gender-counterstereotypic personality traits (e.g., men working in retail sales at a jewelry store and women working in grounds maintenance) but that was job-irrelevant; they found higher employability ratings for both male and female applicants with stereotypic masculine traits, although the preference of raters for a match between job sex-type and applicant gender remained. To measure the degree of gender stereotyping, the participants in the study by Heilman<sup>16</sup> assessed applicants by using five adjectival scales associated with gender-related work attributes (e.g., emotional–rational, ambitious–unambitious, tough–soft). Providing a high degree of job-relevant information about a female applicant eliminated the difference in gender stereotyping between male and female applicants seen with low job-relevant information or no information. Furthermore, when composites of these adjectival scores were covaried with applicant ratings, the perceptions of gender-related attributes rather than the applicant's actual gender accounted for assessments of hireability and of potential for advancement. Rudman and Glick<sup>13</sup> found that highly competent female applicants benefited from applications that included a written “life philosophy” endorsing communal (stereotypically female) rather than agentic (stereotypically male) values, particularly when they were applying for female sex-typed jobs.

Two studies examined the impact of including information on parental status in the application.<sup>18,23</sup> Male and female applicants without children received comparable ratings on all employment-relevant measures. Parenthood resulted in lower ratings for both male and female applicants, but women whose applications indicated that they had children were more disadvantaged. Although both female and male parents were rated as less committed and less dependable than nonparents, only female applicants with children were rated lower on measures of hiring and promotion.<sup>18,23</sup> One study included both marital and parental status information in the applications.<sup>17</sup> Marital status had little effect on applicant ratings, although married men with children and single women were ranked as the most suitable applicants for two neutral sex-typed positions. One study examined the impact of applications that contained discontinuities in employment and found

that men were generally judged more harshly than women in such cases.<sup>14</sup>

One study compared the effect of gender ambiguity in the application.<sup>34</sup> When an applicant's gender was apparent from the application, women were disadvantaged; however, when applicants had gender-ambiguous names (e.g., Pat or Chris), job suitability was based solely on the applicants' qualifications (even if the inferred gender was female).

#### **Applicant behavior, scent, or appearance**

Three studies assessed the impact of interview behavior on gender bias.<sup>13,21,37</sup> All found negative reactions to women who exhibited stereotypic male behaviors. Rudman<sup>37</sup> found that, when applicants of either gender violated behavioral norms—men by being self-effacing and women by being self-promoting—both were rated lower than applicants who behaved in a more gender-congruent manner. In one of the few differences by participant gender, female raters judged self-promoting women more harshly than did male raters. Rudman and Glick<sup>13</sup> found that women who exhibited an agentic interview style were rated lower on social skills than were men, although this difference was eliminated when women's applications included a communal life philosophy statement. Brescoll and Uhlmann<sup>21</sup> found that the expression of anger by an applicant enhanced the evaluation of men and lowered the evaluation of women, particularly women applying for a high-status position. The existence of a specific external cause for anger mitigated but did not eliminate the negative bias toward women; external attribution for anger improved the status and salary ratings for women who expressed anger but had no impact on the lower rating of competence.

Sczesny and Stahlberg<sup>27</sup> and Sczesny and Kühnen<sup>28</sup> found that visual and olfactory cues can activate gender stereotypes independent of the actual biological sex of the applicant. Male and female applicants wearing a masculine-scented perfume or submitting paper applications to which such a scent was applied received more positive ratings than did identically qualified applicants who used a feminine scent.<sup>27</sup> This group also found that both men and women who looked more stereotypically masculine in photographs were favored for hiring into a leadership position.<sup>28</sup>

Five studies examined the impact of physical attractiveness and found that overall attractiveness is advantageous, but more so for men than women.<sup>19,28,32,33,36</sup> Highly attractive women can be disadvantaged in applying for male sex-typed jobs, and less attractive women can be disadvantaged in applying for female sex-typed and neutral jobs. Heilman and Saruwatari<sup>36</sup> found that attractiveness predicted ratings of stereotypic male or female traits among applicants and that, when these ratings were factored out, the impact of attractiveness was eliminated.

#### **Conditions under which raters assessed applicants**

Five studies sought to manipulate automatic gender bias in hiring by informing raters of employment equity directives<sup>11,20,39</sup> or by prior training of raters with an exercise to decrease the response time to gender-counterstereotypic word associations.<sup>25,26</sup> In response to employment equity directives, Ng and Wiesner<sup>39</sup> found that men who were less qualified than women for a female sex-typed job (i.e., nurse) were more likely to be hired, but this positive bias for the underrepresented candidate did not hold true for women who were less qualified than male applicants for a male sex-typed job (i.e., police officer). In the study by Biernat and Fiegen,<sup>11</sup> raters with the expectancy of accountability for their hiring decisions were less likely to hire a female applicant. Rosen and Mericle<sup>20</sup> found that, even under strong employment equity directives, female applicants were recommended for lower salaries than were men with identical qualifications. Kawakami and colleagues<sup>25,26</sup> engaged raters in “antibias” training that successfully reduced response time in matching gender-counterstereotypic words that were displayed sequentially on a computer screen. However, this training did not reduce gender bias in a subsequent mock-hiring situation unless an intervening task or concurrent cognitive distraction prevented subjects from correcting against the perceived coercion of training.<sup>25</sup> If participants were able to correct for perceived coercion on an initial task, the preference for male over female job candidates and the attribution of gender-stereotypic traits were eliminated.<sup>26</sup>

Two studies varied the order in which aspects of the hiring process occurred.<sup>22,32</sup>



Uhlmann and Cohen<sup>22</sup> found that requiring raters to commit to the value of credentials before reviewing any applicants eliminated gender bias in hiring a police chief. Cann et al<sup>32</sup> found better correlation between applicant ratings and recommendations to hire when raters were forced to rate applicants' qualifications separately before, rather than after, providing summary employability judgments.

Heilman<sup>15</sup> found that, when women composed 25% or less (i.e., no more than two) of the applicants in a pool of eight, they were viewed as less qualified than male applicants for a managerial job and as being more stereotypically female on gender-related adjectival scales than when women made up at least 37.5% of the pool (three of eight applicants). Covariance analysis of gender-stereotypic and hireability ratings indicated that the impact of gender proportion in the applicant pool could be completely accounted for by the stronger attribution of female gender stereotypes to women when they made up 25% or less of the pool. In a study by Heilman and Martell,<sup>35</sup> priming raters with data that women are succeeding in a relevant male-dominated field eliminated bias against female applicants, although priming with information about a single successful woman did not.

Sczesny and Kühnen<sup>28</sup> found that rating applicants in the presence of a competing cognitive demand (i.e., memorizing a nine-digit number) enhanced the evaluation of male applicants for leadership competence and certainty of hiring. This effect was most pronounced in female raters.

## Discussion

This systematic review reaffirmed the ubiquity of unconscious stereotypes regarding the behaviors and traits associated with being male or female, the ease with which these stereotypes are activated, and the consequent negative bias against women applicants for jobs historically occupied by men. More important, however, this review documents the capability for mitigating the automatic activation and subsequent application of these biases.

Taken together, these studies indicate that, when ambiguity exists in an individual's qualifications or competence, evaluators will fill the void with

assumptions drawn from gendered stereotypes. Providing individuating proof of competence and past performance excellence that are relevant to the employment opportunity seems to be effective in mitigating gender bias,<sup>16,17,24,29,30,33</sup> provided that raters do not feel coerced,<sup>25,26</sup> conditions enable raters to fully attend to the information provided,<sup>28</sup> and raters commit to the value of specific credentials both before the review<sup>22</sup> and before giving an overall rating.<sup>32</sup> Informing raters about research confirming women's competence in sex-typed male tasks is also effective.<sup>35</sup>

Given the large number of competent women physicians and scientists, this approach would seem to be a fairly straightforward way to ensure gender equity. The studies reviewed also indicate, however, that the issue is more complex than expected. Women who are clearly competent in male sex-typed roles may engender negative reactions<sup>37</sup> and lower ratings simply because their competence violates the prescriptive norms for female behavior.<sup>31</sup> This outcome seems particularly likely for women who exhibit anger (a "male" emotion<sup>45</sup>) and for women who use self-promoting, powerful verbal and nonverbal status cues.<sup>37</sup> At the same time, men are penalized in evaluations for exhibiting communal or stereotypic female behaviors (e.g., parenthood or self-effacing speech).<sup>23,37</sup> Providing evidence that agentic, competent women also behave in gender-congruent communal ways helps mitigate this negative bias<sup>13,31,37</sup>; however, women must be careful not to seem overly communal by bringing attention to the fact that they are parents or by seeming too feminine in appearance or scent.<sup>18,23,27,28</sup> The potential benefit to a woman who is applying for a male sex-typed job of having a gender-ambiguous name<sup>34</sup> is worth noting.

Diversity training and employment equity policies would seem logical institutional initiatives to promote gender equity. Evidence from our review suggests, however, that these directives do not ensure gender equity in hiring.<sup>20,39</sup> Furthermore, if such directives result in women's presence as a small proportion of an applicant pool, individuating from the stereotypes of the social group that women occupy becomes more difficult, and they may be less likely to be hired.<sup>15</sup> Counterstereotype training was effective only under certain circumstances.<sup>25,26</sup>

This review covered more than 30 years of publications. More recent studies often built on previous work and tended to employ more sophisticated interventions and analyses, but there was no clear diminution of gender bias in the findings between earlier and more recent studies. Several studies did not meet all inclusion criteria but are worth mentioning. Bragger and colleagues<sup>46</sup> found that structured interviews with standardized, sequential questions that were relevant to the position eliminated the hiring bias against pregnant applicants found when the same information was obtained through haphazard conversation. Glick and colleagues<sup>47</sup> found "sexy" attire was a particular disadvantage, as compared with neutral dress, for women applying for a managerial position. Wiley and Eskilson<sup>48</sup> found that applicants with tentative speech patterns, regardless of gender, received lower ratings. The benefit of gender ambiguity was striking in a study comparing employer response to identical resumes with female names or initials.<sup>49</sup> Davies and colleagues<sup>50</sup> found that affirmation that both men and women are equally capable prevented female-stereotype priming from undermining women's subsequent leadership aspirations. McConnell and Fazio<sup>51</sup> found that use of the title "chairman" primed raters to give a position more stereotypic masculine ratings than did the use of "chairperson" or "chair." Martell<sup>52</sup> found that gender bias in rating police officers was eliminated by the reducing time pressure and cognitive distraction during evaluation. Heilman and Okimoto<sup>31</sup> confirmed the importance for highly agentic women of providing evidence of communality, to prevent negative ratings. Hugenberg and colleagues<sup>53</sup> found less gender bias in selection when raters decided whom to include rather than whom to exclude from a list of individuals in a male sex-typed job.

This study had some limitations. Evidence-based recommendations are limited by the predominant use of college students as participants,<sup>54–56</sup> although gender bias in evaluation was also found in the six studies with adult nonstudent participants.<sup>12,14,19–22</sup> Furthermore, Marlowe and colleagues<sup>19</sup> found gender biases even in the evaluations of experienced managers. The absence of any study in an academic medicine setting is a limitation in the capacity to generalize our findings to academic medicine. We also

have little information on the ethnic–racial diversity of the participants, but, given the populations from which these studies drew participants, it is likely that nearly all were white. Finally, although the randomized

controlled design of these studies is important for establishing a causal relationship between the intervention and the outcome, the success of these interventions in actual employment settings is unknown.

## List 2

### Evidence-based recommendations to reduce the application of bias that could disadvantage women applicants in hiring settings\*

#### Recommendations for Institutions

- Design process to allow applicants to provide individuating evidence of job-relevant competency<sup>16,17,24,30,33</sup>
- Visibly display research evidence that men and women are equivalently successful in male sex-typed roles<sup>35,50†</sup>
- Work hard to ensure that women comprise at least 25% of an applicant pool<sup>15</sup>
- Insist that raters commit to the value of specific credentials before seeing actual applicants<sup>22</sup>
- Rate specific qualifications before making summary judgments about applicant<sup>32</sup>
- Design equity directives and antibias training so that raters do not feel coerced during evaluation<sup>11,20,25,26,39</sup>
- Do not ask about parenthood status in the application<sup>18,23</sup>
- Encourage raters to spend adequate time and avoid cognitive distractions during evaluation<sup>28,52†,58§</sup>
- Use structured rather than unstructured interviews<sup>46¶</sup>
- Do not use man-suffix in job titles (e.g., use “chair” or “chairperson” as opposed to “chairman”)<sup>51+</sup>
- Implement training workshops for personnel decision makers that include examples of common hiring biases and group problem solving for overcoming such biases<sup>59§,60††</sup>
- Encourage raters to use an inclusion rather than an exclusion selection strategy in constructing a final list of applicants<sup>53‡</sup>

#### Recommendations for female applicants

- Provide some evidence of communal job-relevant behaviors (e.g., being *helpful* and *sensitive* to the needs of subordinates)<sup>13,18</sup>
- Indicate clear evidence of competency (e.g., resume, third-party endorsements) but avoid appearing self-promoting in an interview<sup>12,16,29,30,37</sup>
- Do not show anger or discuss previous job-related situations that made you angry<sup>21</sup>
- Best to avoid feminine-scented perfume, but wearing masculine-scented perfume may be beneficial (although you would need to pretest the scent to ensure that it is considered “masculine”)<sup>27</sup>
- Avoid revealing parenthood status until job and salary are secured<sup>18,23</sup>
- In your initial application, if you have a female-gendered first name, consider using initials only, and if you have a gender-ambiguous name, consider removing gender-identifying information<sup>34,49¶</sup>
- Strive for an “attractive” but neutral appearance for interviews or application photographs. Avoid interviewing in overly feminine clothing (more masculine clothing and facial features may be beneficial)<sup>28,32,36,47¶,61¶,62††</sup>
- If you are visibly pregnant, it might be wise to obscure it with your clothing<sup>42¶</sup>
- Avoid tentative speech patterns (e.g., use of intensifiers such as “really” and “definitely,” hedges such as “I guess” or “sort of,” and hesitations such as “well” or “let’s see”)<sup>37,48††</sup>

\* All studies cited in this table, except those with superscript symbols, met inclusion criteria for the systematic review. The studies with superscripts are all experimental, controlled studies, but they were excluded from the systematic review for the reasons listed below. We include the citations in this table because the studies support the recommendation.

† Self-selection of a leadership role by women.

‡ Intervention involved a personnel evaluation or a selection decision but was not in a hiring setting.

§ Intervention and assessment of hiring bias, but ratings of applicants not broken down by gender.

¶ No men in the applicant pool.

†† Intervention appeared to be randomly assigned, but this was not specifically stated.

## Conclusions

This review identifies several institutional interventions with a high level of evidence promising the possibility of promoting gender equity in hiring (List 2). The limitations of the studies, in combination with the continual and rapid evolution of social norms, make us reluctant to dictate to individual female applicants behaviors that may enhance their hireability. Whereas we are mindful of these caveats, we also provide recommendations for individual applicants that are supported by the existing research evidence (List 2).

The National Institutes of Health Roadmap calls for scientists to move beyond the limits of their own discipline and explore new organizational models for interdisciplinary science.<sup>57</sup> Evidence-based practice has become a core value of academic medicine.<sup>5</sup> With this systematic review, we encourage those within the institution of academic medicine to apply evidence from social science research to the practice of personnel decision making.

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## References

- 1 National Institutes of Health. Changing the Face of Medicine Web site. Available at: (<http://www.nlm.nih.gov/changingthefaceofmedicine>). Accessed June 29, 2008.
- 2 Wright AL, Schwindt LA, Bassford TL, et al. Gender differences in academic advancement: Patterns, causes, and potential solutions in one US college of medicine. *Acad Med*. 2003; 78:500–508.
- 3 Carnes M, Morrissey C, Geller S. Women’s health and women in academic medicine: Hitting the same glass ceiling? *J Womens Health*. 2008;17:1453–1462.
- 4 Ash AS, Carr PL, Goldstein R, Friedman RH. Compensation and advancement of women in academic medicine: Is there equity? *Ann Intern Med*. 2004;141:205–212.
- 5 Strauss SE, Richardson WS, Glaziov P, Haynes RB. Evidence-based Medicine: How

- to Practice and Teach EBM. 3rd ed. Edinburgh, UK: Churchill Livingstone; 2005.
- 6 Oxford Centre for Evidence-Based Medicine—Levels of Evidence (March 2009). Available at: ([http://www.cebm.net/levels\\_of\\_evidence.asp](http://www.cebm.net/levels_of_evidence.asp)). Accessed July 1, 2008.
  - 7 Valian V. *Why So Slow? The Advancement of Women*. Cambridge, Mass: MIT Press; 1998.
  - 8 Ridgeway C. Gender, status, and leadership. *J Soc Issues*. 2001;57:637–655.
  - 9 Rose GL, Andiappan P. Sex effects on managerial hiring decisions. *Acad Manage J*. 1978;21:104–112.
  - 10 Jadad AR, Moore RA, Carroll D, et al. Assessing the quality of reports of randomized clinical trials: Is blinding necessary? *Control Clin Trials*. 1996;17:1–12.
  - 11 Biernat M, Fuegen K. Shifting standards and the evaluation of competence: Complexity in gender-based judgment and decision making. *J Soc Issues*. 2001;57:707–724.
  - 12 Glick P, Zion C, Nelson C. What mediates sex discrimination in hiring decisions? *J Pers Soc Psychol*. 1988;55:178–186.
  - 13 Rudman LA, Glick P. Prescriptive gender stereotypes and backlash toward agentic women. *J Soc Issues*. 2001;57:743–762.
  - 14 Smith FL, Tabak F, Showail S, Parks JM, Kleist JS. The name game: Employability evaluations of prototypical applicants with stereotypical feminine and masculine first names. *Sex Roles*. 2005;52:63–82.
  - 15 Heilman ME. The impact of situational factors on personnel decisions concerning women: Varying the sex composition of the applicant pool. *Organ Behav Hum Perf*. 1980;26:386–395.
  - 16 Heilman ME. Information as a deterrent against sex discrimination: The effects of applicant sex and information type on preliminary employment decisions. *Organ Behav Hum Perf*. 1984;33:174–186.
  - 17 Renwick PA, Tosi H. The effects of sex, marital status, and educational background on selection decisions. *Acad Manage J*. 1978; 21:93–103.
  - 18 Heilman ME, Okimoto TG. Motherhood: A potential source of bias in employment decisions. *J Appl Psychol*. 2008;93:189–198.
  - 19 Marlowe CM, Schneider SL, Nelson CE. Gender and attractiveness biases in hiring decisions: Are more experienced managers less biased? *J Appl Psychol*. 1996;81:11–21.
  - 20 Rosen B, Mericle MF. Influence of strong versus weak fair employment policies and applicant's sex on selection decisions and salary recommendations in a management simulation. *J Appl Psychol*. 1979;64:435–439.
  - 21 Brescoll VL, Uhlmann EL. Can an angry woman get ahead? Status conferral, gender, and expression of emotion in the workplace. *Psychol Sci*. 2008;19:268–275.
  - 22 Uhlmann EL, Cohen GL. Constructed criteria: Redefining merit to justify discrimination. *Psychol Sci*. 2005;16:474–480.
  - 23 Fuegen K, Biernat M, Haines E, Deaux K. Mothers and fathers in the workplace: How gender and parental status influence judgments of job-related competence. *J Soc Issues*. 2004;60:737–754.
  - 24 Muchinsky PM, Harris SL. The effect of applicant sex and scholastic standing on the evaluation of job applicant resumes in sex-typed occupations. *J Vocat Behav*. 1977;11:95–108.
  - 25 Kawakami K, Dovidio JF, van Kamp S. Kicking the habit: Effects of nonstereotypic association training and correction processes on hiring decisions. *J Exp Soc Psychol*. 2005; 41:68–75.
  - 26 Kawakami K, Dovidio JF, van Kamp S. The impact of counterstereotypic training and related correction processes on the application of stereotypes. *Group Processes Intergroup Relat*. 2007;10:139–156.
  - 27 Sczesny S, Stahlberg D. The influence of gender-stereotyped perfumes on leadership attribution. *Eur J Soc Psychol*. 2002;32:815–828.
  - 28 Sczesny S, Kühnen U. Meta-cognition about biological sex and gender-stereotypic physical appearance: Consequences for the assessment of leadership competence. *Pers Soc Psychol Bull*. 2004;30:13–21.
  - 29 Heilman ME, Martell RF, Simon MC. The vagaries of sex bias: Conditions regulating the undervaluation, equiavaluation, and overvaluation of female job applicants. *Organ Behav Hum Decis Process*. 1988;41:98–110.
  - 30 Hodgins DC, Kalin R. Reducing sex bias in judgements of occupational suitability by the provision of sex-typed personality information. *Can J Behav Sci*. 1985;17:346–358.
  - 31 Heilman ME, Okimoto TG. Why are women penalized for success at male tasks? The implied communality deficit. *J Appl Psychol*. 2007;92:81–92.
  - 32 Cann A, Siegfried WD, Pearce L. Forced attention to specific applicant qualifications: Impact on physical attractiveness and sex of applicant biases. *Personnel Psychol*. 1981;34: 65–75.
  - 33 Dipboye RL, Arvey RD, Terpstra DE. Sex and physical attractiveness of raters and applicants as determinants of resume evaluations. *J Appl Psychol*. 1977;62:288–294.
  - 34 Futoran GC, Wyer RS. The effects of traits and gender stereotypes on occupational suitability judgments and the recall of judgment-relevant information. *J Exp Soc Psychol*. 1986;22:475–503.
  - 35 Heilman ME, Martell RF. Exposure to successful women: Antidote to sex discrimination in applicant screening decisions? *Organ Behav Hum Decis Process*. 1986;37:376–390.
  - 36 Heilman ME, Saruwatari LR. When beauty is beastly: The effects of appearance and sex on evaluations of job applicants for managerial and nonmanagerial jobs. *Organ Behav Hum Perform*. 1979;23:360–372.
  - 37 Rudman LA. Self-promotion as a risk factor for women: The costs and benefits of counterstereotypical impression management. *J Pers Soc Psychol*. 1998;74:629–645.
  - 38 Goldberg P. Are women prejudiced against women? *Transaction*. 1968;5:316–322.
  - 39 Ng ES, Wiesner WH. Are men always picked over women? The effects of employment equity directives on selection decisions. *J Bus Ethics*. 2007;76:177–187.
  - 40 Bem S. The measurement of psychological androgyny. *J Consult Clin Psychol*. 1974;42: 155–162.
  - 41 Gottfredson LS. Circumscription and compromise: A developmental theory of occupational aspirations. *J Couns Psychol*. 1981;28:545–579.
  - 42 Schein VE. A global look at psychological barriers to women's progress in management. *J Soc Issues*. 2001;57:675–688.
  - 43 Broverman IK. Sex-role stereotypes: A current appraisal. *J Soc Issues*. 1972;28:59–78.
  - 44 Schein VE. Relationships between sex role stereotypes and requisite management characteristics among female managers. *J Appl Psychol*. 1975;60:340–344.
  - 45 Plant EA, Hyde JS, Keltner D, Devine PG. The gender stereotyping of emotions. *Psychol Women Q*. 2000;24:81–92.
  - 46 Bragger JD, Kutcher E, Morgan J, Firth P. The effects of the structured interview on reducing biases against pregnant job applicants. *Sex Roles*. 2002;46:215–226.
  - 47 Glick P, Larsen S, Johnson C, Branstetter H. Evaluations of sexy women in low- and high-status jobs. *Psychol Women Q*. 2005;29:389–395.
  - 48 Wiley MG, Eskilson A. Speech style, gender stereotypes, and corporate success: What if women talk more like men? *Sex Roles*. 1985; 12:993–1007.
  - 49 Zikmund WG, Hitt MA, Pickens BA. Influence of sex and scholastic performance on reactions to job applicant resumes. *J Appl Psychol*. 1978;63:252–254.
  - 50 Davies PG, Spencer SJ, Steele CM. Clearing the air: Identity safety moderates the effects of stereotype threat on women's leadership aspirations. *J Pers Soc Psychol*. 2005;88:276–287.
  - 51 McConnell AR, Fazio RH. Women as men and people: Effects of gender-marked language. *Pers Soc Psychol Bull*. 1996;22:1004–1013.
  - 52 Martell RF. Sex bias at work: The effects of attentional and memory demands on performance ratings of men and women. *J Appl Soc Psychol*. 1991;21:1939–1960.
  - 53 Hugenberg K, Bodenhausen GV, McLain M. Framing discrimination: Effects of inclusion versus exclusion mind-sets on stereotypic judgments. *J Pers Soc Psychol*. 2006;91:1020–1031.
  - 54 Sears DO. College sophomores in the laboratory: Influences of a narrow data base on social psychology's view of human nature. *J Pers Soc Psychol*. 1986;51:515–530.
  - 55 Ward EA. Generalizability of psychological research from undergraduates to employed adults. *J Soc Psychol*. 1993;133:513–519.
  - 56 Peterson RA. On the use of college students in social science research: Insights from a second-order meta-analysis. *J Consum Res*. 2001;28:450–461.
  - 57 National Institutes of Health Office of Portfolio Analysis and Strategic Initiatives. Overview of the NIH Roadmap Web site. Available at: (<http://nihroadmap.nih.gov/overview.asp>). Accessed July 19, 2008. References Cited in List 2 Only.
  - 58 Tullar WL, Mullins TW, Caldwell SA. Effects of interview length and applicant quality on interview decision time. *J Appl Psychol*. 1979;64:669–674.
  - 59 Hahn DC, Dipboye RL. Effects of training and information on the accuracy and reliability of job evaluations. *J Appl Psychol*. 1988;73:146–153.
  - 60 Latham GP, Wexley KN, Pursell ED. Training managers to minimize rating errors in the observation of behavior. *J Appl Psychol*. 1975;60:550–555.
  - 61 Forsythe SM. Effect of applicant's clothing on interviewer's decision to hire. *J Appl Soc Psychol*. 1990;20:1579–1595.
  - 62 Zebrowitz LA, Tenenbaum DR, Goldstein LH. The impact of job applicants' facial maturity, gender, and academic achievement on hiring recommendations. *J Appl Soc Psychol*. 1991;21:525–548.