

The Influence of an Equity Statement on Perceivers' Implicit and Explicit Associations Between Males and Science

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The present study investigated how an Equal Educational Opportunity (EEdO) statement influenced students' attitudes towards the association of males and females with science. After reading an advertisement for a student scholarship in physical science, including the equity statement or not, 109 participants completed both an implicit and an explicit measure of the relative association of males and females with physical sciences. As expected, physical science was more strongly associated with males than with females, on both the implicit and explicit measures. There was no impact of the presence or absence of the equity statement on explicit attitudes. However, there was an impact of the equity-statement for the implicit attitudes, though only for the female participants. Females showed a weaker relative association of sciences with males when an equity-statement was present. Male participants, in contrast, were not influenced by the presence or the absence of the statement. The results are discussed in terms the influence of equity statements on people's attitudes.

A large number of organizations now include equity and diversity promoting statements¹ in their recruitment advertisements, policies, mission statements and other company information. The inclusion of such statements is designed to enhance the attractiveness of the organization, to promote the organization as a good employer, and to attract diverse, high quality applicants (Smith, Wokutch, Harrington, & Dennis, 2004; Liff, 1999).

Past research has indeed shown that the inclusion of such statements can enhance the evaluation of the specific organization (McNab & Johnston, 2002; Williams & Bauer, 1994). The impact of such statements is, however, qualified by the nature of the perceiver. The positive impact of equity statements may depend on the perceiver's group membership and the personal relevance

of such statement (Veilleux & Tougas, 1989). That is, including an equity promoting statement in advertisements may have a positive impact on those individuals, such as members of minority or under-represented groups, who would likely benefit from the equity policy so advertised. At the same time such statements can have a negative impact for the majority applicants with liking of the organization decreasing (Graves & Powell, 1994; Tougas & Beaton, 1993). It is likely that such negative impact of the Equal Employment Opportunity (EEO) statements is the result of perceived threat by the majority applicants who may see such a programme favouring minority applicants over themselves (Barber & Roehlin, 1993).

Thomas and Wise (1999) have also suggested that minority group members place more importance on factors such as diversity than do

majority group members, and hence equity statements and the like are more salient to minority than majority groups. For example, Matheson and colleagues (1994) found that only in a situation where discrimination against women was made salient did the female participants equally endorse all forms of affirmative action. When discrimination was not salient, the female participants did not endorse preferential treatment. In a similar manner, Perkins and colleagues (2000) found that only minority participants were influenced by the portrayal of a diverse workforce (advertisement pictured both white and black employees), where as the majority participants were not influenced by such portrayals. Although not univocal (e.g. Paddison, 1990), the majority of past research indicates that equity statements do influence people's opinions on organizations, but the influence is dependent upon the individual's group membership.

The present study extends this research by considering a more generalized impact of the inclusion of equity statements. Rather than considering whether the inclusion of an equity promoting statement increases or decreases the attractiveness of a given organization, we investigated the impact of an equity statement on attitudes more generally. The present research investigated whether the inclusion of an equity-promoting statement, in a scholarship advertisement, would influence students' attitudes towards the association of physical science²

with males rather than with females. The association of sciences and males is well established. On both explicit, self-report, (Ayalon, 2003; National Science Foundation, 2002; Smith & White, 2002; Nosek, Banaji, & Greenwald, 2002; Nosek, 1999; Nosek, Banaji, & Greenwald, 1998) and implicit (Nosek et al., 1998) attitude measures, individuals show a stronger association between males and science than between females and science. Nosek (1999) has suggested that this attitude toward seeing sciences as a male domain can partly explain the lack of females in science fields, and influence the availability of qualified workforce in these areas (Hyde, Fennema, Ryan, Frost, & Hopp, 1990). It is noteworthy that this association between males and science is seen for both male and female participants, even for females involved in science themselves. Assuming that the number of females studying science is influenced by the association of sciences with males (Nosek, 1999), altering this association, either by reducing the strength of the association between males and science, or by increasing that between females and science, has the potential to increase in the numbers of females entering the field of sciences. The inclusion of EEO statements in job advertisements has been argued to increase the association of minority groups with that organization or occupation. In the same manner, the present research investigated whether the presence of an Equal Educational Opportunity (EEO) statement would influence the extent to which students would associate males and females with physical sciences.

We included both explicit and implicit attitude measures in our study. As a consequence of being available to introspection, the expression of explicit attitudes can be under the voluntary control of the individual such that an individual can choose whether or not to express their explicit attitudes (Dovidio, Kawakami, & Gaertner, 2002; Nosek, Banaji & Greenwald, 2002). Accordingly, explicit attitudes are open to the influence of social desirability pressures and a desire not to appear to be prejudiced. Implicit attitudes, in contrast, are available to neither introspection nor voluntary control. This lack of controllability

over implicit attitudes led researchers to suggest that implicit, rather than explicit beliefs, represent an individual's "true" attitudes toward an attitude object (Blair, 2002). Implicit attitudes have also been conceptualised as being more stable and having greater longevity than explicit attitudes (Rudman, Ashmore, & Gary, 2001; Nosek et al., 1998; Greenwald & Banaji, 1995). Furthermore, implicit attitudes have been shown to be a valid predictor of subsequent behaviour, over and above of the predictive power of explicit measures (McConnell & Leibold, 2001; Poehlman, Uhlmann, Greenwald, & Banaji, 2004).

Accordingly, much recent research has focused on assessing implicit attitudes, facilitated by developments in implicit attitude measurement tools (Fazio & Olson, 2003; Nosek et al., 1998). Although participants may have some awareness whilst completing these implicit attitude tasks (e.g., the IAT; Greenwald, McGhee, & Schwarz, 1998; the GNAT; Nosek & Banaji, 2001) that their attitudes are being assessed, it is argued that they are not able to control their responses. For example, it is very hard to intentionally control one's responses on a latency type task in order to convey a certain type of evaluation. Whilst not challenging the conceptualization of implicit attitudes as being outside of deliberative control, recent research has shown that rather than being stable and enduring, implicit attitudes can be flexible and malleable. Implicit attitudes have been shown to be influenced by individuals' goals, motives and the context of the situation (Blair, 2002). For example, Blair, Ma and Lenton (2001) found that counter-stereotypical mental imagery reduced the strength of implicit sex stereotypes, and Wittenbrink, Judd and Park (2001) demonstrated the malleability of implicit attitudes by varying the context in which the target individuals were presented in. Specifically, seeing an African American in a street context produced implicit negative evaluation of African Americans, whereas seeing an African American in a church context produced an implicit positive evaluation of African Americans. In the present research we consider whether an inclusion of an equity statement is a powerful enough contextual cue to change people's

implicit attitudes toward males and science.

In summary, the focus of the current study is to investigate the influence of equity-promoting statement on students' implicit and explicit attitudes with regard to the association of males and females with science. It was predicted that a bias towards associating science with males more than with females would be seen on both implicit and explicit attitudes, but that the equity statement would reduce the strength of the association. It was also expected that the reduction of the association would be seen more strongly with female participants, as compared with the male participants, since females are likely to be more affected by such a statement (Thomas & Wise, 1999; Graves & Powell, 1994).

Method

Participants

One hundred and nine (50 male; 59 female) undergraduate students volunteered to participate in return for a NZ\$1 scratch and win lottery ticket, and entry into a draw to win one of eight CD vouchers. The study used a 2 (sex of participant: male/female) x 2 (sex of target: male/female) x 2 (EEO-statement: present/absent) between-subjects design.

Materials

The situational cue, the Equal Educational Opportunity (EEO)-statement was embedded in a 'scholarship application evaluation' task. Two versions of an advertisement for a scholarship, said to come from the Foundation of Physical Sciences, were developed. The versions were identical except for the inclusion, in one version, of an Equal Education Opportunities (EEO) statement: "The Foundation of Physical Sciences supports Equal Educational Opportunities and encourages applications from females, Maori³ and individuals with disabilities".

A research proposal was developed by the authors and concerned research investigating the physical properties of the planet Pluto. A single version of the research proposal was used. The sex of the applicant was communicated by having the applicant's name, Anna or Michael Thompson, at the top of the

page on which the research proposal was typed.

The participants completed two measures, one explicit and one implicit measure, of the associations between males and females and science. Explicit associations were assessed by asking participants to indicate the extent to which they consider physical sciences to be a male domain and, on a separate scale, the extent to which they consider physical sciences to be a female domain. An ordered-category response form was used, ranging from 'strongly' (1) to 'not at all' (5).

Implicit associations were tested using a custom-written PC version (Walton, 2003) of the Implicit Association Test (IAT; Greenwald, McGhee, & Schwartz, 1998). The IAT measures the relative strength with which people associate a group (e.g. males) with a particular type of attribute (e.g. science) in comparison to the association of another group (e.g. females) with that same attribute, using response latency as a measure of attitude strength. When strongly associated targets and attributes share a response key participants tend to respond quickly whereas when weakly associated targets and attributes share a response key, participants respond more slowly. Accordingly, the difference in response latency as a function of the pairing of categories and attributes on response keys provides an index of the associative strength between that category and attribute. In this version of the IAT the stimuli came from 2 categories – subject domain (arts/science) with 8 target words related to science (physics, biology, forestry, maths, engineering, geology, chemistry and astronomy) and 8 to arts (history, English, Latin, Spanish, anthropology, sociology, music and classics), and sex (male/female) with 8 photographs of

males and 8 photographs of females. The IAT task consisted of 7 blocks of trials with Blocks 4 and 7 being the critical blocks. On each trial the participant was asked to press a response key to indicate which category a target item presented in the centre of the computer screen came from. The critical blocks involved either congruent trials (male and science sharing one response key and female and arts sharing another response key) or incongruent trials (male and arts sharing one response key and female and science sharing another response key). Each of the critical blocks consisted of 64 trials. The IAT effect was calculated for each participant using the revised algorithm recommended by Greenwald, Nosek, and Banaji (2003). A positive IAT score indicates a stronger implicit association between males and science than between females and science. A negative IAT score indicates a stronger implicit association between females and science than between males and science. The larger the IAT score (regardless of the direction), the stronger the implicit association.

Procedure

Participants completed the study individually. They were allocated to an experimental condition, with approximately equal numbers of male and female participants in each condition, and were told that the study is investigating people's evaluations of scholarship applications. Each participant was given one version of the scholarship advertisement and a copy of the research proposal, attributed to either a male or a female applicant. The target's name appeared on the top of the proposal to indicate their sex. Participants then completed the questions regarding the quality of the applicant and the research proposal⁴.

Following this, the participants completed the explicit attitude questions and the IAT. After completion of all the dependent measures, the participant was fully debriefed, and paid for their participation.

Results

The IAT scores and explicit attitude ratings for science as a male domain and science as a female domain are shown in Table 1 as a function of the presence or absence of the EEdO statement and the sex of the participant. The explicit ratings were reverse scored so that a higher rating indicates a stronger association between each sex and science. As there was no effect of target sex on any of the dependent measures, and the manipulation of target sex was not central to our investigation, this factor is not considered further⁵.

Implicit Attitudes

In all experimental conditions the mean IAT score was positive, indicating a stronger association of science with males than with females. A single sample t-test ($p < .05$) indicated that in each condition the mean IAT score was significantly greater than zero. That is, for both male and female participants there was a significant bias toward associating males with science, regardless of whether or not the EEdO statement was present.

A 2 (sex of participant: male/female) x 2 (EEdO-statement: present/absent) between-subjects ANOVA revealed only a significant interaction, $F(1, 105) = 4.96, p < .05$. This interaction is shown in Figure 1. Post-hoc tests (Fisher's LSD, $p < .05$) revealed a significant effect of the EEdO statement for female participants only. For the female participants the IAT score was higher when there was no EEdO statement present than when

Table 1. IAT Scores and Explicit Attitudes scores as a Function of the Presence or Absence of the EEdO-Statement and the Sex of the Participant

	EEdO present		EEdO absent	
	Female part.	Male part.	Female part.	Male part.
IAT effect	0.20	0.28	0.37	0.17
Explicit rating - Male domain	3.50	2.62	3.31	2.62
Explicit rating - Female domain	2.30	1.81	2.00	2.04
Relative explicit rating	1.20	0.81	1.31	0.58

such a statement was present ($M_s = 0.37$ vs. 0.20), indicating that the association between males and science was greater for females in the absence of the EEdO statement. For males there was no difference in the IAT score when the EEdO statement was present and absent ($M_s = 0.28$ vs. 0.17), indicating that the association between males and science did not differ for male participants as a function of the presence of the EEdO statement. There was a significant difference between the IAT scores of male and female participants only when the EEdO statement was absent, with females having a higher mean score than males ($M_s = 0.37$ and 0.17), indicating that in the absence of an EEdO statement female participants had a stronger association between males and science than did male participants. In the presence of the EEdO statement there was no difference in the IAT scores for female and male participants ($M_s = 0.20$ vs. 0.28).

In addition a 2 (sex of participant: male/female) x 2 (EEdO statement: present/absent) x 2 (block: congruent/incongruent) ANOVA with repeated measures on the final factor, was computed. In line with Greenwald et al.'s (2003) recommendations, blocks 3, 4, 6 and 7 were included in this analysis. The ANOVA revealed a significant main effect of block, $F(1, 105) = 39.50$, $p < .001$, that was qualified by a significant 3-way interaction, $F(1, 105) = 4.83$, $p < .05$. This interaction is shown in Figure 2.

To investigate this interaction further, separate statement by block ANOVAs were conducted for the male and female participants. For the male participants there was only a main effect of block, $F(1, 48) = 25.04$, $p < .0001$, with slower response latencies for the incongruent than the congruent blocks ($M_s = 1.06$ vs. 0.94 secs). For the female participants, however, there was a significant main effect of block and a significant statement by block interaction, $F(1, 57) = 5.11$, $p < .05$. Post-hoc tests (Fisher's LSD, $p < .05$) showed a significant effect of block when the EEdO statement was absent ($M_s = 1.06$ vs. 0.86), but not when the EEdO statement was present ($M_s = 1.01$ vs. 0.94). Furthermore, there

were no significant effects of statement present/absent on latencies of either with congruent ($M_s = 0.94$ vs. 0.86) or incongruent (1.01 vs. 1.06) blocks.

Explicit Attitudes

A 2 (sex of participant: male / female) x 2 (EEdO-statement: present / absent) x 2 (domain ratings: male/female) ANOVA with repeated measures on

the final factor was conducted on the domain ratings of the extent to which physical sciences are seen as a male and a female domain. Significant main effects of participant sex, $F(1, 105) = 5.11$, $p < .05$, and domain ratings, $F(1, 105) = 69.11$, $p < .001$, were qualified by a significant domain ratings by participant sex interaction, $F(1, 105) = 5.48$, $p < .05$, as shown in Figure 3.

Figure 1. Mean IAT scores as a function of participant sex and the presence or absence of the EEdO-statement.

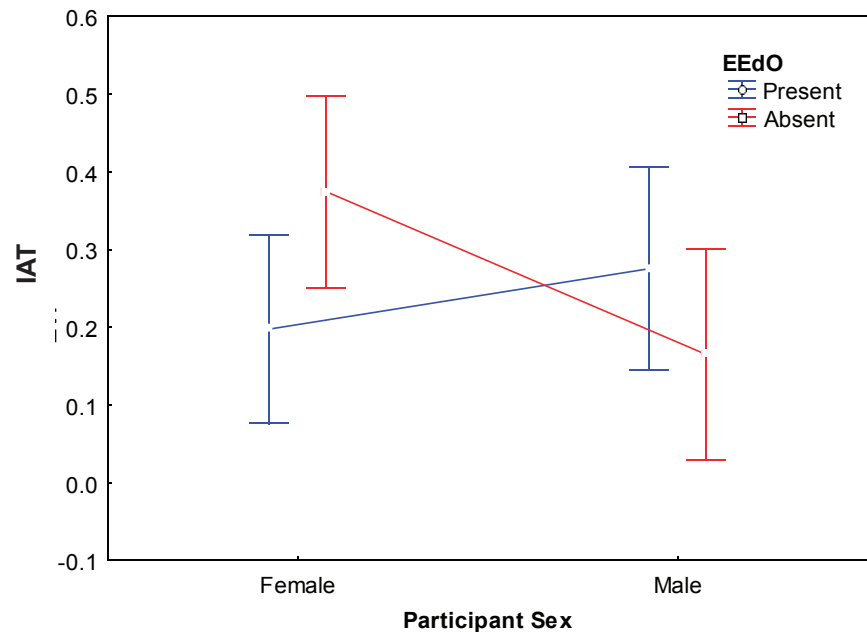
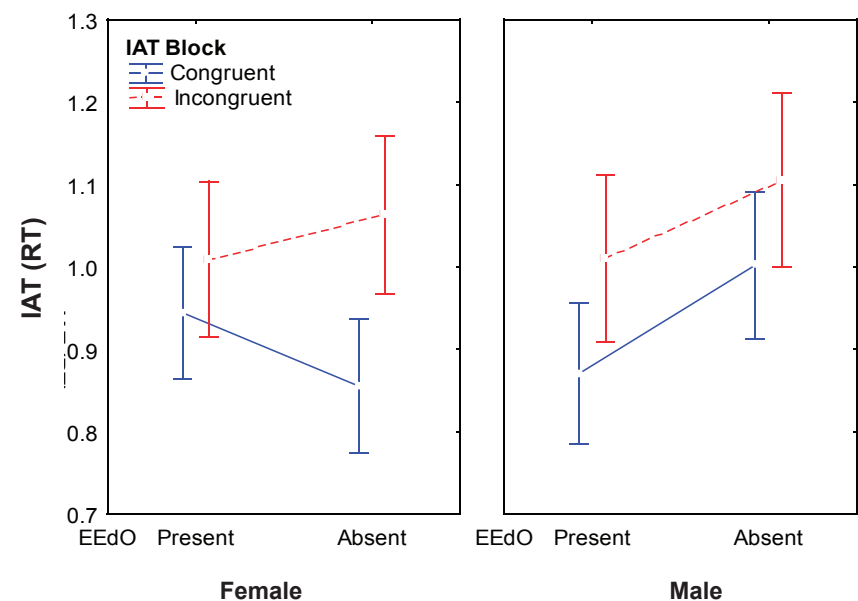


Figure 2. Mean IAT reaction time as a function of block, participant sex and the presence or absence of the EEdO-statement.



There were no significant main effects or interactions involving the EEdO statement.

Post-hoc tests (Fisher's LSD, $p < .05$) revealed a significant effect of domain ratings for both female and male participants. Both female and male participants gave higher ratings for science as a male domain than as a female domain (Female participants: $M_s = 3.40$ vs. 2.17 ; Male participants: $M_s = 2.62$ vs. 1.92). That is, both male and female participants saw science as more strongly a male than a female domain. There was no significant difference between male and female participants in their ratings of science as a female domain ($M_s = 1.92$ vs. 2.17), but there was a significant difference in the ratings of science as a male domain, with females seeing science as a male domain to a greater extent than did male participants ($M_s = 3.40$ vs. 2.62).

To investigate whether there was a bias toward associating males with science on the explicit attitude measure, a relative explicit score was calculated by subtracting the rating for sciences as a female domain from their rating given for seeing science as a male domain (see Table 1). A negative score indicates a bias toward seeing sciences as a female domain, and a positive

score indicates a bias towards seeing sciences as a male domain. Mean scores were positive in each condition and single sample t-tests ($p < .05$) revealed that the explicit attitude scores were significantly greater than zero in each condition, indicating a bias toward seeing science as a male domain.

Discussion

As expected, participants associated science more strongly with males than with females, consistent with past research (Nosek et al., 2002; Nosek et al., 1998). This effect was seen on both the implicit and explicit attitude measures. Inclusion of an equity statement did, however, influence the strength of that association, at least on implicit measures for the female participants.

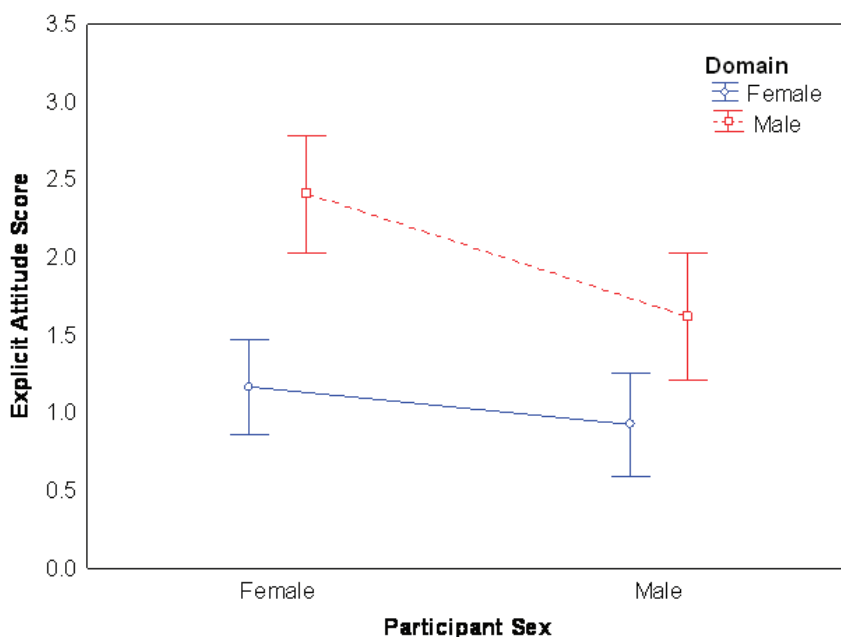
Evidence of a strong association of males with science on explicit measures, and the lack of an impact of the presence of an EEdO statement on such measures is consistent with suggestions that there are no strong social norms against associating males with science, in the way there are such norms against the explicit association of other groups and concepts (Nosek et al., 2002). In a similar vein, Nosek and Banaji (2002) found that a situational cue (experimenter sex) had no influence

on explicit attitudes between male and females and mathematics although, as in our experiment, there was an impact on female implicit attitudes. However, it is noted that the phrasing of the explicit attitude items were somewhat ambiguous. Participants could have interpreted the request to indicate the extent to which one associates physical sciences with males/females, to refer to the numerical representation of males in physical sciences, rather than (as intended) to the extent to which they saw physical sciences as a masculine or feminine domain. In case of such interpretation, it is unlikely that the equity-statement would have influenced the explicit association of science and males. Accordingly, the lack of any effect of the equity statement on the explicit measures in the reported research should be interpreted with caution.

Male participants showed a significant bias toward associating males with science, and were not influenced by the presence of the equity statement. Female participants, in contrast, showed a weaker association between males and science, on the implicit attitude measure, when the EEdO was present, as predicted. That the EEdO statement in the present research had a stronger impact on female than male participants is consistent with previous research that has shown equity issues to be more salient to minority groups, or under-represented groups such as women (Perkins et al., 2000; Thomas & Wise, 1999; Matheson et al., 1994), and that the impact of equity-type statements is greater if one is likely to be personally influenced by the policies so described (Veilleux & Tougas, 1989). The post hoc tests revealed no significant speeding of responses to the incongruent blocks (female and science, male and arts sharing response keys) or slowing of responses in the congruent block (male and science, female and arts sharing response keys). Therefore it would appear that the overall IAT effect is a result of a combination of the two.

That the effects of the EEdO manipulation were only seen for female participants indicates that the nature of the participant group as well as situational constraints need

Figure 3. Mean explicit attitude scores as the function of participant sex and male - female domain.



to be taken into consideration when investigating both the use of equity statements and the malleability of implicit attitudes. It cannot be assumed that an equity statement will have the same impact for all participants. It can also not be assumed that the attitude malleability occurs in the same manner, and in response to the same cues, for all perceivers. Although male participants showed no reduction in the strength of their association between males and science in the presence of the EEdO statement, neither did they show any increase in this association. It is possible for majority group members to feel threatened and disadvantaged by the inclusion of such statements (Barber & Roehlin, 1993; Veilleux & Tougas, 1989) and hence show a strengthening of the association as a defensive response. For example, Barber and Roehlin (1993) found that male participants were more likely to make a negative comment about a strong EEO statement than females, and furthermore, none of the male participants made a positive comment about the statement. Similarly, an extensive equity-statement produced higher evaluations from females as compared with males, and males' ratings of organizational attractiveness were the highest when only a minimal equity-statement was included (McNab & Johnston, 2002). That this did not occur in the present study supports the argument that equity statements are simply more salient, and hence have greater impact, for minority group members.

The present results are interesting for attitudinal research, as the results suggest that the target groups' (females) implicit associations can be altered (at least temporarily) with the inclusion of an equity statement, a fairly nominal manipulation. This is a noteworthy finding, since implicit attitude measures have been shown to predict subsequent behaviour (e.g. McConnell & Leibold, 2001). For example, Nosek et al. (1998) reported a relationship between implicit attitudes and behaviour in the domain of mathematics. Hence, although the equity-statement did not influence the participants' explicit attitudes, the influence on the female participants' implicit associations suggests that equity statements have the potential to influence

people's subsequent behaviours, such as applying for an advertised position. Using implicit measures also provides another means for investigating the sex gap in the field of science.

Finally, the effect of the EEdO statement on IAT scores is consistent with recent research showing that implicit attitudes are malleable and influenced by a variety of situational cues (Livingston & Brewer, 2002; Wittenbrink, Judd, & Park, 2001). The insertion of a simple equity-promoting statement was strong enough to produce a significant change in the female participants' implicit associations towards science and males.

In conclusion, the inclusion of an equity-promoting statement in an educational environment was shown to be strong enough cue to reduce the association between science and males, but only for the female participants. Organizations should hence carefully consider the impact of equity statements for both the majority and minority members before including such statements in their recruitment advertisements and other organizational material. Further, the results provide further evidence for the malleability of implicit attitudes. The equity statement was a strong enough cue to influence implicit attitudes although the influence differed depending on the participant group. Finally, in line with past research (Nosek & Banaji, 2002), the situational cue had no effect on the explicit attitudes.

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Notes

- ¹ Equity and diversity promoting statements can take a number of forms. The distinction between Equal Opportunities Statements (EEO) and Affirmative Action (AA) statements is an important one, but beyond the scope of the present paper.
- ² Although the focus of the paper is towards physical sciences, the terms 'science' and 'physical science' are used interchangeably in this paper.
- ³ Maori are the indigenous people of New Zealand and are under represented in tertiary education, especially in the physical sciences (Ministry of Education, 1997).
- ⁴ The judgment task was completed as part of the cover story for the research.
- ⁵ Full details of the analyses including the target sex factor can be obtained from the corresponding author.