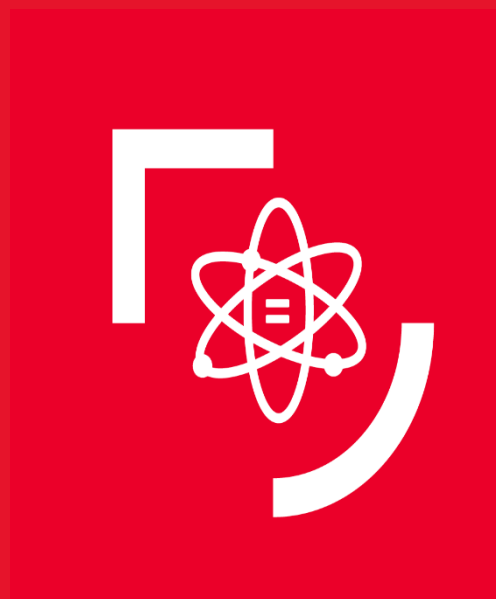


Understanding & Improving Attitudes:

Making SWAN work for your

Department





**Research undertaken by the 'Inclusion Really Does Matter' Project
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Foreword

Dear Athena SWAN Community,

The work we present in this guide was inspired by our increasing awareness of two uncomfortable truths. One is that existing gender equality initiatives, such as Athena SWAN, are not as effective as they could be. Recent modelling analyses suggest that it may take more than 100 years to close the gender science gap in some STEM fields. We simply cannot afford to wait this long. The second uncomfortable truth is that there are negative or indifferent attitudes on the ground towards such initiatives. We have sat in numerous SWAN meetings in which we discussed this resistance and how we can get more academics on board.

As researchers, we sought data to address these problems. We looked at valuable qualitative research, we listened to our colleagues, and sought theory from psychology and management to design six experimental studies that each investigated factors that could make gender equality initiatives more or less impactful. With funding from the EPSRC Inclusion Matters call and the collaboration of the Universities of Warwick and Glasgow, we specifically and innovatively collected data from 604 academics from approximately 17 Engineering and Physical Science faculty departments across three universities.

The current guide and recommendations are based on evidence obtained from these studies and is accompanied by short video resources, as well as a questionnaire which can help you measure your department's attitudes towards Athena SWAN. We sincerely hope you will find these findings and recommendations useful in your efforts to achieve gender equality within your department.



Dr Ioana Latu
Project Director



Glossary of Terms

EPS – Engineering & Physical Sciences

EPSRC – Engineering & Physical Sciences Research Council

GEI(s) – Gender Equality Initiative(s)

IAT – Implicit Association Test

SDT – Self-Determination Theory

STEM – Science, Technology, Engineering and Maths

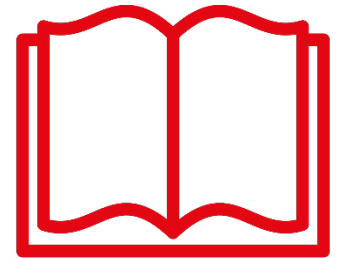
QUB – Queen’s University Belfast

VR – Virtual Reality



About This Guide

This guide brings together the findings of the EPSRC funded ‘Inclusion Really Does Matter: Improving Attitudes towards Gender Equality Initiatives among Engineering and Physical Sciences faculty’ project based at Queen’s University Belfast (QUB) in collaboration with the University of Warwick and University of Glasgow. This project gathered new empirical evidence about how best to implement Gender Equality Initiatives (GEIs) to increase positive attitudes towards these initiatives among Science, Technology, Engineering and Math (STEM) academics.



Across six experimental studies, we examined the impact that differences in content and framing of GEIs had on attitudes towards these initiatives among STEM faculty and postgraduates. These findings provide empirical support for a number of recommendations detailed within this guide on how best to implement GEIs to promote greater positivity towards these initiatives which should encourage more engagement. Alongside our own findings, this guide draws on other relevant social psychological and management literature cited throughout.

In terms of intended audience, we believe the guide will be useful for anyone involved in gender equality, diversity, and inclusion work in universities. This includes both academics and professional services staff. The aim of the guide is to provide an extensive overview of our research (i.e. aims, methods & findings), and outline our evidence-based recommendations for GEIs in detail. However, in order to provide shorter, more digestible snapshots of our key findings and recommendations, we have created a series of bitesize videos which accompany this guide. Please feel free to share these videos with your

Improve Attitudes towards Gender Equality Initiatives

colleagues or use them in any meetings or workshops in order to disseminate our research and practical recommendations further.

The guide itself is separated into two main themes – the framing or description of GEIs, and the content of GEIs. We strongly suggest that both themes are attended to when designing and implementing GEIs to most benefit from the recommendations. These evidence-based suggestions should also be considered as part of the larger narrative on how to address gender inequalities in academia.

Our recommendations focus in particular on increasing support for GEIs and encouraging engagement amongst STEM academics, including men (a group typically less involved in gender equality work¹, often to the detriment of these initiatives). To be clear, this does not mean that we advocate for diluting the goals of equality initiatives, rather we make suggestions for how to better engage academics in supporting these goals and associated actions so that GEIs benefit from the support of a larger number of academics. Systemic changes and relevant actions that address the unique concerns of gender minorities will still be necessary to implement as part of any GEI in academia.

We also want to highlight that the recommendations most beneficial to you will depend on your own institutional and departmental context, as well as the particular groups you are targeting. We strongly recommend that you gather data on your own institution/department prior to rolling out a GEI to better understand the issues that may be unique to your context and that could be addressed by such an initiative. To facilitate data-gathering with respect to attitudes towards GEIs, we have included a survey along with administration instructions that you may decide to use (see Appendix I).

Improve Attitudes towards Gender Equality Initiatives

STEM academics were our target population as GEIs such as Athena SWAN are more established within STEM departments, however, we believe that these recommendations will also be useful when designing GEIs for non-STEM departments, given that Athena SWAN expands into the Arts and Humanities, and that academics share many similar characteristics (e.g., high level of education and critical thinking).

Resource Toolkit

To supplement this guide, the Project Research Team will develop multimedia resources including a video and app as part of a toolkit to improve attitudes towards GEIs. This toolkit will be made freely available once completed. Contact Dr Ioana Latu (i.latu@qub.ac.uk) for more information.

Inclusion Matters

To address other facets of equality, diversity, and inclusion (EDI) initiatives we refer you to the ten other EPSRC-funded Inclusion Matters projects that conducted a mix of qualitative and quantitative research to help accelerate cultural change in favour of EDI. They cover areas such as LGBT+ inclusion, early career networking among women, disability inclusion and diversity among Big Grant holders. To find out more about these projects see here: <https://epsrc.ukri.org/funding/edi-at-epsrc/inclusion-matters/>

Executive Summary

Across six experimental studies with a total of 604 STEM academics, we examined how best to design and implement GEIs to improve attitudes towards these initiatives.

Research Findings on Framing of GEIs:

- Internal motivation (e.g., promoting the intrinsic benefits of diversity) improved support among both men and women.
- Female leadership produced fewer concerns of anti-women discrimination in the workplace among men and women.
- Men were more supportive of inclusive GEIs (e.g., framed as providing benefits for both men and women) due to fewer concerns of unfair treatment and more internal motivation to engage with the GEI.

Research Findings on Content of GEIs:

- A dual route of persuasion incorporating a cognitive route (e.g., evidence-based information) and an affective route (e.g., perspective-taking) led to improved support for GEIs among men.
- When men felt responsible for gender inequalities in STEM, increasing their self-efficacy (i.e., belief in one's ability to address gender bias) was related to greater support for GEIs.
- Men felt threatened by GEIs when they believed that greater gender equality would affect their career opportunities in STEM, and they were told that biological sex differences did not explain gender inequality in STEM.

Practical Suggestions for Designing & Implementing GEIs:

- Frame Gender Equality Initiatives more inclusively. For example, when communicating these efforts, try to highlight their benefits for *all* individuals, regardless of gender.
- Encourage female leadership of GEIs, and ensure women are appropriately awarded for this work so they are not disadvantaged by taking on these roles.
- Highlight the intrinsic benefits of achieving gender equity for the workplace, individuals, and science itself. This will help promote greater internal motivation to engage with & support GEIs amongst academics.
- Utilise both cognitive and affective routes of persuasion to appeal to male STEM academics. For example, this could include providing male academics with empirical evidence-based information on gender biases and inequality, and running a perspective-taking exercise to allow them to experience how it typically “feels” to be a woman in STEM.
- Promote greater self-efficacy to tackle gender bias in STEM. This could be achieved by making academics aware of practical, empirically supported actions they can take to address gender equality issues in academic contexts.
- In combination with boosting self-efficacy, it may also be useful to increase responsibility for addressing gender biases, particularly amongst male STEM academics.
- Address men’s feelings of career and status threat regarding greater gender equality in STEM. This could be achieved by highlighting the huge economic growth in STEM careers, and increasing empathy for women’s career struggles in STEM.

Why is this Research Necessary?

Gender Equality Initiatives (GEIs), such as Athena SWAN, have been widely adopted in STEM departments across UK academic institutions, however:

- Progress towards gender equality has remained slow, particularly as one moves up the career ladder
- Many STEM fields still require additional intervention if they are to reach parity this century²



Cultural change to promote and sustain equality within academic institutions remains a challenge³.

In order to accelerate progress in this domain, the effectiveness of Athena SWAN initiatives must be improved. The negative attitudes that STEM academics express towards GEIs such as Athena SWAN are an important contributing factor to their effectiveness. Without a positive climate of support, structural changes will be less effective⁴. These negative attitudes are not always openly expressed; however, anonymous surveys have captured a range of responses which suggest that GEIs within academic settings can experience resistance or backlash.

Resistance to Gender Equality Initiatives

Academics have expressed concerns that GEIs:

- Are box-ticking exercises without real impact^{5, 6}
- Provide preferential treatment to women based on their gender, not ability^{5, 6}
- Women fear their achievements will be attributed solely to GEIs⁶



Additionally, **men tend to be less supportive of diversity policies¹** making them a key group to target. We must better engage men in gender equality work in order to produce widespread culture change and support for equality actions. This will involve a careful balancing act as, while we need GEIs that better engage all academics regardless of gender, these initiatives must retain effective actions that promote equality for gender minority groups such as women in STEM. We strongly advocate that GEIs retain this important goal while working to engage the gatekeepers in academia in equality work that is both inclusive and effective.

Backlash towards GEIs can reinforce perceptions that gender equality work is:

- Low status
- Provides no benefits for men⁷
- “Women’s work”, typically shouldered by early career women^{6, 8}

In sum, **there is a need to improve support for Athena SWAN among STEM academics, particularly men** – the majority group in most STEM fields.

Our Empirical Approach

Little experimental work has targeted improving attitudes towards GEIs amongst STEM academics. Experimental work is important, as it allows us to systematically explore the causal effect that contextual changes can have on people's attitudes and behaviours.

Our experimental approach:

- Targeted certain relevant factors or variables in our research design;
- Randomly assigned participants to groups that varied these factors;
- Compared the effect that systematically varying the factors we were interested in (**independent variables**) had on the outcome we were interested in - in this case, participants' attitudes towards GEIs (**dependent variables**)



This approach allowed us to make **causal inferences** that any change in attitudes (dependent variable) was most likely due to the manipulation of the contextual factors we varied (independent variable).

Inferential statistical analysis:

- Allowed us to interpret whether our independent variables **were having a significant effect** on our dependent variables
- Traditionally, results with a **p value of < .05** are interpreted as evidence that these results would rarely occur by chance if there was no relationship between our variables
- Calculating **effect sizes** allowed us to quantify the magnitude or importance of our experimental effect
- Larger effect sizes suggest a stronger relationship between our variables
- All significant results we describe were statistically significant at the **level of $p < .05$** .

Empirical Research to Improve Attitudes towards Gender Equality Initiatives among STEM Academics

In response to the need for improved attitudes towards GEIs, our project focused on two main categories of factors: **framing** and **content** of GEIs. In the following sections, we briefly detail the factors targeted by our research, our findings, and recommendations.

Framing of Gender Equality Initiatives (GEIs)

Across two studies we examined the impact of four framing factors⁹.

GEI Focus

GEIs in STEM are typically framed to emphasise opportunities for women as the minority group. This may convey a message of exclusion to men, which is problematic when gender equality is the goal³. Such GEIs may also be perceived as affirmative action for women which tends to be evaluated less favourably, particularly by men¹⁰, and women also fear that their success is then attributed to GEIs rather than personal achievements⁶. A more inclusive approach, therefore, would be to frame GEIs as providing opportunities and benefits for both men and women. This may lessen the perception that GEIs are only ‘women’s work’ and help ameliorate women’s concerns that their success will be solely attributed to GEIs if men also perceive benefits from GEIs, while men may feel more included.



GEI Leadership

GEIs are championed and led predominantly by women³. As a consequence, women also complete a disproportionate amount of administrative work for

Improve Attitudes towards Gender Equality Initiatives

GEIs⁶. This may signal that gender equality work is of lower status¹¹ and a ‘women’s issue’ only¹². The additional burden of this work on women may further increase gender inequality and negatively impact women’s career progression⁸. GEI male leadership may address the dearth of male role models undertaking GEI work⁷. However, female leadership remains important as same-sex role models can have a particularly strong positive impact on women¹³.

GEI Motivation

GEIs may be framed as internally or externally motivated when implemented by organisations. Externally motivated activities are enforced by an organisation, for example compulsory unconscious bias training for staff. Internally motivated activities emphasise the intrinsic value of the activity and participation is freely chosen by staff. Certain elements of GEIs may need to be compulsory, however, this can create backlash¹⁴.

An emphasis on GEIs as legal requirements or necessary for funding eligibility may portray these initiatives as box-ticking exercises and produce backlash effects¹⁵. Research suggests that employees react more favourably when the opportunity for learning and adaptive change through diversity is highlighted¹⁶. Internal motivation to engage with GEIs can thus improve attitudes towards GEIs.

GEI Management Support

GEIs actively supported by senior management are more likely to be perceived as authentic¹⁷ and evaluated favourably by employees¹⁸. Support from university leaders is important to ensure that GEI efforts are not undermined by wider institutional practices⁸. However, indications of support may be treated

Improve Attitudes towards Gender Equality Initiatives

with suspicion or discounted given academics' concerns that GEIs are just 'lip service'⁵. For instance, verbal support may not always be translated into necessary action and participation by senior figures¹⁹. The importance of management support may also be perceived differently depending on academics' previous level of experience with GEIs. If people have less familiarity with GEI work then management support may be viewed as a proxy for GEI success, while those with more experience may be less reliant on this support to maintain a positive attitude²⁰ and address gender equality issues.

Studies 1-2^a

Participants

Study 1: 116^b UK-based, mainly White STEM academics (59 women).

Study 2: 152 UK-based, mainly White STEM academics (83 women).

Gender comparisons were made between men and women due to sample limitations^c.

Method

The impact of the above four factors (GEI Focus, Leadership, Motivation and Management Support) on attitudes towards GEIs was examined across two online studies.



^a Published in BioScience (Farrell et al., 2020). See References.

^b Sample sizes varied across analyses as participants were free to withdraw at any point.

^c Our samples were relatively homogenous in terms of race (predominantly White) and gender (predominantly binary genders). This is acknowledged as a limitation of the research. It is important to expand and replicate these findings with more diverse samples of STEM academics.

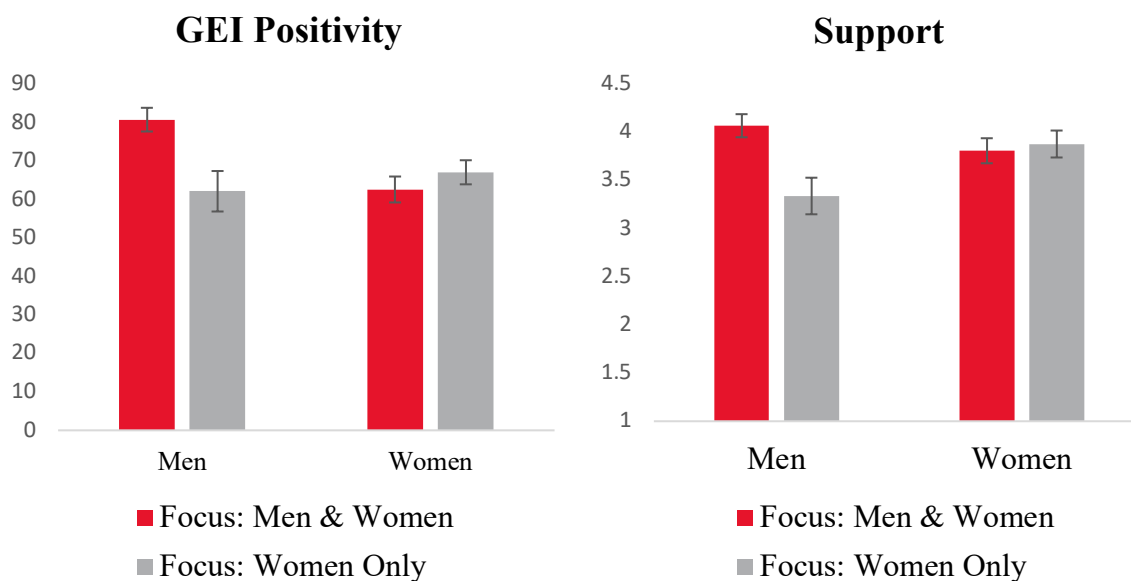
In each study, participants read **one of four fictitious emails** describing a University GEI (see Appendices II & III)

Study 1 GEI Emails		Study 2 GEI Emails	
1. Male-Led; Benefitting Men & Women	2. Female-Led; Benefitting Men & Women	1. Internally Motivated; Supported by Management	2. Externally Motivated; Supported by Management
3. Male-Led; Benefitting Women Only	4. Female-Led; Benefitting Women Only	3. Internally Motivated; Not Supported by Management	4. Externally Motivated; Not Supported by Management

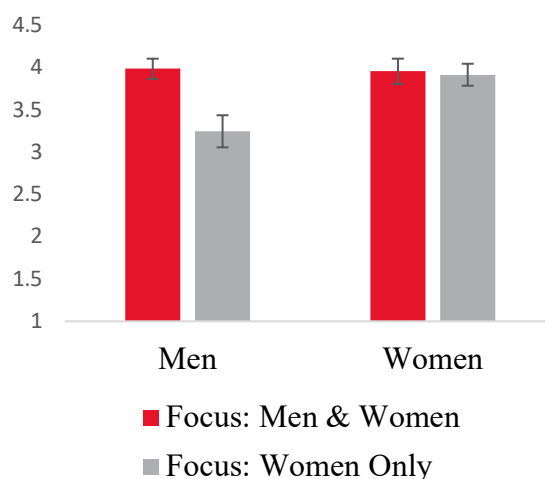
Completed self-report attitudinal questionnaires &
GEI attitudes Implicit Association Test (IAT)

IAT measures implicit attitudes assessed under time pressure and thought to be less influenced by socially desirable responding

Study 1 Main Results



Internal Motivations to Engage with GEI



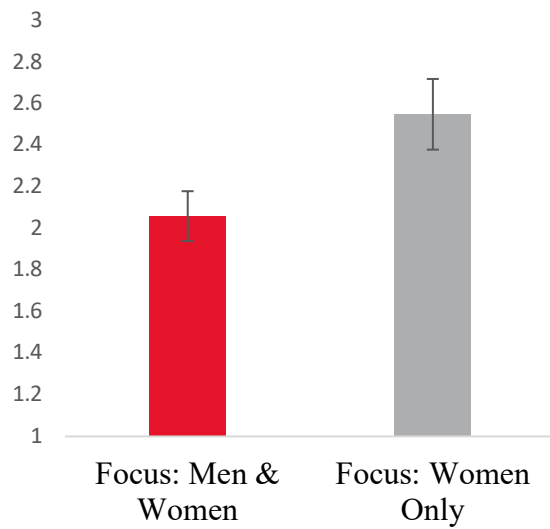
Men reported more **self-reported positivity, support & internal motivation to engage** with the GEI when it was framed as benefitting both men & women.

Men were more supportive of this more inclusively framed GEI due to **less concerns of unfair treatment** and **more internal motivations to engage** with the GEI.

Women were similarly supportive across the four conditions.

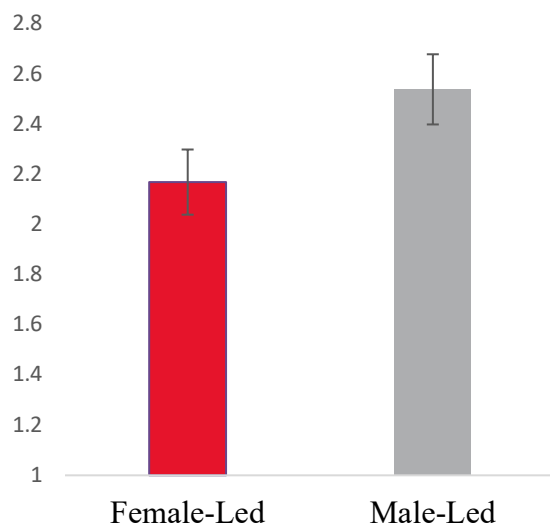
Improve Attitudes towards Gender Equality Initiatives

Anti-Men Discrimination



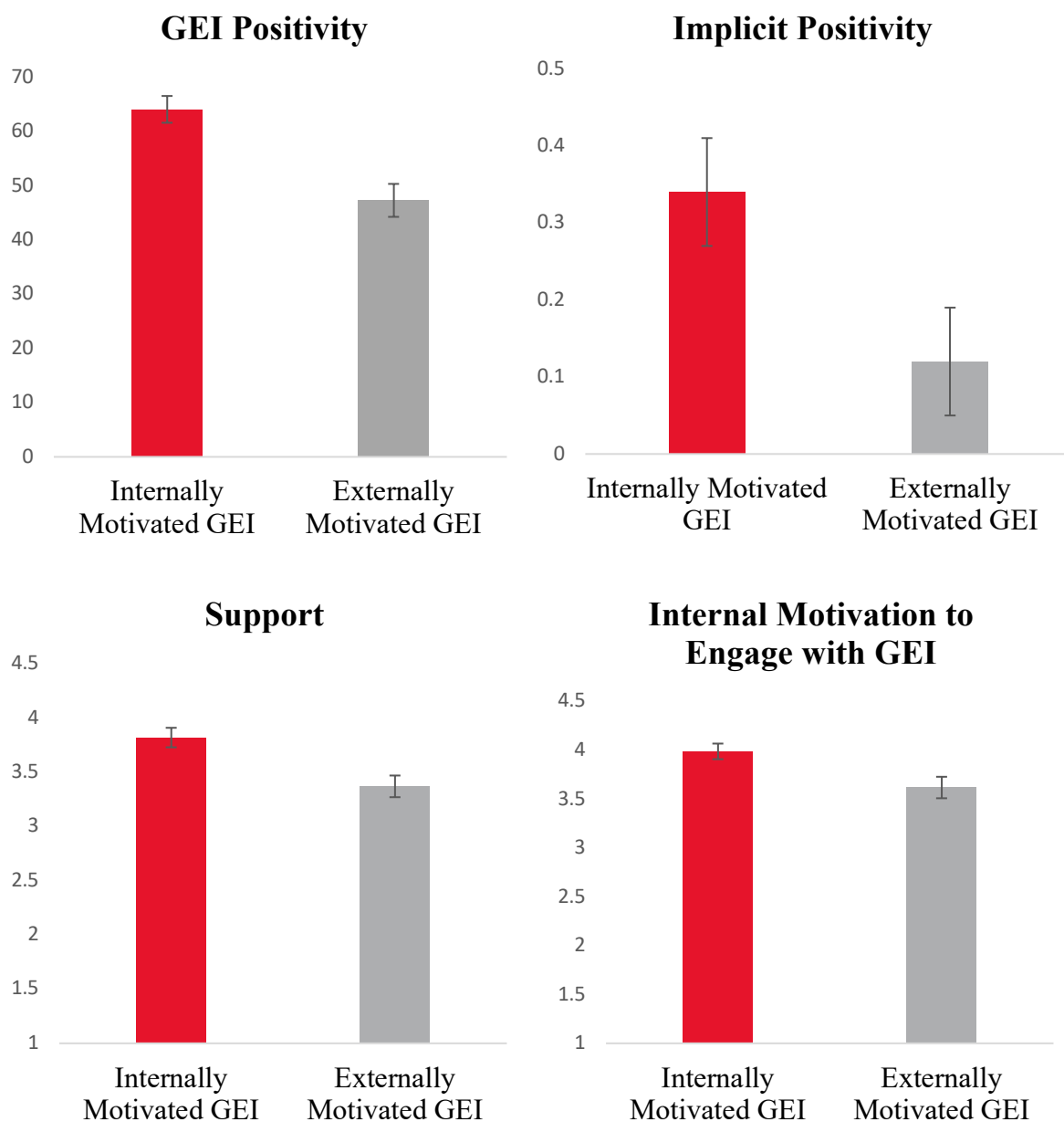
Both men and women reported **less concerns of anti-men discrimination** when the GEI was framed as benefitting both men and women

Anti-Women Discrimination



Both men and women reported **less concerns of anti-women discrimination** when the GEI was framed as led by a woman

Study 2 Main Results

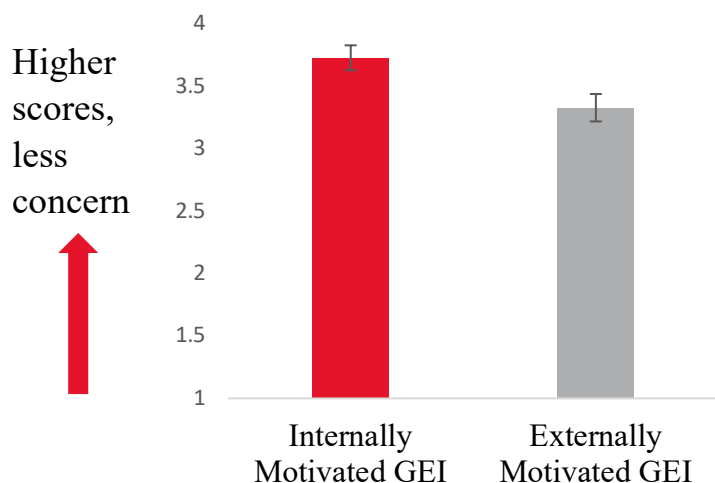


All participants (regardless of gender) reported more **implicit** and **self-reported positivity, support & internal motivation to engage** with the GEI when engagement with the GEI was framed as internally motivated.

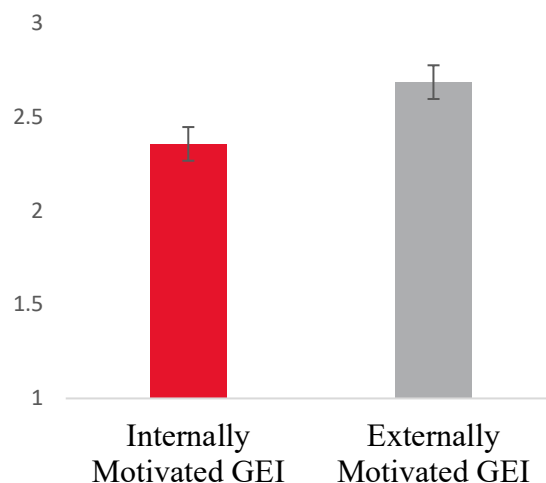
However, women were generally **more supportive** regardless of GEI framing.

Improve Attitudes towards Gender Equality Initiatives

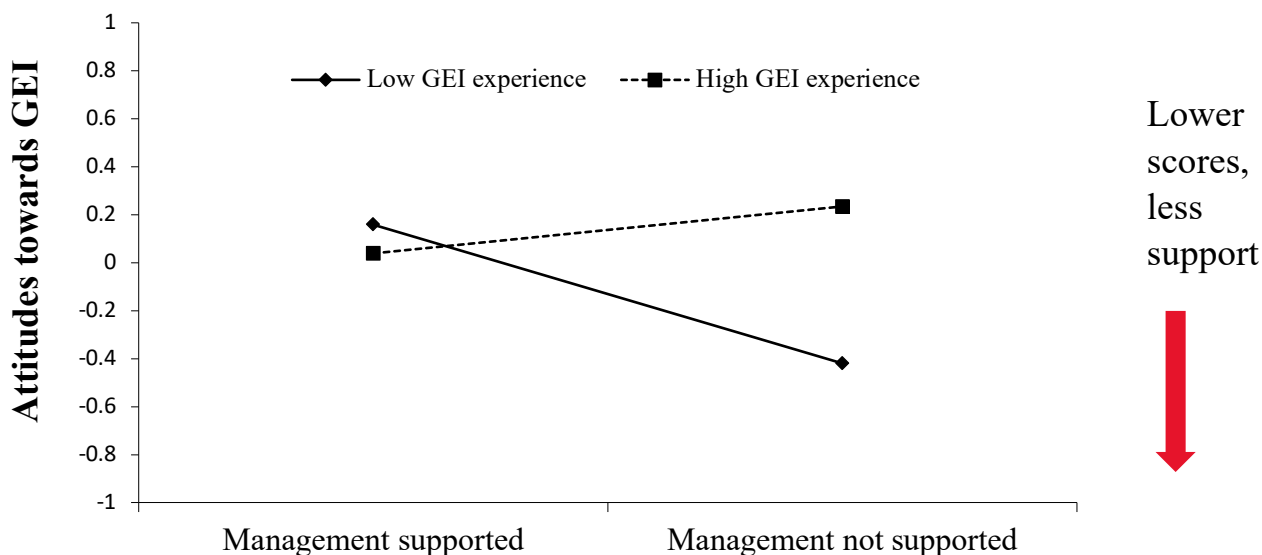
Concerns of Unfair Treatment



External Motivation to Engage with GEI



Men and women reported **less concerns of unfair treatment and less external motivation to engage** with the GEI when engagement with the GEI was framed as internally motivated.



Impact of Management Support influenced by academics' level of GEI experience.

Those with less GEI experience showed more **support for GEIs** supported by senior management. For those with more GEI experience, there was **no relationship** between management support and GEI attitudes.

Improve Attitudes towards Gender Equality Initiatives

The differential effect of management support may be a **sign of self-efficacy or a compensation strategy**, such that those with more GEI experience know that they can and should tackle gender inequality regardless of management's position.

It may also be the case that those with more GEI experience require evidence of more concrete management support to increase their positivity. Management support in the current study may have been perceived as merely symbolic support as opposed to necessary management role models visibly 'walking the talk'^{3, 17, 19}.

Recommendations to Improve the Design and Implementation of Gender Equality Initiatives – Framing

These results suggest that attitudes towards GEIs can be influenced by how these initiatives are **framed**. Specifically, our research suggests that **GEI motivation, focus and leadership** are significant factors to consider when designing & implementing GEIs in order to motivate greater engagement amongst STEM academics.



- 1. Internal motivation was a powerful means of increasing support and positive attitudes for both men and women.** Pressurised framing of GEIs as compulsory and required should, therefore, be reduced. Individuals are more likely to want to engage with GEIs when they are able to perceive the value of equality and diversity and feel they have some autonomy. Therefore, when communicating GEIs, the intrinsic

value of achieving gender equity for the workplace, individuals, and science itself should be emphasised, as opposed to compulsory and legal requirements, for example.

2. A more inclusive framing for GEIs, promoting benefits for all individuals regardless of gender may lessen the perception that gender equality is an issue for women only and is of no benefit or interest to men. This may reduce the burden of additional work in this domain for women and aid the effective integration of GEI actions into policy⁷. Male buy-in is necessary to advance gender equality. It is important to note here, however, that GEIs should still advance minority gender groups and address their unique concerns, supporting people of all genders, not just men and women⁹. We do not advocate for abandoning women- or minority gender-focused components of GEIs but rather when communicating these initiatives, it may be beneficial to highlight the broader benefits these initiatives can bring alongside these actions. For example, a GEI may include actions such as raising awareness of family-friendly policies for all staff, regardless of gender, and fostering positive networking between staff and students of all genders.

3. Female leadership for GEIs also appeared to be an important factor. This may be particularly important for engaging women, and reducing concerns of anti-women discrimination in the workplace. However, GEI work must be more significantly recognised and appropriately rewarded in university settings so that women are not disadvantaged by these leadership roles. For example, GEI work could be consistently considered as part of promotion criteria⁸. If the number of women in an institution or department is too low for female GEI leadership (running the risk that women will be overburdened by this

Improve Attitudes towards Gender Equality Initiatives

work) then, in tandem with better rewarding this work, joint leadership with men may be considered so that the women involved are supported in leading this work.

4. Finally, GEI communications should be framed differently depending on the communication’s target audience. There is no “one size fits all” framing for gender equality work. This is supported by the finding that management support was more important for those with little GEI experience.

Key Summary

- An **internally motivated** GEI, **led by a woman** with an **inclusive focus** providing opportunities for both women and men appears most likely to increase positivity and support among men and women in STEM academia.
- GEI communications should be **nuanced** taking into consideration the characteristics of the different groups being targeted.

Content of Gender Equality Initiatives^d

GEIs must be nuanced depending on their target audience. When addressing the content of GEIs for academics, one must acknowledge that they are a unique population differing from the general population in significant ways, such as their level of education, scientific training and experience as researchers and educators.



The four studies in this section focus on men, given that they are the majority group in STEM and are typically less supportive¹ and less involved in GEIs³. To facilitate large-scale departmental and institutional culture change, we need to encourage greater buy-in from the gatekeepers in STEM academic fields who are mainly men. We therefore examined four factors that may best improve men's attitudes towards and engagement with GEIs, including evidence-based information, perspective-taking, increased self-efficacy and responsibility or blame for gender bias (Studies 3-4). We also considered the impact of feelings of threat on men's reactions to GEIs – threat to their career opportunities and threat to their prototypical beliefs surrounding their status as the typical majority group in STEM (Studies 5-6).

Evidence-Based Information

Given their scientific training, STEM academics likely have a high need for cognition (defined as one's tendency to engage in and enjoy thinking²¹), and so may respond well to persuasive information via a central, rational route. Given that information supported by experts is typically more effective²², empirical scientific evidence about the causes and consequences of gender bias in STEM

^d Studies 4 and 5 were adapted from their original lab-based design to be delivered online due to the impact of the COVID-19 pandemic.

Improve Attitudes towards Gender Equality Initiatives

may be effective at increasing positive attitudes towards gender equality work among male STEM academics. However, targeting this one higher-level processing route may not be enough, given that some male academics evaluate gender bias research less favourably compared to other research²³. Therefore, a peripheral, affective route may also be necessary to increase positive attitudes towards GEIs.

Perspective-Taking

One way to target an affective route of persuasion is via perspective-taking. Perspective-taking involves taking on the perspective of another person, ‘seeing’ the world through their eyes²⁴. Perspective-taking can increase empathy and prosocial behaviour towards the outgroup that is the target of the perspective-taking²⁵. This may create more receptive emotional states among men in STEM academia by promoting empathy for women in STEM²⁶. Emotional states may influence how individuals react to counterintuitive or threatening information²⁷ such as challenges to biological explanations for gender disparities in STEM and the need for greater equality.

We explored perspective-taking both through traditional manipulations (by having male academics create narratives about a female academic’s experiences) and via virtual reality (by having male academic embody a female academic avatar). Together, perspective-taking with a female scientist (affective route) in combination with the presentation of empirical evidence about gender bias (rational route) may better promote positive attitudes towards GEIs among men in STEM.

Self-Efficacy

Self-efficacy refers to the confidence one has in their ability to complete a task²⁸ and is important for fostering effective changes in behaviour. Initiatives that target self-efficacy related to issues of equality and diversity have been shown to improve participants' confidence that they can address these issues²⁹. Male STEM academics may avoid tackling gender equality issues if they feel they insurmountable, while they may be more supportive of GEIs if they feel capable of addressing gender inequality³⁰. This self-efficacy can be increased by making academics aware of practical, empirically supported actions they can take to address gender equality issues in academic contexts (e.g., raise awareness of stereotypes³¹).

Responsibility

Attributing blame or responsibility to a social group for a particular outcome may produce feelings of guilt which triggers behavioural reflection and self-control³². Generating feelings of responsibility or guilt for gender inequality in STEM among male STEM academics (the majority group) may facilitate internal motivations to support GEIs which is important for increasing positive GEI attitudes. In certain contexts, this responsibility or blame may generate more support for gender equality efforts, particularly, for example, if people experience high levels of self-efficacy and feel that their actions will make a difference²⁰.

Threat to Career Opportunities

The effectiveness of GEIs may be compromised by men's concerns that successful equality initiatives might negatively affect their career opportunities^{17, 33}. For example, male academics might fear that their chances of being hired and promoted may decrease due to the introduction of gender

Improve Attitudes towards Gender Equality Initiatives

equality initiatives, lowering their chances of finding employment or progressing in their chosen field. These concerns often trigger feelings of threat, which are linked to disengagement from pro-diversity initiatives and lower support for these programs³³.

Threat to Prototypical Beliefs

GEIs may be met with backlash since they may counter participants long held attitudes and beliefs surrounding men's status in STEM fields. For example, male academics may view gender disparities in science and engineering as natural, due to innate biological differences between females and males³⁴.

However, there is no conclusive scientific evidence for these assumptions, with men and women's cognitive abilities appearing more similar than different^{35, 36}.

Thus, GEIs attempting to resolve gender disparities in STEM might be met with negative attitudes from male academics for challenging these prototypical beliefs of biological differences, which might also threaten men's perceived status in STEM.

Study 3

Participants

72 male, mainly White STEM academics based in the UK.

Method

Participants experienced a VR conference reception.

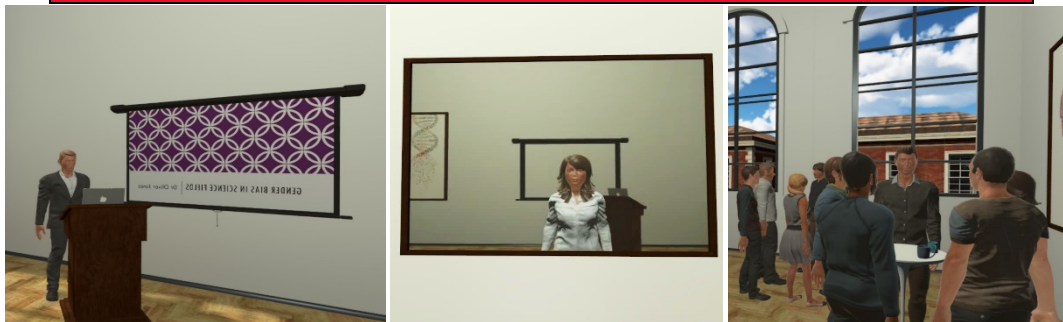
At the beginning of the experimental session, electrodes were attached to participants' hands to measure Electrodermal Activity (EDA) which provided an index of physiological arousal.

Electrodes attached to measure Electrodermal Activity (EDA): Physiological arousal

In VR participants either assigned:

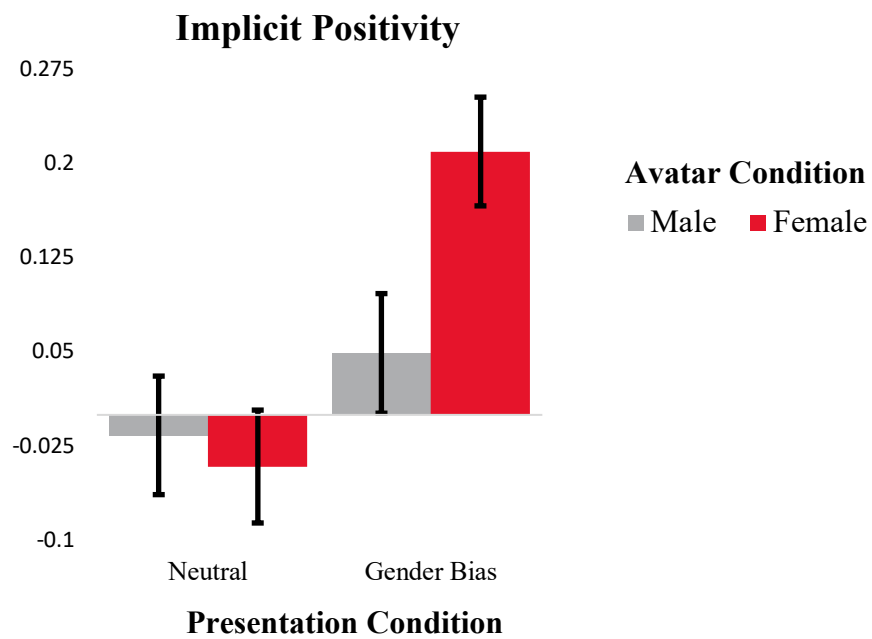
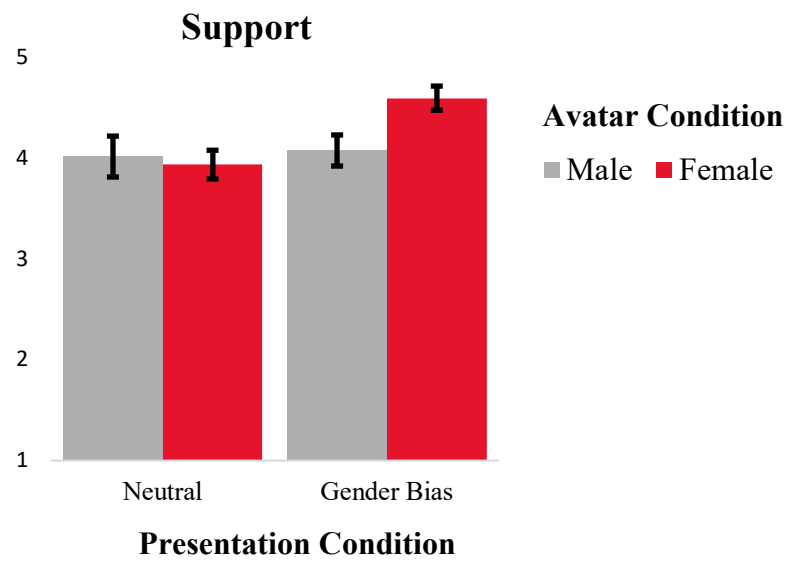
- | | |
|---|--|
| 1. Female Avatar (Perspective-Taking); Viewed presentation on causes and consequences of gender bias in STEM | 2. Male Avatar; Viewed presentation on causes and consequences of gender bias in STEM |
| 3. Female Avatar (perspective-Taking); Viewed neutral presentation on conference host city | 4. Male Avatar; Viewed neutral presentation on conference host city |

Then walked through a conference reception dominated by male attendees

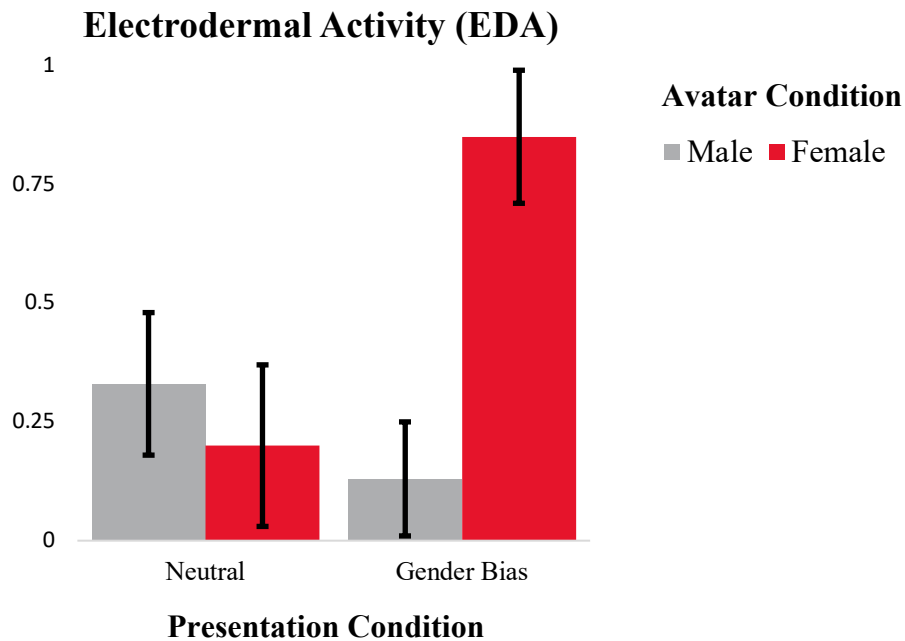


Completed self-report attitudinal questionnaires and Implicit Association Test (IAT)

Study 3 Main Results



Men reported greater **self-reported support** & **implicit positivity** for GEIs after viewing the gender bias presentation as a female avatar.



Men experienced greater **physiological arousal** when embodying female avatars compared to male avatars, but only after viewing the gender bias presentation.

EDA accounted for the **greater support for GEIs** reported by men who embodied a female avatar and viewed the gender bias presentation.

Study 4

Participants

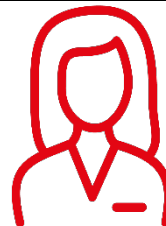
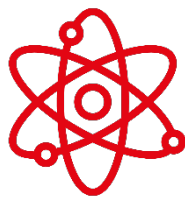
120 mainly White, male STEM academics based in the UK.

Method

Building on gender bias presentation from Study 3, we added two further factors to examine their impact on GEI attitudes – self-efficacy and blame.

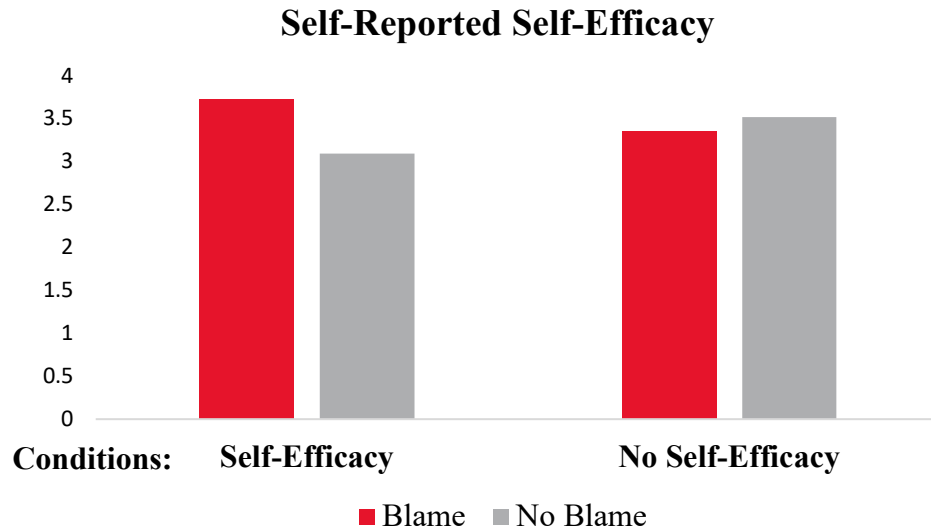
Watched one of four conference presentations:	
1. Promoted Gender Bias Self-Efficacy; Blamed Men for Gender Bias in STEM	2. Didn't Promote Gender Bias Self-Efficacy; Blamed Men for Gender Bias in STEM
3. Promoted Gender Bias Self-Efficacy; Blamed Men & Women for Gender Bias in STEM	4. Didn't Promote Gender Bias Self-Efficacy; Blamed Men & Women for Gender Bias in STEM

Then watched multimedia video of conference reception mainly populated by men and completed perspective-taking narrative task imagining being a female scientist in that space



Completed self-report attitudinal questionnaires and Implicit Association Test (IAT)

Study 4 Main Results



Men who viewed the gender bias presentation that promoted self-efficacy felt more able to **address gender bias** in their field, **particularly when men were blamed** for STEM gender bias in the presentation.

When men were given strategies for addressing gender bias (**self-efficacy promoted**) and told that men were mainly responsible for gender bias in STEM (**blamed**) they showed increased **self-efficacy** to address gender bias which predicted more **support for GEIs**.

Studies 5-6

Studies 5-6 consisted of two complementary studies assessing men's experiences of threat in two different ways – one consisted of an online self-report assessment of threat (Study 5) while the other was a lab-based physiological study of cardiovascular challenge and threat (Study 6).

Study 6 - Cardiovascular Challenge vs. Threat³⁷:

Challenge is deemed a positive physiological response that occurs when our evaluated resources exceed situational demands. Challenge is indexed by increased blood flow and decreased restriction of blood flow.

Threat is a negative physiological response that occurs when demands appear to exceed our resources. Threat is indexed by increased restriction of blood flow.



Study 5

Participants

Online: 100 UK-based, mainly White male STEM academics.



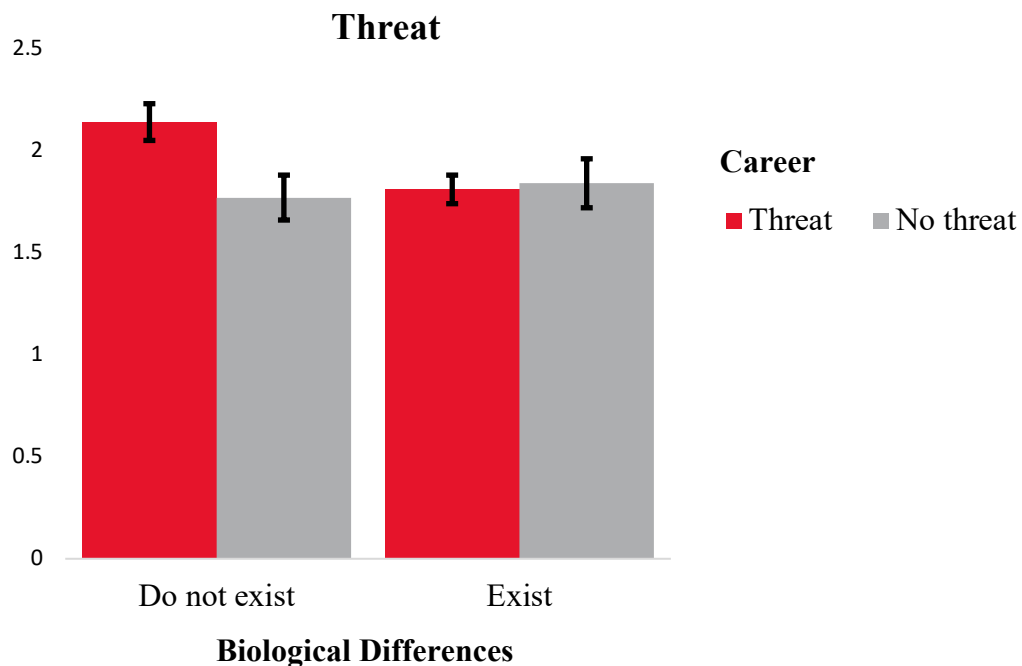
Method

Study 5 was an online study. Threat responses measured via self-report questionnaires only.

Read one of four fictitious news articles (See Appendix IV) discussing gender equality issues in STEM that either described:	
1. Gender Equality as Threat to Men's Career Opportunities; Biological sex differences explain inequality in STEM	2. Gender Equality No Threat to Men's Career Opportunities; Biological sex differences explain inequality in STEM
3. Gender Equality as Threat to Men's Career Opportunities; Biological explanations are not supported by science	4. Gender Equality No Threat to Men's Career Opportunities; Biological explanations are not supported by science

Self-report attitudinal questionnaires; Self-report measures of threat; GEI Implicit Attitudes Test

Study 5 Main Results



Men who were told that science does **not support biological explanations** for gender inequalities in STEM and that GEIs are a **career threat** reported **more threat**.

Threat in this instance captured men's perceptions that women in STEM represent a threat to the status and success of men in STEM.

Greater threat was related to **less support for GEIs** among men told that their careers would be threatened and that biological differences do not explain STEM gender inequality.

Study 6

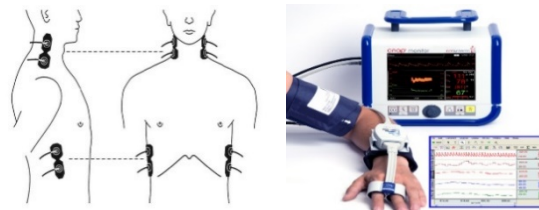
Participants

Lab-based: 44 UK-based, mainly White male STEM academics



Method

Sensors attached to skin to measure blood pressure, blood flow and heart rate; **index of cardiovascular challenge/threat**



Relaxed for 5mins to capture baseline levels of physiological measures

Read one of four fictitious news articles discussing gender equality issues in STEM that either described:

1. Gender Equality as Threat to Men's Career Opportunities; Biological sex differences explain inequality in STEM

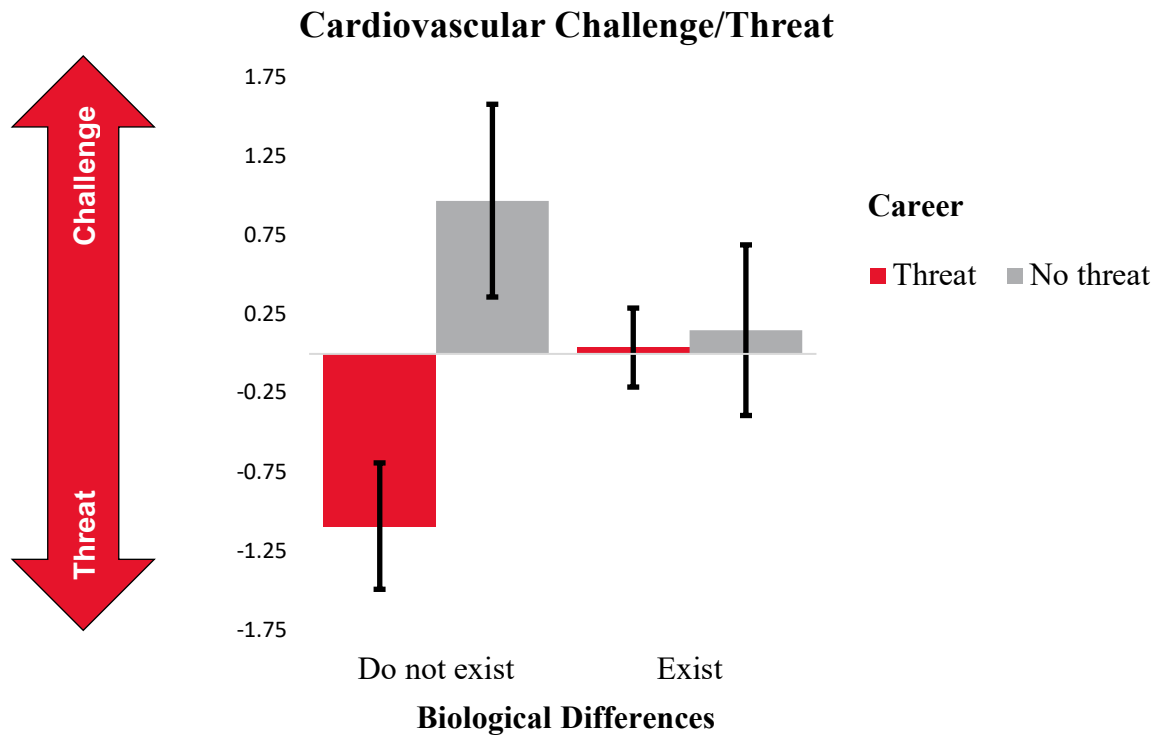
2. Gender Equality **No** Threat to Men's Career Opportunities; Biological sex differences explain inequality in STEM

3. Gender Equality as Threat to Men's Career Opportunities; Biological explanations are **not** supported by science

4. Gender Equality **No** Threat to Men's Career Opportunities; Biological explanations are **not** supported by science

5min speech on GEI opinion and article; Self-report attitudinal questionnaires; GEI Implicit Attitudes Test

Study 6 Main Results



Men exhibited a **cardiovascular threat** response when GEIs described as a threat to their career opportunities, and they were told that biological differences did not explain gender inequality in STEM.

Men told there was no threat to their career and that biological differences did not explain gender inequality in STEM showed a **cardiovascular challenge response**.

Recommendations to Improve the Design and Implementation of Gender Equality Initiatives - Content

These findings have implications for the design of GEIs and how best to engage male STEM academics.



- 1. GEI actions geared towards male STEM academics should utilise both cognitive and emotional routes of persuasion.** This could include providing male academics with empirical evidence-based information on gender biases and gender inequality in STEM, and running a perspective-taking exercise to allow them to experience how it typically “feels” to be a woman in STEM. Our findings suggested that doing so may help to increase their support for GEIS.
- 2. These findings advocate for the use of multimedia training tools by academic GEIs in STEM, such as the tools being developed by this project.** It is important to facilitate perspective-taking as female scientists in addition to providing scientifically framed information about bias. Multimedia resources can facilitate this.
- 3. Increasing men’s self-efficacy to reduce gender bias in STEM is an important mechanism to engage men in gender equality efforts, particularly when responsibility for gender inequality is made salient.** Responsibility to address gender bias may be made salient for men by highlighting that they are the majority group in STEM and so wield a large amount of influence over academic STEM culture. Self-

Improve Attitudes towards Gender Equality Initiatives

efficacy may be increased by providing academics with actions they can take to address gender inequalities such as:

- being conscious of the number of female speakers at events;
- including female authors on reading lists;
- promoting awareness of stereotypes;
- working to eliminate bias from interview processes, by using structured interviews, for example.

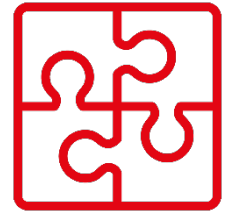
4. Men's feelings of threat regarding their career opportunities and perceived status need to be acknowledged and addressed in GEIs, particularly when challenging biological explanations for STEM gender inequality. These feelings of threat can indirectly reduce support for GEIs; therefore, they must be targeted as a valid concern among men in STEM. Highlighting the huge economic growth in STEM careers may protect against this negative impact. Additionally, increasing empathy for women's career struggles in STEM due to continued gender inequality (as advocated in point 1 above) will likely help mitigate the negative impact of feelings of threat among men and invest them in supporting equality actions to reduce this negative impact on women.

Key Summary

- Men in STEM academia may be best influenced by **dual routes of persuasion** during GEIs. The empirical information regarding gender bias targeted a **cognitive route of persuasion** while the female scientist perspective-taking targeted **an affective or emotional route**.
- **Self-efficacy** is an important mechanism to promote to increase support for GEIs particularly when men feel **responsible for gender bias** in STEM.
- A lack of support for GEIs among men may be partly explained by **feelings of threat** which may be elicited by beliefs that gender equality may **negatively impact their careers** and **challenges prototypical beliefs** surrounding biological explanations for gender inequality in STEM.
- These **feelings of threat** could be acknowledged and addressed in GEIs.
- **Increasing empathy** for women's career struggles related to continued gender inequality in STEM may also help mitigate the negative impact of feelings of threat among men.

Conclusion

We have now detailed the results of our six Inclusion Matters studies which aimed to empirically examine the factors that may influence positivity and support for GEIs among STEM academics, particularly men. So, what kind of GEI is likely to be better supported by academics in STEM fields?



According to our research a GEI for STEM academics could:

- Highlight opportunities and benefits for both women and men;
- Have a female lead (and better reward this work);
- Promote internal motivation for GEIs by highlighting their intrinsic value;
- Attain and clearly convey active support from senior management;
- Use perspective-taking to evoke empathy for female scientists personal and professional struggles in STEM related to gender inequality;
- Challenge beliefs regarding biological sex differences significantly contributing to gender inequality in STEM;
- Increase self-efficacy to address gender bias, particularly when acknowledging men's responsibility to address such bias as the dominant group in STEM;
- Address men's concerns regarding greater equality in STEM such as concerns regarding their career opportunities and status in STEM.

GEIs should always be nuanced depending on the target audience (e.g., experienced champions of gender equality vs. staff with less GEI experience). Again, the recommendations which will most benefit your department or institution will depend on your own institutional and departmental context and the particular groups you are targeting. It is very important to gather data on the particular makeup and culture of your institution/department prior to rolling out a GEI to better understand the issues that need to be addressed by a GEI. The factors mentioned above have shown empirical promise influencing support for GEIs among male and female STEM academics. Incorporating them into GEI design and implementation should positively impact attitudes towards GEIs, increasing willingness to engage with these initiatives and boosting their chances of having a lasting impact on institutional culture.

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Improve Attitudes towards Gender Equality Initiatives

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Appendix I

Attitudes towards Gender Equality Initiatives Questionnaires

The following questionnaires target a number of concepts which may be helpful for you to measure when assessing attitudes towards your Gender Equality Initiatives (GEIs).

There are three main ways you can use these questionnaires:

1. You may wish to assess all the concepts by using all the brief questionnaires provided in this document (38 questions in total).
2. If this is not feasible or necessary, you may choose which concepts to target and use the corresponding questionnaires. However, we recommend you always include the *Support for the Gender Equality Initiative* questionnaire in your assessment, as increased support for GEIs was the main target of our research.
3. If you wish to measure all or some of the concepts but it would not be feasible to use all of the questions due to time demands, then you may choose to only use the questions denoted by an asterisk for a shorter version. *Perceived Anti-Women Discrimination* should not be shortened. Note also that a shorter version is not available for the *Diversity Fatigue* and *Institution/Department Support for GEI* as we did not have data to support shortening these questionnaires.

Tips for Administering the Questionnaires

- Do not include the titles, concept names or scoring methods for the questionnaires when administering them, as this may influence responding.
- You may wish to assess your chosen concepts before and after implementing a GEI that aligns with some of the relevant suggestions made by our research to determine whether the GEI has resulted in a change in attitudes amongst participants.
- Try to randomize both the order of your questionnaires and the order of the questions within each questionnaire so that not every participant gets the questionnaires and questions in the exact same order every time. This reduces any potential order effects.

The rating scales and scoring methods are provided for each questionnaire below.

Concept 1 - Support for Gender Equality Initiatives

Adapted from Dover, Major & Kaiser (2016)

Rated from 1 (*Strongly disagree*) to 5 (*Strongly agree*)

Please rate how much you agree or disagree with the following statements.

1. I would like to work for a University with this Gender Equality Initiative.*
2. I would like to apply for a post at a University with this Gender Equality Initiative.
3. I would not enjoy working for a University with this Gender Equality Initiative (reverse scored).
4. If I worked for a University with this Gender Equality Initiative, I would get involved in this initiative.
5. As part of my administrative roles, I would choose to get involved in this Gender Equality Initiative.*

Scoring: Reverse score item 3 (5 becomes *strongly disagree* to 1 *strongly agree*) and calculate a mean summary score of responses to all items. Higher scores represent more support for the Gender Equality Initiative.

Concept 2 – Concerns about Unfair Treatment in the Workplace

Adapted from Dover, Major & Kaiser (2016)

Rated from 1 (*Strongly disagree*) to 5 (*Strongly agree*)

Please rate how much you agree or disagree with the following statements.

1. If I were working at a University with this Gender Equality Initiative in place, I would worry that my gender would put me at a disadvantage. (Reverse Score).
2. A University with this Gender Equality Initiative seems like a fair place to work.*

Improve Attitudes towards Gender Equality Initiatives

3. A University with this Gender Equality Initiative would be a good place for someone like me to work.*

Scoring: Reverse score item 1 (5 becomes *strongly disagree* to 1 *strongly agree*) and calculate a mean summary score of responses to all items. Higher scores represent fewer concerns of unfair treatment in the workplace.

Concept 3 – Perceived Anti-Women Discrimination

Adapted from Dover, Major & Kaiser (2016)

Rated from 1 (*Not at all likely*) to 5 (*Extremely likely*)

How likely do you think a University with this Gender Equality Initiative would be to:

- (a) discriminate against women*
- (b) unfairly favour men*

Scoring: Calculate a mean summary score of responses to both items. Higher scores represent more concerns of anti-women discrimination.

Concept 4 – Internal Motivations to Engage with GEIs

Adapted from Plant & Devine (1998)

Rated from 1 (*Strongly disagree*) to 5 (*Strongly agree*)

Please rate how much you agree or disagree with the following statements.

1. Initiatives like this Gender Equality Initiative are a good use of my personal time.

Improve Attitudes towards Gender Equality Initiatives

2. According to my personal values, I agree with goals of initiatives like this Gender Equality Initiative.
3. Because of my personal values, I believe initiatives like this Gender Equality Initiative are wrong. (Reverse score)
4. I would participate in initiatives like this Gender Equality Initiative because I would want to.*
5. I would participate in initiatives like this Gender Equality Initiative because they are personally important to me.*

Scoring: Reverse score item 3 (5 becomes *strongly disagree* to 1 *strongly agree*) and calculate a mean summary score of responses to all items. Higher scores represent more internal motivations to engage with the Gender Equality Initiative.

Concept 5 – Self-Efficacy to Address Gender Bias

Adapted from Pietri et al., (2017); van Zomeren, Saguy, & Schellhaas (2012); and Chemers, Hu, & Garcia (2001)

Rated from 1 (*Strongly disagree*) to 5 (*Strongly agree*)

Please rate how much you agree or disagree with the following statements.

1. I believe that I can help address gender bias in my professional field.
2. I feel confident in my ability to address instances of gender bias in my professional field.*
3. I have been provided with opportunities to strengthen my ability to address gender bias in my professional field.*
4. I have been provided with opportunities to overcome obstacles related to addressing instances of gender bias.

Improve Attitudes towards Gender Equality Initiatives

5. I feel hopeful about being able to address examples of gender bias in my professional field.*
6. With the right amount of effort, I can address gender bias in my professional field.
7. I have a strong belief that I can help tackle gender bias in my professional field.*
8. I know how to address gender bias in my professional life.

Scoring: Calculate a mean summary score of responses to all items. Higher scores represent higher levels of self-efficacy to address gender bias promoted by the Gender Equality Initiative.

Concept 6 – Realistic Threat Perceptions

Adapted from Stephan, Ybarra, & Bachman (1999) & Stephan et al. (2000)

Realistic Threat captures perception that women in the field represent a threat to the status and success of men in that field.

Rated from 1 (*Strongly disagree*) to 5 (*Strongly agree*)

Please rate how much you agree or disagree with the following statements.

If this Gender Equality Initiative is successful, I think:

1. Women get more from my professional field than they contribute.*
2. Women are not displacing men from their jobs in my professional field.*
(Reverse Score)
3. Women have made it more difficult for men to get jobs in my professional field.*
4. Women are taking power away from men in my professional field.*
5. By entering my professional field, women are undermining the status of men in my professional field.

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Scoring: Reverse score item 2 (where 5 becomes *strongly disagree* to 1 *strongly agree*) and calculate a mean summary score of responses to all items so that higher scores represent more realistic threat resulting from greater gender equality.

Concept 7 – Institution/Departmental Support for GEI

Adapted from McKay, Avery, & Morris (2008) and Nishii (2013)

Rated from 1 (*Strongly disagree*) to 5 (*Strongly agree*)

Note: Use either the term institution or department depending on the level you wish to target.

Please rate how much you agree or disagree with the following statements.

1. My institution/department maintains an environment that supports gender equality.
2. Top leaders demonstrate a visible commitment to gender equality.
3. This institution/department has a culture in which employees appreciate the differences that diverse genders bring to the workplace.
4. This institution/department has a fair promotion process for all genders.
5. This institution/department invests in the development of employees of all genders.

Scoring: Calculate a mean summary score of responses to all items. Higher scores represent an institutional/departmental environment that supports gender equality.

Concept 8 – Diversity Fatigue

Adapted from Smith, McPartlan, Poe, & Thoman (2021)

Rated from 1 (*Not At All True*) to 5 (*Completely True*)

Note: Replace {your/my university} with the name of your institution. Or, if using a general sample across universities, you can leave it as written.

The following questions concern your feelings about [your university] during the last year. (If you have been at this university for less than a year, this concerns the entire time you have been here).

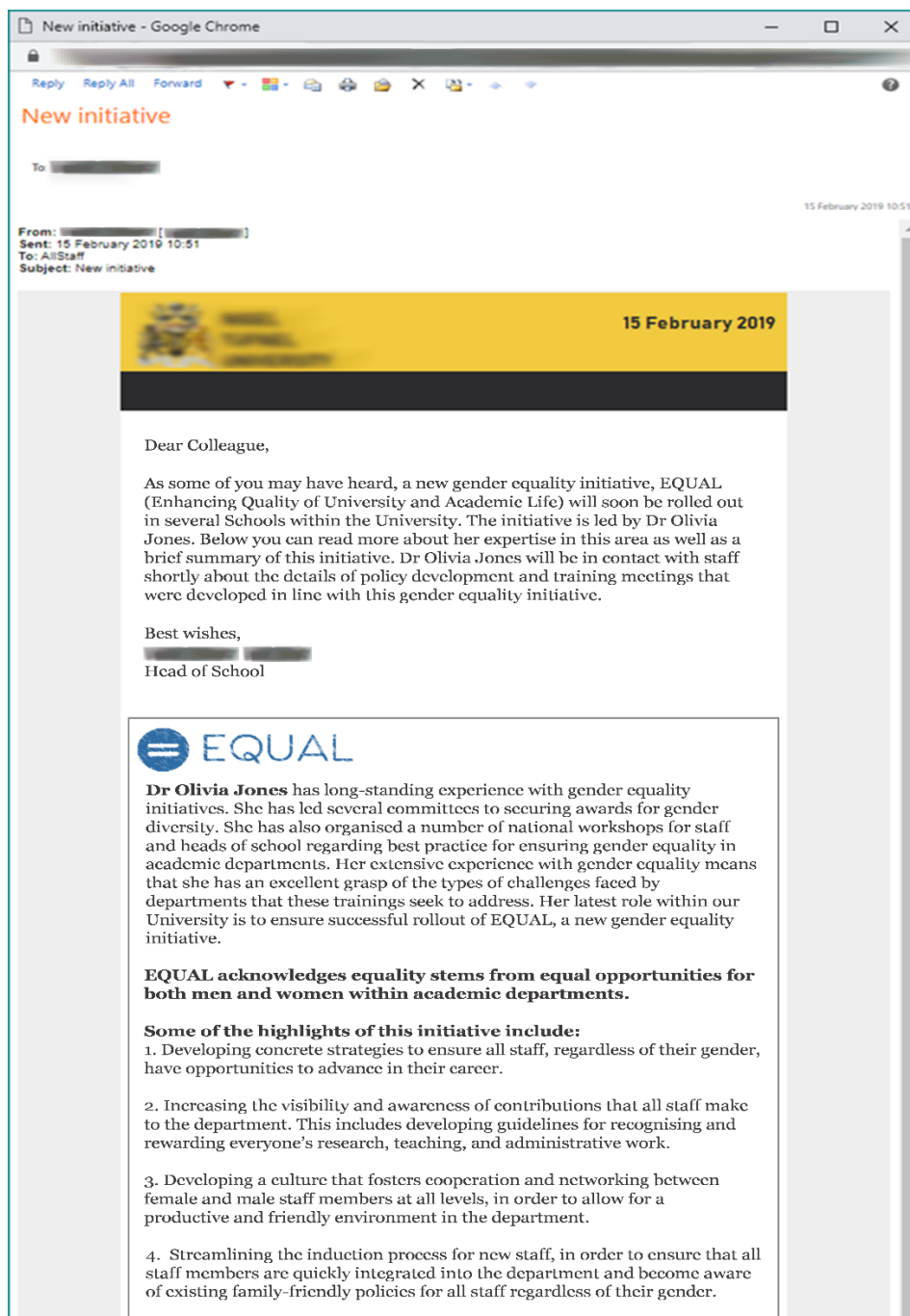
1. I am tired of hearing about gender equality issues on campus.
2. I feel annoyed when someone brings up concerns about gender equality in academia.
3. I do not want to see any more gender equality classes and programs at {my university}.
4. I worry that {my university} has neglected other important issues because of too much focus on gender equality initiatives.
5. Gender equality efforts on campus are becoming distracting.

Scoring: Calculate a mean summary score of responses to all items. Higher scores indicate more fatigue in relation to Gender Equality Initiatives.

Overall Questions Total: 38

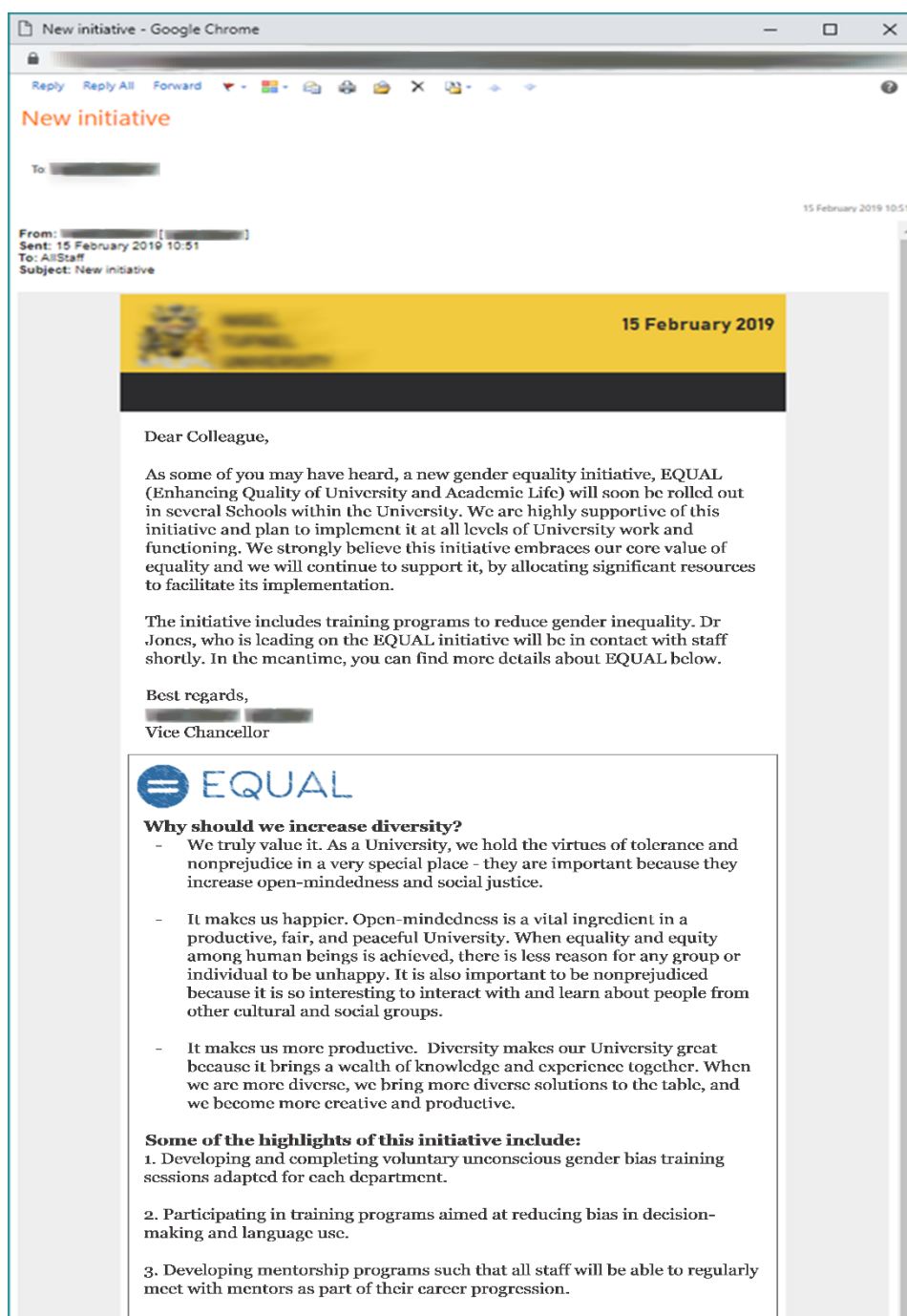
Appendix II

Sample of Fictitious Email – Female-Led & Benefitting Men & Women



Appendix III

Sample of Fictitious Email – Internally Motivated, Supported by Management



Appendix IV

Sample of Fictitious Article – Gender equality a threat to men’s career and biological differences not supported as an explanation of inequalities

Gender Equality in the Sciences: An Updated Perspective

Gender equality initiatives are succeeding in increasing the representation of women in engineering and physical science occupations in the UK.

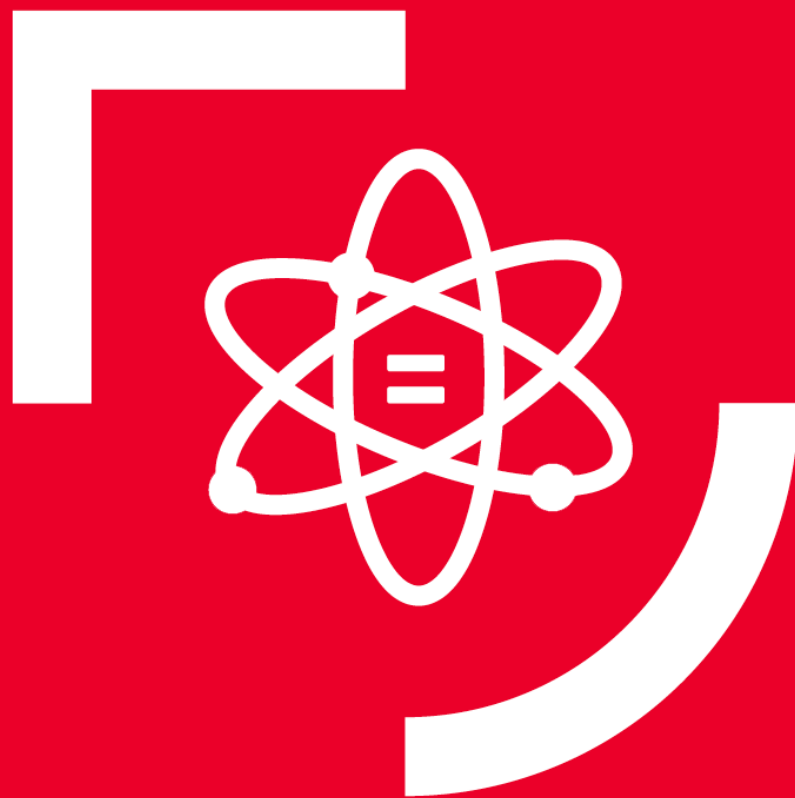


Mon 30 Apr 2018 17.29 BST

There is an increasing focus on gender inequality in academia and the under-representation of women in academic positions. In the UK, only 23% of those in engineering and physical science (EPS) occupations are women. Progress on addressing gender inequality in these fields has been slow. Women remain under-represented on editorial boards, have fewer publications in high-ranking journals, are less likely to be awarded research funding and receive less funding in relative terms. They are also more likely to leave academia.

In recent years, many interventions have sought to advance women’s careers in EPS domains and close this gender gap. These programmes focus on identifying barriers to gender equity and constructing action plans to address these problems. These action plans often include mentoring, leadership development, and automatic bias training. Research examining the hiring and retention of women in EPS faculties in the UK have found that universities with gender equality initiatives are more effective at increasing the number of women in engineering and physical science academic positions. Women have also reported improvement in their visibility, self-confidence, and leadership skills due to these programmes, which has positively impacted their career development. However, given the focus of these interventions on women, further evidence suggests these initiatives may negatively impact male’s chances of career success. Rates of hiring and retention of male EPS academics have decreased since the introduction of gender equality initiatives across UK universities. Men are now somewhat less likely to find employment in these fields.

There is, however, evidence from research on sex differences that the gender gap in EPS is natural given certain biological differences between men and women including differing brain development. These differences in the brain during early development create a cascade of changes which may be the basis of gender inequality in the sciences. Specifically, differing patterns of brain growth between males and females promote and inhibit growth of certain skills. For example, males might develop greater ability for mathematics and critical thinking and females might develop greater ability for emotion identification and communication. These assumptions have not been supported by brain imaging studies which have found no specific differences between the brains of women and men. Thus, the low representation of women within engineering and the physical sciences is not a natural phenomenon given that there are no apparent innate, biological differences that account for this underrepresentation. Rather extensive research provides evidence that this gender gap is likely related to cultural stereotypes which can be influenced.



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