Modern prejudice and strength of conjunction error:

Overestimating proportions of minority employees

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Abstract

Purpose – Modern prejudice was examined as a potential predictor of overestimating proportions of minority employees in gender-typed occupations. Strength of conjunction error was considered as an indicator of distorted perceptions of these proportions. Furthermore, it was investigated whether the association between modern prejudice and strength of conjunction error was weaker for gender-untypical than for gender-typical targets.

Design/methodology/approach – Modern prejudice was considered as a predictor of overestimations of black female employees in Study 1 ($N = 183$) and black female older employees in Study 2 ($N = 409$). Data was collected using internet-mediated questionnaires.

Findings – In Study 1, modern racism, but not modern sexism, was associated with greater strength of conjunction error when respondents were presented with gender-typical targets. In Study 2, using a sample scoring higher on modern prejudice than in Study 1, modern racism, but not modern sexism and modern ageism, was associated with greater strength of conjunction error, irrespective of target occupation. Furthermore, there was an unexpected association between *lower* sexism and *greater* strength of conjunction error for gender-typical targets, but not for gender-untypical targets.

Implications – The findings lend support to the ethnic-prominence hypothesis in that modern racism, but not modern sexism or modern ageism, was associated with greater strength of conjunction error. Furthermore, empirical evidence suggests that target non-prototypicality can dilute the effect of modern prejudice on strength of conjunction error.

Originality/value – This is one of the rare studies examining attitudes and conjunction error in a work-relevant context, thereby bridging the gap between social cognition and applied psychology.

Key words – Modern sexism; modern racism; modern ageism; modern prejudice; conjunction error; bias

Modern prejudice and strength of conjunction error:

Overestimating proportions of minority employees

In Western industrialised countries, the labour force is becoming more demographically

diverse (International Labour Organization, 2010). Organisations in the U.K. often

appreciate and promote diversity among their employees. In the health sector and in public

transport for example, organisations consider a diverse labour force as crucial to meet the

demands of increasingly diverse communities (Draechslin, 2007). These organisations often

run career management programmes that aim at attracting and retaining ethnic minority

workers (Transport for London, 2011). These special programmes are clearly warranted as

research has consistently shown that ethnic minority status can negatively affect indicators of

employee well-being (e.g., stress, depression: Larsen, 2007), work attitudes (e.g.,

organisational commitment: Shields & Price, 2002), and perceived career opportunities

(Alexis, Vydelingum, & Robbins, 2007).

It has been suggested that modern forms of prejudice such as modern racism and

modern sexism incorporate antagonism, resentment, and denial of discrimination against the

relevant target group (McConahay, Hardee, & Batts, 1981; Swim, Aiken, Hall, & Hunter,

1997). Accordingly, individuals scoring high on modern prejudice might perceive the

underrepresentation of stereotyped employee groups as less pronounced than reported in

official labour statistics. Overestimations of the prevalence of stereotyped employee groups

are likely to reduce perceived need for career management programmes for minority workers

and also the acceptance of such programmes (Konrad & Linnehan, 1995). Relatedly,

empirical evidence suggests that sexist and racist attitudes are directly associated with

opposition to affirmative action programmes (Harrison, Kravitz, Mayer, Leslie, & Lev-Arey,

2006). Furthermore, majority members in general may tend to reject identity-conscious

diversity initiatives because of "beliefs that […] discrimination no longer exists (Konrad & Linnehan, 1995, p. 790). Minority members, on the other hand, evaluate identity-conscious policies positively (Stevens, Plaut, & Sanchez-Burks, 2008), and such policies have more positive effects for women and ethnic minority members than 'colour-blind' policies (Konrad & Linnehan, 1995).

In the current studies, modern prejudice is considered as a potential predictor of overestimations of black female employees (Study 1) and black female older (i.e., over the age of 50 years) employees in different occupations (Study 2). More specifically, strength of conjunction error is regarded as an indicator of distorted perceptions of these employee proportions. Conjunction error is a logical error where respondents rate a conjunction as more likely than its constituents (Tversky & Kahneman, 1983). For example, the proportion of black female workers can be estimated as higher than the proportions of black employees or female employees. Target prototypicality in terms of match between target gender and gender-typicality of occupation was accounted for in both studies, and potential effects of this variable on the association between modern prejudice and strength of conjunction error were examined.

The studies borrow assumptions from social cognition, and cognitive psychology more broadly, to explain the potential association between modern prejudice and strength of conjunction error. The key assumption is that people scoring high on modern prejudice are prone to intuitive rather than rule-based reasoning (Sedek, Piber-Dabrowska, Maio, & von Hecker, 2011). Prejudiced people may use perceived target representativeness (Whaley & Link, 1998) when estimating proportions of minority employees. This over-reliance on stereotypes and prototypical images (Sloman, 1996) may lead prejudiced people to ignore actual base rates (Fiedler, 2000), resulting in higher vulnerability to conjunction error.

Modern prejudice

Measures of modern prejudice have been developed in order to account for prejudice that is less overt or blatant than traditional types of prejudice (Benokraitis & Feagin, 1995). With less societal tolerance of open racism and sexism, prejudiced individuals are less likely to express their racist and sexist attitudes. Examples of openly prejudiced attitudes are appreciation of discrimination against target groups and endorsement of double-standards in order to judge target groups and non-target groups (Swim & Cohen, 1997). It has been suggested that modern prejudice embraces antagonism against demands of the target group, resentment about special favours for the target group, and denial of discrimination against the target group (Swim, Aiken, Hall, & Hunter 1995; Sears, 1988). Instruments assessing modern racism (McConahay, 1986) as well as modern sexism (Swim, Aiken, Hall, & Hunter, 1995) allow respondents to express their prejudice in an apparently non-prejudiced manner. Empirical evidence suggests that traditional prejudice and modern prejudice are overlapping constructs, but they are not redundant (Pettigrew & Meertens, 1995; Swim & Cohen, 1997). Modern prejudice is assumed to be "common and problematic on a day-to-day basis for most minorities" (Fiske & Lee, 2008, p. 24). Among others, modern sexism has been shown to predict belittlement of sexual harassment of women (Swim, Aiken, Hall, & Hunter, 1995), and passive resistance against affirmative action aimed at promoting women (Tougas, Brown, Beaton, & Joly, 1995). Regarding modern racism, research findings suggest negative effects on hiring decisions as well as work policy decisions (McConahay, 1983). Furthermore, it has been suggested that for socially prejudiced individuals, the relevant target groups are highly salient social categories, indicating high stereotype strength, which might activate category-based information processing rather than individuating information processing (Fiske & Neuberg, 1990).

Conjunction error

Conjunction error is a common logical mistake where respondents rate a conjunction of events as more frequent than its constituents. A conjunction of two events A and B, however, "cannot be more probable than one of its constituents […] regardless of whether A and B are independent" (Tversky & Kahneman, 1983, p. 294). It has been suggested that strength of conjunction error can be determined by calculating the difference between estimate of conjunction and product of constituents' estimates (e.g., Kemmelmeier, 2010).

According to Tversky and Kahneman (1983), the prevalence of conjunction error can be reduced by providing unambiguous instructions, by asking for relative frequencies of a conjunction (rather than probabilities) and by letting respondents estimate the frequency of both constituents themselves before estimating the conjunction (as opposed to presenting respondents with given frequencies of the constituents). Under these conditions, 31 per cent of respondents still rated 'men over 55 years of age that had had one or more heart attacks' as more frequent than 'men over 55 years of age' or 'men that had had one or more heart attacks' (Tversky & Kahneman, 1983, p. 309).

As the aforementioned example might illustrate, implied causal relationships between a condition and an event that constitute a conjunction could be among the reasons why conjunction errors are so commonly observed. Respondents may consider 'over 55 years of age' a relevant condition of the event 'having had one or more heart attacks'. Accordingly respondents might "rely almost exclusively on the meaningful relation between the event and the condition" (base-rate neglect: Fiedler, 2000, p. 665). In line with this consideration, it has been suggested that respondents showing conjunction error engage in associative or intuitive rather than rule-based reasoning (Sloman, 1996).

More broadly, the associative reasoning style that may underlie conjunction error has been termed representativeness heuristic (Kahneman & Tversky, 1972). Representativeness

heuristic has been described as an intuitive judgement of similarity (Whaley & Link, 1998) or

"correspondence between a sample and a population" (Tversky & Kahneman, 1983, p. 295).

Representativeness heuristic can be applied to conjunctions that might come to mind more

easily than their constituents through "using such aspects of general knowledge as images

and stereotypes" (Sloman, 1996, p. 6). Accordingly, specific sub-groups of employees might

be overestimated because they are perceived as representative of the population of all job

holders in a certain occupation. For example, black female nurses could be rated as more

frequent than female nurses or black nurses because they might appear to be representative of

the population of all nurses (i.e., they "resemble the stereotypical member of that group":

Tversky & Kahneman, 1983, p. 296). Empirical evidence suggests that there might indeed be

an association between perceived representativeness and social stereotypes. Utilising the

concept of representativeness heuristic, Whaley and Link (1998) asked respondents to

estimate the proportion of black individuals among the homeless population in per cent.

Expectedly, respondents' perceptions of how representative black people are of the homeless

population were associated with higher ascriptions of ethnically relevant negative

stereotypical traits to the homeless population (Whaley & Link, 1998, p. 200). It has been

argued that intuitive or associative judgements of this kind can be affected by everyday

experience in specific contexts (i.e., the availability of prototypes), prior knowledge as well

as biases (Sloman, 1996, p. 4).

Modern prejudice and conjunction error

Empirical evidence suggests that attitudes can affect aspects of cognition such as the

acceptance or rejection of conclusions (e.g., Janis and Frick, 1943) as well as the depth of

analytical reasoning (Peeters & Czapinski, 1990). More recently, it has been suggested that

individuals scoring comparatively high on social prejudice show impaired reasoning, whereas

less prejudiced individuals are more likely to engage in analytical or rule-based reasoning (Sedek, Piber-Dabrowska, Maio, & von Hecker, 2011).

In one of the rare studies explicitly examining attitudes and conjunction error, conjunction error was more often observed when respondents appreciated the respective conjunction (Teigen, Martinussen, & Lund, 1996). In a more recent study (Gervais, Shariff & Norenzayan, 2011), religious belief predicted conjunction error. Religious respondents more often assumed it to be more likely that a criminal individual is both a teacher and an atheist rather than just a teacher. Finally, empirical evidence exists that authoritarianism is associated with greater strength of conjunction error, indicating that authoritarian individuals might rely more heavily on associative or intuitive reasoning than on rule-based or analytical reasoning (Kemmelmeier, 2010). Authoritarianism has been shown to be interrelated with social stereotyping and prejudice (Whitley, 1999), and is thus mentioned in the context of potential effects of attitudes on conjunction error.

In the current studies, modern racism and modern sexism (Study 1), and additionally modern ageism (Study 2) were considered as potential predictors of strength of conjunction error. More specifically, the expectation was that more prejudiced respondents are more likely to overestimate the proportions of black female employees (Study 1) and black female older employees (Study 2). Socially prejudiced individuals have been shown to be prone to associative or intuitive reasoning rather than analytical or rule-based reasoning with regards to the corresponding target groups (Sedek, Piber-Dabrowska, Maio, & von Hecker, 2011). Accordingly, prejudiced respondents might be more vulnerable to show conjunction error which can be considered a symptom or indicator of associative reasoning. More specifically, for socially prejudiced individuals, the relevant targets are highly salient social categories, which is likely to activate intuitive or associative information processing (Fiske & Neuberg,

1990), resulting in overestimations of stereotyped employee groups. Accordingly, it is expected that *modern prejudice is associated with greater strength of conjunction error* (H1).

Modern prejudice, conjunction error, and target prototypicality

In the current studies, respondents were asked to estimate the proportions of black female employees and black female older employees in occupations that are numerically female dominated (i.e., health sector) or male dominated (i.e., public transport). There has been much debate about the potential effects of belonging to more than one stereotyped group (e.g., King, 1988). Black women, for example, may be stereotyped and discriminated against because they are targets of both stereotypes about black people and stereotypes about women (Beale, 1970; Settles, 2006). The term double jeopardy describes such "dual" discrimination where belonging to multiple subordinate groups may have additive or interactionist negative effects (Berdahl & Moore, 2006, p. 428).

According to the ethnic-prominence hypothesis (Levin, Sinclair, Veniegas, & Taylor, 2002), ethnic background can be more salient than gender, especially when looking at ethnic minority members, and therefore ethnic discrimination should have stronger effects for black women than gender discrimination. There is evidence that information about target ethnic background might indeed have stronger effects on stereotyping than information about target gender because gender segregation is less extensive than ethnic segregation, "at least in families, neighborhoods, schools, and churches" (category salience: Timberlake & Estes, 2007, p. 420).

Another theoretical framework suggests that multiple subordinate group memberships may have positive as well as negative effects (Purdie-Vaughns & Eibach, 2008). The assumption here is that single subordinate group members (i.e., belonging to a prototypical subordinate group, e.g., white women) might be the main target of stereotyping and

discrimination, whereas double subordinate group members (i.e., belonging to a non-prototypical subordinate group, e.g., black women) can go largely unnoticed due to their non-prototypicality. This phenomenon of double subordinate group members being ignored has been termed "intersectional invisibility" and can have ambivalent effects (e.g., not being hit hard by stereotypes, but not being honoured for one's achievements either: Purdie-Vaughns & Eibach, 2008, p. 383; Sesko & Biernat, 2010). Building on this line of argument, one could assume that black women working in gender-untypical fields (i.e., public transport) are perhaps even less prototypical targets of racism and sexism than black women working in gender-typical areas (i.e., health sector). According to official labour statistics, the health sector is numerically female dominated (International Labour Organization, 2010), and 52 % of working black women in the U.K. are employed in health, education, and public administration (Trades Union Congress, 2006). Following on from the discussion above, it is expected that *the association between modern prejudice and greater strength of conjunction error is weaker for non-prototypical targets (i.e., gender-untypical) than for prototypical targets (i.e., gender-typical)* (H2).

Two studies were conducted to examine the hypotheses. In Study 1, respondents filled in a questionnaire assessing modern sexism and modern racism. Furthermore, respondents were asked to estimate the proportions of female employees, black employees, and female black employees in occupations that were numerically dominated by one gender group (i.e., female dominated: health sector; male dominated: public transport). In Study 2, a different sample of respondents was used, and the design of the study was extended. Respondents filled in a questionnaire assessing modern sexism, modern racism, and modern ageism. After that respondents were asked to estimate the proportions of female employees, black employees, older employees (i.e., over the age of 50 years), and female black older employees in the

same occupations as in the first study. Both studies allowed to determine the association between modern prejudice and strength of conjunction error (H_1), and to examine whether this association was weaker for gender-untypical targets (i.e., targets that were employed in occupations discrepant to their gender) than for gender-typical targets (i.e., targets working in occupations congruent with their gender) (H_2).

Study 1: Modern sexism, modern racism, and strength of conjunction error

Method

Sample and procedure

The sample comprised $N = 183$ U.K. resident respondents. One-hundred-and-thirty-six participants were female (74 %). Respondents' average age was 37.8 years ($SD = 11.8$), ranging from 19 to 62 years. Eighty-one per cent of the participants considered themselves white. The remaining respondents indicated that they were Asian (5 %), Indian (4 %), Hispanic (1 %), or that they had another ethnic background (6 %). Forty per cent of respondents reported that they held a Master's degree, and 32 % indicated that they had an Undergraduate Degree or Postgraduate Diploma. The remaining respondents held a Doctorate (15 %), had completed Secondary School (5 %), Technical College (3 %), or they had achieved another educational attainment (5.5 %). The majority of respondents reported that they were living in Central London or Greater London (50 %), thirty-nine per cent indicated that they were living in the Southeast of England, and the remaining respondents lived elsewhere (12 %). All participants indicated that they were working. The majority of respondents reported that they were working in various accounting and administrative roles (31 %), or as academics (17 %). With the exception of two respondents who indicated that they worked as nurses, respondents were not employed in the health sector or in public transport.

All respondents filled in the questionnaire online. E-mails inviting to participate and containing a link to the online questionnaire were distributed via e-mail. Furthermore, the link to the survey was publicised on various internet platforms that appeared relevant to the subject of the study (i.e., gender and ethnic minority at work). These internet platforms were maintained by professional bodies representing HRM professionals and academics. Respondents were encouraged to circulate the invitation to participate among people that they felt might be willing to participate.

Instruments

The questionnaire contained questions assessing modern prejudice and asked respondents to estimate the proportions of black employees, female employees, and black female employees in occupations that were numerically female or male dominated. Furthermore, respondents answered questions about demographic variables (i.e., gender, age, ethnic background, highest level of educational attainment, and current geographic location).

Modern sexism and modern racism. Modern sexism was assessed using items developed by Swim, Aiken, Hall, and Hunter (1995). This scale comprises eight items and captures denial of discrimination (e.g., "Discrimination against women is no longer a problem"), antagonism (e.g., "It is easy to understand the anger of women's groups" [reversely coded]), and resentment against women (e.g., "Over the past few years, the government and news media have been showing more concern about the treatment of women than is warranted by women's actual experiences"). Answer categories ranged from 1 = *strongly disagree* to 5 = *strongly agree*. Swim, Aiken, Hall, and Hunter (1995) reported a reliability of $\alpha = 75$. In this study, the reliability was $\alpha = .81$.

Modern racism was assessed with an instrument developed by McConahay (1986). This scale comprises six items that capture denial of discrimination (e.g., "Discrimination

against black people is no longer a problem"), antagonism (e.g., "It is easy to understand the anger of black people" [reversely coded]), and resentment against black people (e.g., "Over the past few years, the government and news media have shown more respect to black people than they deserve"). Answer categories ranged from 1 = *strongly disagree* to 5 = *strongly agree*. Swim, Aiken, Hall, and Hunter (1995) reported a reliability of $\alpha = 83$. In this study, the reliability was $\alpha = .85$.

Strength of conjunction error. Each respondent was asked to estimate the proportions of female, black, and black female employees among either health workers (e.g., nurses and carers for the elderly) or workers in public transport (e.g., bus drivers and transport guards). Respondents used sliders that could be clicked and dragged to indicate the above proportions in per cent (e.g., proportion of female nurses among all nurses, proportion of black nurses among all nurses, and proportion of female black nurses among all nurses). Screenshot 1 illustrates how this task was presented to respondents.

- Screenshot 1 about here -

Health workers and workers in public transport had been chosen because they are distinctly gender-typed (International Labour Organization, 2010). Furthermore, official labour statistics indicate that black and minority ethnic workers are often employed in these fields. More precisely, according to the Trades Union Congress (2006), 9 % of employees in transport and communication and 7 % of employees in health and education are black and minority ethnic workers. Official statistics also show that the National Health Service (NHS) and large public transport providers such as Transport for London (TfL) are among the top black and ethnic minority employers in the U.K. (Cabinet Office, 2002). More specifically, 14 % of NHS staff are black and minority ethnic workers (Taylor, Lambert, & Goldacre, 2009), whereas the proportion of black, Asian or minority ethnic TfL workers is 30 % (Transport for London, 2011).

In order to determine the strength of conjunction error, the difference between estimate of conjunction and product of single estimates was calculated (i.e., estimate$_{\text{black female employees}}$ − [estimate$_{\text{black employees}}$ × estimate$_{\text{female employees}}$]). This term captures the extent to which respondents exceeded a rule-based estimate under the assumption that both constituents of the conjunction would be statistically independent.

Table 1 summarises mean values, standard deviations, intercorrelations, and scale reliabilities of the variables assessed in this study, along with demographic variables of the study sample.

- Table 1 about here -

Results

Preliminary analyses: Demographic variables and strength of conjunction error

In a first step, potential effects of demographic variables on strength of conjunction error were examined. Analyses showed that none of the demographic variables was associated with strength of conjunction error. More specifically, female and male respondents did not differ with regards to strength of conjunction error ($t(66.07) = 1.43$, $p = .158$), nor was respondents' age associated with strength of conjunction error ($r = .00$, $p = .961$). Furthermore, there were no significant differences between respondents with different ethnic background ($F(4.183) = 0.45$, $p = .813$), or between respondents who had achieved different levels of educational attainment ($F(5.183) = 0.27$, $p = .927$). Lastly, respondents' geographic location did not have a significant effect on strength of conjunction error either ($F(2.183) = 1.69$, $p = .187$).

Hypotheses testing

As can be seen from the correlations presented in Table 1, there was some support for the expectation that modern sexism and modern racism were associated with greater strength of conjunction error ($r = .19$). However, when both predictors were considered jointly in a regression analysis, modern sexism and modern racism did not yield statistical significance ($\beta = .13$ and .12 respectively), although these predictors explained 4 % of variance in strength of conjunction error (see Table 2: step 1). These findings provide partial and weak support for hypothesis 1.

- Table 1 about here -

The assumption that the association between modern prejudice and strength of conjunction error is weaker for non-prototypical targets than for prototypical targets was examined using moderated regression analysis. Target occupation (i.e., female dominated or male dominated) was additionally entered into the regression equation, followed by the interaction terms modern sexism x target occupation and modern racism x target occupation (see Table 2: steps 2 and 3 respectively). Whereas the interaction term modern sexism x target occupation did not yield statistical significance ($\beta = .11$), the interaction term modern racism x target occupation was a significant predictor of strength of conjunction error ($\beta = -.19$; $\Delta R^2 = .03$ for both interaction terms jointly). As is illustrated in Figure 1, there was a weak negative association between modern racism and strength of conjunction error for non-prototypical targets (i.e., working in a gender-untypical occupation), whereas this association was strong and positive for prototypical targets (i.e., working in a gender-typical occupation). This finding partly supports hypothesis 2.

- Figure 1 about here -

Common method bias was not expected to be a threat to the findings reported above because prejudiced attitudes and impaired reasoning styles were assumed to be sufficiently

distinct constructs. Nevertheless, analyses were repeated using educational attainment as proxy variable for respondents' intelligence, thereby controlling for common method variance (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). As the findings remained unchanged, no further details about these additional analyses are reported here.

Discussion

Correlational analyses provided support for the hypothesis that modern prejudice is associated with greater strength of conjunction error. Respondents scoring higher on modern sexism or modern racism showed greater strength of conjunction error than respondents scoring comparatively low on modern prejudice. This perhaps indicates that for prejudiced individuals, black women form a salient social category (Fiske & Neuberg, 1990; stereotype strength/representativeness: Whaley & Link, 1998), resulting in associative or intuitive rather than rule-based reasoning (Sedek, Piber-Dabrowska, Maio, & von Hecker, 2011). However, when modern sexism and modern racism were considered jointly in a regression analysis, none of the two variables qualified as a significant predictor of strength of conjunction error - although the direction of potential influence was as expected.

With regards to hypothesis 2, analyses revealed that, expectedly, the association between modern racism and strength of conjunction error was weaker for non-prototypical targets than for prototypical targets. The association between modern sexism and strength of conjunction error, however, was not affected by targets' (non-)prototypicality. This perhaps lends support to the notion that targets' non-prototypicality can dilute the effects of discrimination and stereotyping (Purdie-Vaughns & Eibach, 2008; Sesko & Biernat, 2010), but especially with regards to modern racism.

Taken together, the findings of Study 1 appeared to be encouraging, but somewhat dissatisfying. In an attempt to explain the rather weak, and only partial support of the

hypotheses, one might suggest that, perhaps, sample restrictions had affected the findings. The sample of the first study comprised more women than men, the majority of respondents reported to have attained rather high educational attainment, and most respondents indicated to be living in Central London, Greater London, or the Southeast of England. In order to address these potential restrictions, a second study was conducted, trying to replicate the findings using a sample that was more gender-balanced, less educated, more geographically dispersed, and potentially scoring higher on modern prejudice than the respondents who participated in the first study. Furthermore, the study design was extended through additionally accounting for modern ageism, and asking respondents to estimate the proportion of female black older (i.e., over the age of 50 years) employees in gender-typical or gender-untypical occupations.

Study 2: Modern sexism, modern racism, modern ageism, and strength of conjunction error

Method

Sample and procedure

The sample comprised $N = 409$ U.K. resident respondents. Two-hundred-and-twenty-seven participants were female (56 %). Respondents' average age was 46.0 years ($SD = 14.6$), ranging from 18 to 99 years. Ninety per cent of the participants considered themselves white. The remaining respondents indicated that they were Asian (3 %), Indian (2 %), black (2 %), or that they had another ethnic background (3 %). Thirty-nine per cent of participants indicated that they held a Postgraduate Diploma or Undergraduate Degree, whereas 28 % reported that they were Secondary School leavers. The remaining respondents had completed Technical College (17 %), had a Master's degree (11 %) or Doctorate (2 %), or they had achieved another educational attainment (3 %). In terms of current geographical location, 47 % of respondents reported to be living in the South of England, whereas 29 % of respondents

indicated that they were currently based in Central London or Greater London. The remaining respondents indicated to be living elsewhere (24 %). Ninety-six per cent of participants indicated that they were working. Respondents were employed across a wide range of sectors of industry and occupations. Five respondents indicated that they were working as nurses. The remaining respondents were not employed in the health sector or in public transport.

All respondents filled in the questionnaire online. E-mails inviting to participate and containing a link to the online questionnaire were distributed widely via e-mail, avoiding potential respondents that had already been invited to participate in the first study. Furthermore, the link to the survey was publicised on various internet platforms that appeared relevant to the subject of the study (i.e., minority issues at work), but were different from the platforms used for the first study. As the platforms chosen for the second study were not maintained by specific professional bodies, it is likely that less HRM professionals and academics received the invitation to participate in the study.

Instruments

The questionnaire contained questions assessing modern prejudice and asked respondents to estimate the proportions of black employees, female employees, older employees (i.e., over the age of 50 years), and black female older employees in occupations that were numerically female or male dominated. Furthermore, respondents answered questions about demographic variables (i.e., gender, age, ethnic background, educational attainment, and geographical location).

Modern sexism, modern racism, and modern ageism. Modern sexism and modern racism were assessed using the same instruments as in the first study (Swim, Aiken, Hall, & Hunter, 1995; McConahay, 1986). In the second study, the reliabilities were $\alpha = .85$ and $\alpha =$

.84 respectively. In order to assess modern ageism, nine items from the instruments assessing modern sexism and modern racism were paraphrased. These items capture denial of discrimination (e.g., "Discrimination against older people [i.e., over the age of 50 years] is no longer a problem"), antagonism (e.g., "It is easy to understand the anger of older people [i.e., over the age of 50 years]" [reversely coded]), and resentment against older people (e.g., "Over the past few years, the government and news media have been showing more concern about the treatment of older people [i.e., over the age of 50 years] than is warranted by older people's actual experiences"). Answer categories ranged from 1 = *strongly disagree* to 5 = *strongly agree*. The reliability of this scale was $\alpha = .87$.

Strength of conjunction error. Each respondent was asked to estimate the proportions of black, female, older, and black female older employees among either health workers (e.g., nurses and carers for the elderly) or workers in public transport (e.g., bus drivers and transport guards). Similar to Study 1, respondents used sliders that could be clicked and dragged to indicate the above proportions in per cent (e.g., proportion of female nurses among all nurses, proportion of black nurses among all nurses, proportion of older nurses among all nurses, and proportion of female black older nurses among all nurses). Screenshot 2 illustrates how this task was presented to respondents.

- Screenshot 2 about here -

In order to determine the strength of conjunction error, the difference between estimate of conjunction and product of single estimates was calculated (i.e., $\text{estimate}_{\text{black female older employees}} - [\text{estimate}_{\text{black employees}} \times \text{estimate}_{\text{female employees}} \times \text{estimate}_{\text{older employees}}]$). This term captures the extent to which respondents exceeded a rule-based estimate under the assumption that the constituents of the conjunction would be statistically independent.

Table 3 summarises mean values, standard deviations, intercorrelations, and scale reliabilities of the variables assessed in this study, along with demographic variables of the study sample.

- Table 3 about here -

Results

Preliminary analyses: Demographic variables and strength of conjunction error

Similar to study 1, potential effects of demographic variables on strength of conjunction error were examined in a first step. These analyses revealed that none of the demographic variables was associated with strength of conjunction error. More specifically, female and male respondents did not differ with regards to strength conjunction error ($t(406) = 1.72$, $p = .086$), nor was respondents' age associated with strength of conjunction error ($r = -.08$, $p = .128$). Furthermore, there were no significant differences between respondents with different ethnic background ($F(5.408) = 1.80$, $p = .113$), or between respondents who had achieved different levels of educational attainment ($F(5.409) = 0.91$, $p = .478$). Lastly, respondents' geographic location did not have a significant effect on strength of conjunction error either ($F(2.408) = 1.42$, $p = .243$).

Hypotheses testing

The correlations presented in Table 3 indicate some support for the expectation that modern prejudice is associated with greater strength of conjunction error. Whereas there were significant correlations between modern racism as well as modern ageism and strength of conjunction error ($r = .15$ and r = .13 respectively), there was no significant association between modern sexism and strength of conjunction error ($r = .03$). When all three predictors were considered jointly in a regression analysis, modern sexism and modern ageism did not

yield statistical significance (β = -.07 and β = .10 respectively), but modern racism remained

significant (β = .15) (see Table 4: step 1). These findings provide partial support for

hypothesis 1, especially with regards to modern racism.

- Table 4 about here -

The assumption that the association between modern prejudice and strength of

conjunction error is weaker for non-prototypical targets than for prototypical targets was

again examined using moderated regression analysis. Target occupation (i.e., female

dominated or male dominated) was additionally entered into the regression equation,

followed by the interaction terms modern sexism x target occupation, modern racism x target

occupation, and modern ageism x target occupation (see Table 4: steps 2 and 3 respectively).

The interaction term modern sexism x target occupation was a significant predictor of

strength of conjunction error (β = .16; ΔR^2 = .03 for all three interaction terms). As is

illustrated in Figure 2, as expected, there was only a weak positive association between

modern sexism and strength of conjunction error for non-prototypical targets (i.e., working in

gender-untypical occupations). Unexpectedly, however, *lower* modern sexism was

associated with *greater* strength of conjunction error for prototypical targets (i.e., working in

a gender-typical occupation). These findings are partially unexpected, and provide only weak

support for hypothesis 2.

- Figure 2 about here -

Similar to Study 1, analyses were, again, repeated accounting for respondents'

education as proxy variable for their intelligence, but the findings remained the same,

indicating that common method variance was not a major threat to the findings.

Discussion

As in Study 1, there was correlational evidence that modern prejudice might be associated with strength of conjunction error. More specifically, modern ageism and modern racism were correlated with greater strength of conjunction error, and modern racism remained a significant predictor of strength of conjunction error, even when examined jointly with modern ageism and modern sexism in a regression analysis. This finding might indicate that modern racism was perhaps associated with greater strength of conjunction error, when analysing a sample that scored higher on modern prejudice than respondents in Study 1. This finding appears to support the ethnic-prominence hypothesis (Levin, Sinclair, Veniegas, & Taylor, 2002) in that modern racism, but not modern sexism or modern ageism, was shown to be a significant predictor of conjunction error. According to the double jeopardy hypothesis (Beale, 1970; King 1988), black women should "face a double whammy of discrimination" (Berdahl & Moore, 2006, p. 427) because they are potential targets of both modern racism and modern sexism. Extending this line of argument, one might have expected that black older women would have taken a triple hit, as they are potential targets of modern racism, modern ageism, and modern sexism. However, neither correlational nor regression analyses provided evidence that different types of prejudice are equally relevant to strength of conjunction error. Possibly, Timberlake and Estes' (2007) notion of category salience can explain this finding. Not only is gender segregation less extensive than ethnic segregation, but age segregation is perhaps less extensive than ethnic segregation as well.

Furthermore, and again similar to the findings of the first study, non-prototypicality of targets seemed to potentially dilute the effects of stereotyping (Purdie-Vaughns & Eibach, 2008; Sesko & Biernat, 2010). More specifically, the association between modern sexism and strength of conjunction error was weak when targets were presented as working in gender-untypical occupations. The finding that the effect of modern racism on strength of

conjunction error was *not* diluted by target non-prototypicality, on the other hand, may indicate that the generally more prejudiced respondents in Study 2 were less sensitive to additional (contextual) target information.

More pronounced, and more interesting perhaps, was the unexpected finding that lower modern sexism was associated with greater strength of conjunction error when targets were presented as gender-typical employees. It might be that this finding actually indicates that higher modern sexism was associated with lower conjunction error when estimating the proportion of black older women in gender-typical occupations. When visually examining Figure 2, however, the outstanding data point marks indeed low sexist respondents who display greater strength of conjunction error when estimating the proportion of black older women in gender-typical occupations. This effect was beyond the association between modern racism and greater strength of conjunction error irrespective of targets' occupation, and also different from the diluting effect of target non-prototypicality (i.e., gender-untypical occupation) on strength of conjunction error that has been reported above.

In an attempt to try and explain this unexpected finding, one could suggest that, potentially, low sexist respondents in Study 2 might be appreciative of demographic diversity, and therefore they show greater conjunction error when estimating the proportion of black older female employees in gender-typical occupations ('positive' conjunction error: Teigen, Martinussen, & Lund, 1996; valence bias: Swim, 1994). These respondents might be aware of gender discrimination leading to overrepresentation of women in low status jobs in the health sector, and therefore they might overestimate the proportion of female black older workers in these occupations (base-rate neglect: Fiedler, 2000). Related to this argument, research has demonstrated that generally respondents tend to largely underestimate occupational gender segregation (e.g., McCauley & Thangavelu, 1991). More precisely, respondents often underestimate the proportion of female employees in female dominated

occupations, and they overestimate the proportion of women in male dominated occupations (Cejka & Eagly, 1999). It appears somewhat counterintuitive that for 'low sexist' respondents, prototypical female workers might still be a relevant target group. However, maybe, respondents scoring low on modern sexism, due to their comparatively low denial of gender discrimination, are less prone to display a "contraction bias against extreme judgments" (Cejka & Eagly, 1999, p. 421), resulting in less overestimation of gender equality, especially in female dominated occupations. Perhaps these respondents could be considered 'colour-blind' (Fiske & Lee, 2008) low sexist individuals that are aware of discriminatory practice leading to workplace segregation, but nevertheless they appear to engage in associative rather than analytic reasoning. Admittedly, when estimating the proportion of black female older employees in female dominated occupations, gender is just one potentially relevant component, but it links to both target gender as well as target occupation.

Alternatively, the conjunction of female black older workers in caring occupations might have triggered the Mammy stereotypic image (e.g., West, 1995), which portrays a black woman "who willingly and jovially serves a white family" (Weitz & Gordon, 1993, p. 20), and "whose caretaking and nurturing abilities are without limits" (Donovan, 2011, p. 459). As interesting as this consideration may be, it is of a speculative nature. The data collected in this study does not allow to explore whether respondents scoring low on modern sexism held strong stereotypes about female black older health workers in the U.K. What can be claimed though, based on the current data, is that black older women in the health sector are at particularly high risk of being numerically overestimated. The proportion of this employee group is overestimated be people scoring high on modern racism, irrespective of the type of occupation, and by people scoring low on modern sexism, given the job's gender-typicality.

General discussion

Studies explicitly examining attitudes and conjunction error (e.g., Teigen, Martinussen, & Lund, 1996; Gervais, Shariff, & Norenzayan, 2011) are surprisingly rare. The current studies show that modern racism is associated with greater strength of conjunction error, presumably because prejudiced individuals are more likely to engage in intuitive reasoning (Sedek, Piber-Dabrowska, Maio, & von Hecker, 2011). More precisely, prejudiced individuals may rely heavily on the perceived representativeness of targets (Whaley & Link, 1998), thereby ignoring actual base rates (Fiedler, 2000). Using respondents scoring relatively high on modern racism in Study 2, this belief bias (Sloman, 1996) resulted in an association between modern racism and strength of conjunction error, irrespective of target prototypicality. Even with a sample scoring relatively low on modern racism in Study 1, modern racism was still associated with greater strength of conjunction error, when targets were presented as prototypical workers (i.e., employed in gender-typical occupations). These findings point to the possibility that non-prototypicality may dilute effects of ethnic stereotyping (Purdie-Vaughns & Eibach, 2008; Sesko & Biernat, 2010) (Study 1), and that relatively more racist individuals may display lower context sensitivity (Study 2).

Furthermore, the study findings support the ethnic-prominence hypothesis (Levin, Sinclair, Veniegas, & Taylor, 2002) in that modern racism, but not modern sexism or modern ageism, was associated with higher strength of conjunction error. Lastly, low sexist respondents overestimated the proportion of black older female employees in female dominated occupations in Study 2 (valence bias: Swim 1994), indicating that 'colour-blindness' (Fiske & Lee, 2008) might backfire, due to ignorance of individual attributes, which, additionally, may "alienate minority employees" (Stevens, Plaut, & Sanchez-Burks, 2008, p. 120).

Limitations

The current studies have several limitations which could be remedied in future research. It might have been helpful to explicitly account for respondents' awareness of discrimination, and perhaps appreciation of diversity, in addition to modern prejudice. The studies found support for assumptions borrowed from social cognition, and cognitive psychology more broadly, which can be considered a promising starting point. However, the design of the studies did not allow to fully understand the underlying mechanisms that led to the study findings. For example, exploring content and strength of gendered ethnic stereotypes about employees would lend itself to a qualitative approach that goes beyond the correlational nature of the presented studies.

Conjunction error was stronger in Study 2 than in Study 1, which may be due to differences between the samples of respondents. However, it could also be that the task to estimate a 'triple' conjunction was too complicated, inducing errors that may have been due to the complex study design, rather than respondents' levels of modern prejudice. Therefore, future studies should perhaps account for simple conjunctions involving further demographic groups (e.g., disabled workers) that are likely to be stereotyped. Such studies could try and determine the width of the phenomenon demonstrated in the current studies. It might also be promising to investigate attitudes that may be less directly associated with the relevant target groups, thereby examining the importance of a specific match between attitudes and target groups. Given recent developments in the U.K., for example, it would be interesting to investigate whether appreciation of the decision to leave the European Union is associated with overestimating the proportion of European Union citizens among, for example, harvest labourers in the U.K.

Finally, all study participants were recruited electronically and filled in the questionnaire online. Given that the invitation to participate in the studies was circulated

widely, it is impossible to determine the actual response rates, and it might be that respondents with a genuine interest in minority issues at work are overrepresented in the study samples. Therefore, a future study should perhaps use broader ways of distributing the link to the survey questionnaire, instead of using internet platforms that appear to be relevant to the topic under study.

Conclusions

The findings of the current studies contribute to a growing body of knowledge about intuitive or associative reasoning in prejudiced individuals (e.g., Sedek, Piber-Dabrowska, Maio, & von Hecker, 2011). Furthermore, the studies showed that some social categories may induce stronger stereotyping effects than others (e.g., Levin, Sinclair, Veniegas, & Taylor, 2002), and that target prototypicality may affect the strength of these effects (e.g., Sesko & Biernat, 2010). Taken together, empirical evidence suggested that the effects of multiple stereotyping do not simply add up, but that a nuanced view is more appropriate where perceiver attributes, target attributes, and contextual factors need to be carefully considered. The studies examined assumptions, that were borrowed from social cognition, in a work-relevant context, thereby bridging the gap between cognitive and applied psychology.

From a more practical perspective, relevant recommendations can be derived from the study findings as well. Empirical evidence suggests that people generally tend to underestimate workplace segregation (Cejka & Eagly, 1999; McCauley & Thangavelu, 1991; McCauley, Thangavelu, & Rozin, 1988). In both current studies, respondents hugely overestimated the proportions of minority workers. For Study 1, respondents' estimates of black female workers can be directly compared with official labour statistics. On average, respondents assumed that 28 % of all workers in the health sector and in public transport are black and female. According to the Office for National Statistics (2011), however, this

proportion is likely to be around 2 %. Such distorted perceptions in themselves give cause for concern with regards to the perceived need for diversity policies and equal employment opportunities (Konrad & Linnehan, 1995).

However, not only did respondents underestimate segregation, they also demonstrated impaired reasoning, resulting in estimates that were considerably in excess of what rule-based reasoning would have led to. Overall, respondents exceeded rule-based estimates by 7 % in Study 1, and by 13 % in Study 2, but there was substantial variation within the study samples that was partly due to respondents' racist attitudes.

The practical implications of the above are threefold: Diversity practitioners need to be aware that workplace segregation is likely to be underestimated. Therefore, they need to clearly explain the need for diversity policies, including career management programmes for minority workers, that aim at increasing equal employment opportunities. Furthermore, monitoring of demographic information and transparency of corresponding diversity figures may help all members of an organisation to arrive at more realistic perceptions of workplace segregation. Importantly, such monitoring should not only be based on demographic categories in isolation (e.g., gender *or* ethnic background), but their various combinations (e.g., gender *by* ethnic background). Lastly, it would appear that rolling out perceptual bias training may be worthwhile. Focusing on belief bias (Sloman, 1996) and valence bias (Swim, 1994) may be particularly promising as this may correct distorted perceptions of workplace equality in people scoring high on modern racism and people scoring low on modern sexism respectively.

References

Alexis, O., Vydelingum, V., & Robbins, I. (2007). Engaging with a new reality: Experiences of overseas minority ethnic nurses in the NHS. *Journal of Clinical Nursing*, *16*, 2221-2228.

Beale, F. (1970). Double jeopardy: To be black and female. In T. Cade (Ed.), *The black woman* (pp. 90–100). New York: New American Library.

Benokraitis, N. V., & Feagin, J. R. (1995). *Modern sexism*. Englewood Cliffs, NJ: Prentice-Hall.

Berdahl, J. L., & Moore, C. (2006). Workplace harassment: Double jeopardy for minority women. *Journal of Applied Psychology*, *91*, 426-436.

Cabinet Office (2002). *Ethnic minorities and the labour market: Interim analytical report*. London: Strategy Unit.

Ceijka, M. A., & Eagly, A. H. (1999). Gender-stereotypic images of occupations correspond to the gender segregation of employment. *Personality and Social Psychology Bulletin*, *25*, 413-423.

Donovan, R. A. (2011). Tough or tender: (Dis)Similarities in white college students' perceptions of black and white women. *Psychology of Women Quarterly*, *35*, 458-468.

Dreachslin, J. L. (2007). Diversity management and cultural competence: Research, practice, and the business case. *Journal of Healthcare Management*, *52*, 79-96.

Fiedler, K. (2000). Beware of samples! A cognitive-ecological sampling approach to judgment biases. *Psychological Review*, *107*, 659-676.

Fiske, S. T., & Lee, T. L. (2008). Stereotypes and prejudice create workplace discrimination. In A. P. Brief (Ed.), *Diversity at Work* (pp. 13-52). Cambridge: Cambridge University Press.

Fiske, S. T., & Neuberg, S. L. (1990). A continuum of impression formation, from category-based to individuating processes: Influences of information and motivation on attention and interpretation. *Advances in Experimental Social Psychology*, *23*, 1-74.

Gervais, W. M., Shariff, A. F., Norenzayan, A. (2011). Do you believe in atheists? Distrust is central to anti-atheist prejudice. *Journal of Personality and Social Psychology*, *101*, 1189-1206.

Harrison, D. A., Kravitz, D. A., Mayer, D. M., Leslie, L. M., &, Lev-Arey, D. (2006). Understanding attitudes toward affirmative action programs in employment: Summary and meta-analysis of 35 years of research. *Journal of Applied Psychology*, *91*, 1013-1036.

International Labour Organization (2010). *International labour migration: A rights-based approach*. Geneva, Switzerland: International Labour Office.

Janis, I. L., & Frick, F. (1943). The relationship between attitudes toward conclusions and errors in judging logical validity of syllogisms. *Journal of Experimental Psychology, 33,* 73-77.

Kahneman, D., & Tversky, A. (1972). Subjective probability: A judgment of representativeness. *Cognitive Psychology, 3*,430-454.

Kemmelmeier, M. (2010). Authoritarianism and its relationship with intuitive-experiential cognitive style and heuristic processing. *Personality and Individual Differences*, *48*, 44-48.

King, D. H. (1988). Multiple jeopardy, multiple consciousness: The context of a black feminist ideology. *Signs*, *14*, 42-72.

Konrad, A. M., & Linnehan, F. (1995). Formalized HRM structures: Coordinating equal employment opportunity or concealing organizational practices? *Academy of Management Journal*, *38*, 787-820.

Larsen, J. A. (2007). Embodiment of discrimination and overseas nurses' career progression. *Journal of Clinical Nursing*, *16*, 2187-2195.

Levin, S., Sinclair, S., Veniegas, R. C., & Taylor, P. L. (2002). Perceived discrimination in the context of multiple group memberships. *Psychological Science*, 13, 557-560.

McCauley, C., & Thangavelu, K. (1991). Individual differences in sex stereotyping of occupations and personality traits. *Social Psychology Quarterly*, *54*, 267-279.

McCauley, C., Thangavelu, K., & Rozin, P. (1988). Sex stereotyping of occupations in relation to television representations and census facts. *Basic and Applied Social Psychology*, *9*, 197-212.

McConahay, J. B. (1986). Modern racism, ambivalence, and the Modern Racism Scale. In J. F. Dovidio & S. L. Gaertner (Eds.), *Prejudice, discrimination, and racism* (pp. 91-125). Orlando, FL: Academic Press.

McConahay, J. B. (1983). Modern racism and modern discrimination: The effects of race, racial attitudes, and context on simulated hiring decisions. *Personality and Social Psychology Bulletin*, *9*, 551-558.

McConahay, J. B., Hardee, B. B., & Batts, V. (1981). Has racism declined in America? It depends on who is asking and what is asked. *The Journal of Conflict Resolution*, *25*, 563-579.

Office for National Statistics (2011). *Labour Force Survey 2010*. London, U.K.: Office for National Statistics.

Peeters, G., & Czapinski, J. (1990). Positive-negative asymmetry in evaluations. The distinction between affective and informational effects. In: K. W. Stroebe and M. Hewstone (Eds.), *European Review of Social Psychology* (Vol. 1, pp. 33-60). Chichester, U.K.: Wiley.

Pettigrew, T., & Meertens, R. (1995). Subtle and blatant prejudice in Western Europe, *European Journal of Social Psychology*, *25*, 57-75.

Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y, & Podsakoff, N. P. (2003). Common method bias in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, *88*, 879-903.

Purdie-Vaughns, V., & Eibach, R. P. (2008). Intersectional invisibility: The distinctive advantages and disadvantages of multiple subordinate-group identities. *Sex Roles*, *59*, 377-391.

Sears, D. O. (1988). Symbolic racism. In: P. A. Katz & D. A. Taylor (Eds.), *Eliminating racism: Profiles in controversy* (pp. 53-84). New York: Plenum Press.

Sedek, G., Piber-Dabrowska, K., Maio, G. R., & von Hecker, U. (2011). Individual differences in prejudice and associative versus rule-based forms of transitive reasoning. *European Journal of Social Psychology*, *41*, 853-865.

Sesko, A. K., & Biernat, M. (2010). Prototypes of race and gender: The invisibility of black women. *Journal of Experimental Social Psychology*, *46*, 356-360.

Settles, I. H. (2006). Use of an intersectional framework to understand black women's racial and gender identities. *Sex Roles*, *54*, 589-601.

Shields, M. A., & Price, S. W. (2002). Racial harassment, job satisfaction, and intentions to quit: Evidence from the British nursing profession. *Economica*, *69*, 295-326.

Sloman, S. A. (1996). The empirical case for two systems of reasoning. *Psychological Bulletin*, *119*, 3-22.

Stevens, F. G., Plaut, V. C., & Sanchez-Burks, J. (2008). Unlocking the benefits of diversity: All-inclusive multiculturalism and positive organizational change. *The Journal of Applied Behavioral Science*, *44*, 116-133.

Swim. J. K. (1994). Perceived versus meta-analytic effect sizes: An assessment of the accuracy of gender stereotypes. *Journal of Personality and Social Psychology*, *66*, 21-36.

Swim, J. K., Aikin, K.J., Hall, W. S., & Hunter, B. A. (1995). Sexism and racism: Old-fashioned and modern prejudices. *Journal of Personality and Social Psychology*, *68*, 199-214.

Swim, J. K., & Cohen, L. L. (1997). Overt, covert, and subtle sexism. *Psychology of Women Quarterly*, *21*, 103-118.

Taylor, A., Lambert, T., & Goldacre, M. (2009). Career progression and destinations, comparing men and women in the NHS: Postal questionnaire surveys. *British Medical Journal*, *338*, 1429.

Teigen, K. H., Martinussen, M., & Lund, T. (1996). Conjunction errors in the precistion of referendum outcomes: effects of attitude and realism. *Acta Psychologica*, *93*. 91-105.

Timberlake, J. M., & Estes, S. B. (2007). Do racial and ethnic stereotypes depend on the sex of target group members? Evidence from a survey-based experiment. *The Sociological Quarterly*, *48*, 399-433.

Tougas, F., Brown, R., Beaton, A. M., & Joly, S. (1995). Neosexism: Plus ça change, plus c'est pareil. *Personality and Social Psychology Bulletin*, *21*, 842-849.

Trades Union Congress (2006). *Black women and employment*. London: Trades Union Congress.

Transport for London (2011). *Workforce report*. London: Transport for London.

Tversky, A., & Kahneman, D. (1983). Extensional versus intuitive reasoning: The conjunction fallacy in probability judgment. *Psychological Review*, *90*, 293-315.

Weitz, R., & Gordon, L. (1993). Images of black women among Anglo college students. *Sex Roles*, *28*, 19-34.

West, C. M. (1995). Mammy, Sapphire, and Jezebel: Historical images of black women and

their implications for psychotherapy. *Psychotherapy*, *32*, 458-466.

Whaley, A. L., & Link, B. G. (1998). Racial categorization and stereotype-based judgments

about homeless people. *Journal of Applied Social Psychology*, *3*, 189-205.

Whitley, B. E. (1999). Right-wing authoritarianism, social dominance orientation,

and prejudice. *Journal of Personality and Social Psychology*, *77*, 126-134.

Screenshot 1: *Estimating proportions of employee groups in Study 1.*

SECTION 2: ESTIMATING PROPORTIONS OF EMPLOYEE GROUPS

In the following, you will be presented with a specific employee group. You will then be asked to estimate proportions of sub-groups within this employee group.

Please think of **nurses** and estimate the following proportions:

	percentage
0 10 20 30 40 50 60 70 80 90 100	
1. **female** nurses among all nurses	77
2. **black** nurses among all nurses	37
3. **female black** nurses among all nurses	36
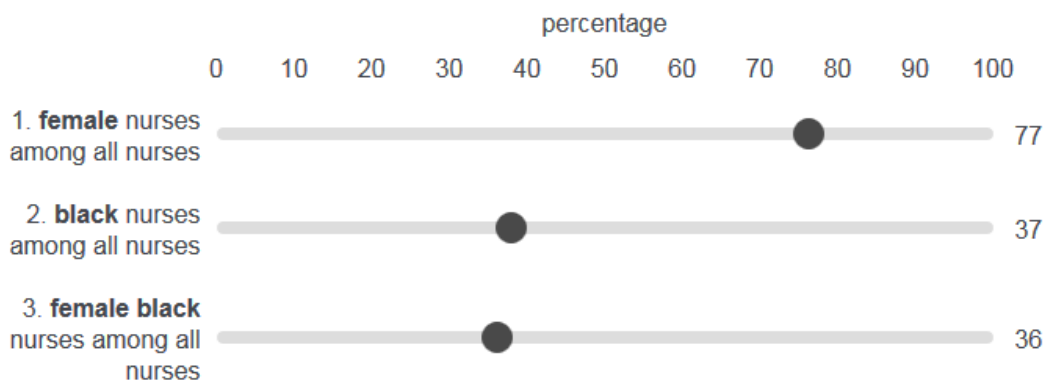
Notes: Respondents indicated estimates of sub-groups of employees using sliders that could be clicked and dragged. The responses shown are for illustration only, and indicate estimates for nurses averaged across respondents.

Table 1: *Intercorrelations between study variables and demographic variables in Study 1.*

Variables	*M*	*SD*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
					N = 181 - 183 respondents					
(1) modern sexism	2.33	0.64	(.81)							
(2) modern racism	1.86	0.72	.54**	(.85)						
(3) target occupation	--	--	.13	.11	--					
(4) strength of conjunction error	6.70	12.88	.19*	.19*	-.07	--				
(5) gender	--	--	-.39**	-.32**	-.01	-.12	--			
(6) age	37.77	11.76	-.19*	-.21**	-.04	.00	-.02	--		
(7) ethnic background	--	--	-.10	.03	.14	.02	.10	-.14	--	
(8) education	--	--	-.21**	-.20**	-.07	.02	-.05	.17**	.08	--
(9) geographic location	--	--	-.19**	-.09	.09	-.11	.04	.16*	.04	.06

Notes: * $p < .05$, ** $p < .01$. Answer formats: sexism and racism: 1 = *low*, 5 = *high*; target occupation: 0 = *gender-typical*, 1 = *gender-untypical*; strength of conjunction error (percentages): higher values indicate higher excess of product of single estimates (estimate$_{black\ female\ employees}$ - [estimate$_{black\ employees}$ x estimate$_{female\ employees}$]); gender: 0 = *male*, 1 = *female*; ethnic background: 0 = *white*, 1 = *non-white*; education: 0 = *up to Postgraduate Diploma*, 1 = *Master's Degree or higher*; geographic location: 0 = *Greater London or Central London*, 1 = *elsewhere*. Reliabilities are shown in the principal diagonal where available.

Table 2: *Regression analysis predicting strength of conjunction error from modern sexism and modern racism with target occupation as moderator in Study 1.*

	Strength of conjunction error		
	step 1	step 2	step 3
1. Predictors			
Modern sexism (SEX)	.13	.14	.12
Modern racism (RAC)	.12	.12	.15
2. Moderator			
Target occupation (OCC)		-.10	-.10
3. Interactions			
SEX x OCC			.11
RAC x OCC			-.19*
ΔR^2	.05*	.01	.03
Total ΔR^2	.05	.06	.08
(adjusted R^2)	(.04)	(.04)	(.05)

Notes: * $p < .05$. Target occupation: 0 = *gender-typical*, 1 = *gender-untypical*.
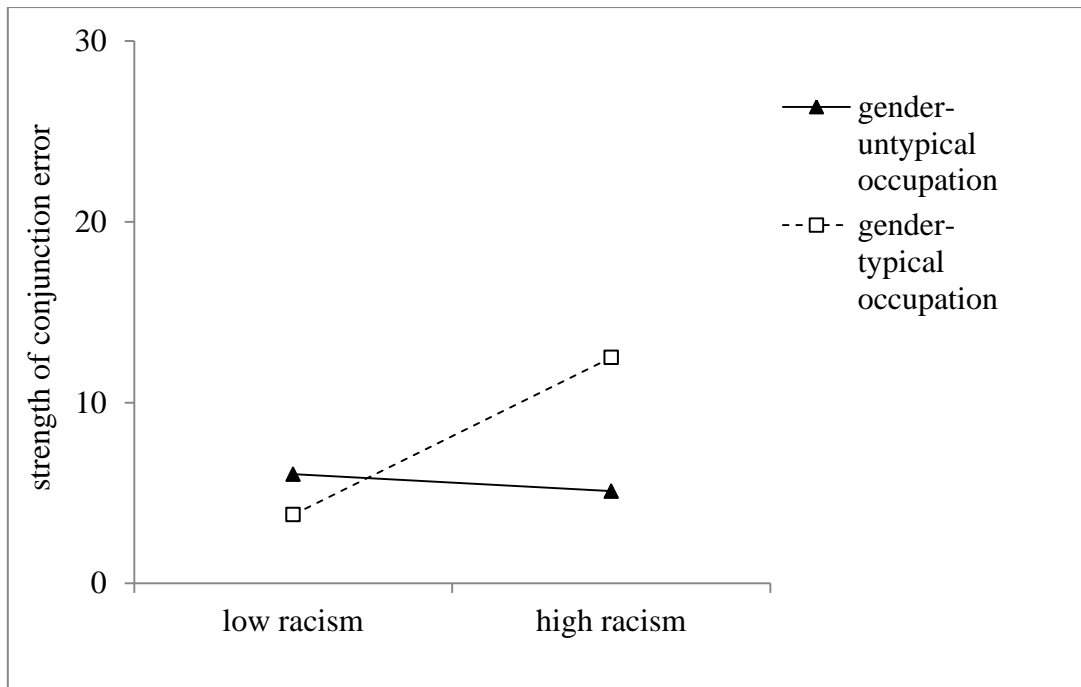
Figure 1: Moderated regression on strength of conjunction error: Interaction term modern racism x target occupation as predictor in Study 1.
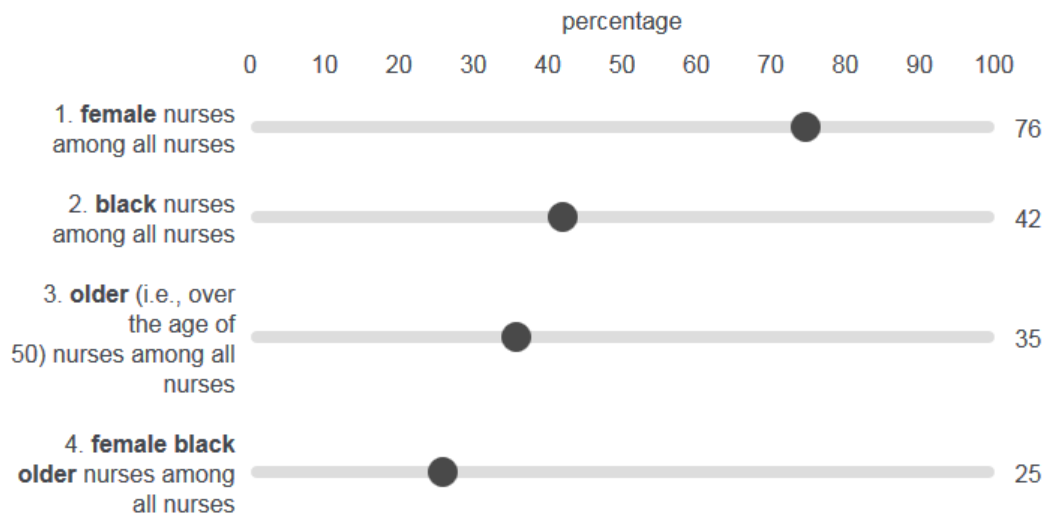
Notes: strength of conjunction error (percentages): higher values indicate higher excess of product of single estimates (estimate$_{\text{black female older employees}}$ - [estimate$_{\text{black employees}}$ x estimate$_{\text{female employees}}$ x estimate$_{\text{older employees}}$]). Low racism = *M* - 1 *SD*, high racism = *M* + 1 *SD*.

Screenshot 2: *Estimating proportions of employee groups in Study 2.*

SECTION 2: ESTIMATING PROPORTIONS OF EMPLOYEE GROUPS

In the following, you will be presented with a specific employee group. You will then be asked to estimate proportions of sub-groups within this employee group.

Please think of **nurses** and estimate the following proportions:

	percentage	
	0 10 20 30 40 50 60 70 80 90 100	
1. **female** nurses among all nurses	●	76
2. **black** nurses among all nurses	●	42
3. **older** (i.e., over the age of 50) nurses among all nurses	●	35
4. **female black older** nurses among all nurses	●	25

Notes: Respondents indicated estimates of sub-groups of employees using sliders that could be clicked and dragged. The responses shown are for illustration only, and indicate estimates for nurses averaged across respondents.

Table 3: *Intercorrelations between study variables and demographic variables in Study 2.*

Variables	*M*	*SD*	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
						N = 405 - 409 respondents					
(1) modern sexism	2.79	.66	(.85)								
(2) modern racism	2.69	.79	.43**	(.84)							
(3) modern ageism	2.39	.63	.38**	.34**	(.87)						
(4) target occupation	--	--	.03	-.02	.02	--					
(5) strength of conjunction error	13.12	14.44	.03	.15**	.13*	-.08	--				
(6) gender	--	--	-.32**	-.11*	-.10	-.01	.09	--			
(7) age	46.00	14.61	-.06	.01	-.20**	-.11*	-.08	-.17**	--		
(8) ethnic background	--	--	-.01	.04	.17**	.09	.09	.12*	-.26**	--	
(9) education	--	--	-.17**	-.23**	-.11*	.01	-.08	.11*	-.10*	.10	--
(10) geographic location	--	--	.07	.06	-.11*	.05	-.05	-.04	.24**	-.24**	-.19**

Notes: * $p < .05$, ** $p < .01$. Answer formats: sexism, racism, and ageism: 1 = *low*, 5 = *high*; target occupation: 0 = *gender-typical*, 1 = *gender-untypical*; strength of conjunction error (percentages): higher values indicate higher excess of product of single estimates (estimate$_{black}$ $_{female\ older\ employees}$ - [estimate$_{black\ employees}$ x estimate$_{female\ employees}$ x estimate$_{older\ employees}$]); gender: 0 = *male*, 1 = *female*; ethnic background: 0 = *white*, 1 = *non-white*; education: 0 = *up to Technical College*, 1 = *Undergraduate Degree or higher*; geographic location: 0 = *Greater London or Central London*, 1 = *elsewhere*. Reliabilities are shown in the principal diagonal where available.

Table 4: *Regression analysis predicting strength of conjunction error from modern sexism, modern racism, and modern ageism with target occupation as moderator in Study 2.*

	Strength of conjunction error		
	step 1	step 2	step 3
1. Predictors			
Modern sexism (SEX)	-.07	-.07	-.06
Modern racism (RAC)	.15*	.15**	.16**
Modern ageism (AGE)	.10	.10	.09
2. Moderator			
Target occupation (OCC)		-.08	-.08
3. Interactions			
SEX x OCC			.16**
RAC x OCC			.06
AGE x OCC			-.06
ΔR^2	.03**	.01	.03**
Total ΔR^2	.03**	.04	.07
(adjusted R^2)	(.03)	(.03)	(.06)

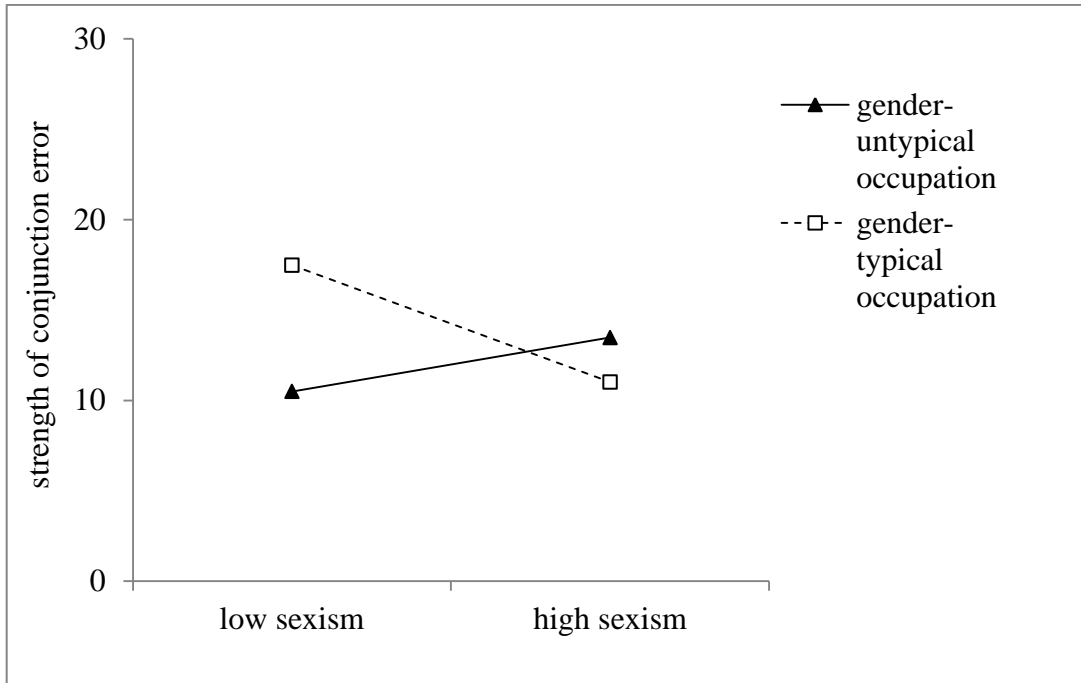Notes: * $p < .05$, ** $p < .01$. Target occupation: 0 = *gender-typical*, 1 = *gender-untypical*.

Figure 2: Moderated regression on strength of conjunction error: Interaction term modern

sexism x target occupation as predictor in Study 2.

Notes: strength of conjunction error (percentages): higher values indicate higher excess

of product of single estimates (estimate$_{\text{black female older employees}}$ - [estimate$_{\text{black employees}}$ x

estimate$_{\text{female employees}}$ x estimate$_{\text{older employees}}$]). Low sexism = M - 1 SD, high sexism = M + 1

SD.