Received 29 April 2023
Revised 18 August 2023
24 September 2023
26 September 2023
Accepted 26 September 2023

Workplace implications for female leaders from stereotype threat in a video conferencing context

Roisin Donnelly and Anthony Ryan
Faculty of Business, Technological University Dublin, Dublin, Ireland

Abstract

Purpose – This study considered the use of video conferencing virtual backgrounds with employees located in a large multinational corporate organisation in Ireland and the USA to discern if background images evoking gendered stereotypes of leadership can cue stereotype threat in female technology workers undertaking a leadership activity, thus negatively effecting performance. This study aims to contribute to the body of research on stereotype threat by establishing whether virtual backgrounds used in video conferencing software are inherently identity safe or whether their use could have a negative performance impact on marginalised groups.

Design/methodology/approach – Using a mixed methods research design with 22 participants in two countries working in the one large organisation, using two quantitative methods (an experiment and a survey) and one qualitative method (semi-structured interviews), the study examined the relationship between performance on the leadership activity and exposure to gendered backgrounds on a video conference call.

Findings – It found that female leaders undertaking a leadership test experienced more anxiety and achieved lower scores on average when exposed to a male-gendered virtual background compared to male colleagues or female leaders exposed to a female gendered background. It was also found that these leaders were aware of the stereotype of leadership being White and male, and showed symptoms of prolonged exposure to stereotype threat in the workplace. While the authors still are working through a post-pandemic environment, it may be judicious for organisations to restrict the use of virtual backgrounds to identity-safe ones, specifically chosen by the company.

Research limitations/implications – The study makes several practical recommendations, indicating actions which can be taken at the individual, team and corporate levels. Re-running this experiment in a more controlled environment with a larger sample set could yield more definitive, statistically significant results and contribute more to the literature.

Practical implications – Some individual impacts were found via the interviews. Male leaders in the organisation need to do more to mentor and endorse their female colleagues. By doing this, they can counter the negative effects of solo status and the subsequent performance degradations of their female counterparts, while also setting an example for other leaders. Participation in the mentoring programme and initiatives such as Dare and value, inclusion, belonging, and equity should be encouraged and supported. Reverse mentoring should also be encouraged among the population of male leaders to aid in allyship and bias-awareness.

Social implications – Teams should note that a democratic vote is not always the best way to decide on the names of teams, projects or meeting rooms. These may skew towards niche interests that can serve to alienate members of the team who do not associate themselves with that interest. Rather, the teams should

International Journal of Organizational Analysis
Vol. 31 No. 8, 2023
pp. 106-130
Emerald Publishing Limited
1934-8835
DOI 10.1108/IJOA-04-2023-3741

strive to be fully inclusive and educated on the need for identity-safety. Team events may also serve to alienate members if teams are not mindful of the need to be inclusive. Activities, such as "go-kart" racing and physical or competitive team events have been highlighted as unsuitable for some team members, and should be avoided in favour of inclusivity.

Originality/value – A significant body of research has documented the effect to which stereotype threat can be triggered by both the physical environment and by the use of various technology media. However, there is a dearth of research exploring the relationship between stereotype threat, defined as "the concrete, real-time threat of being judged and treated poorly in settings where a negative stereotype about one's group applies" (Steele *et al.*, 2002, p. 385), and video conferencing software features, such as virtual backgrounds.

Keywords Gender, Female leaders, Stereotype threat, Video conferencing, Organisational workplaces

Paper type Research paper

Introduction

In an increasingly competitive global environment, commercial organisations constantly strive to boost performance. Companies believe that by diversifying their staff, increased creativity and better decision-making can be achieved which will result in competitive advantage (Simons *et al.*, 1999). There is evidence of the positive value of a diverse workforce to organisations, with a number of studies indicating that companies who deliberately establish heterogeneous teams are the most innovative (Kanter, 1983; Cook, 2022). It was also found that teams, including minority members often produce more creative solutions when presented with a problem compared to homogeneous teams (Nemeth, 1986; Mannix and Neale, 2005). It is important then, to preserve and promote diversity at managerial levels, and minimise any impediments to this goal.

A common issue of concern among today's technology firms relating to diversity is the lack of women in leadership roles. Research has shown that both racial and gender diversity in leadership positions positively influences firm performance (Carter *et al.*, 2003; Erhardt *et al.*, 2003). It has also been shown that women tend to adopt different leadership styles to men, which are particularly appropriate for navigating the complexities of modern organisations (Eagly and Carli, 2003). It can, therefore, be posited that an increase in female leaders in a firm with predominantly male leadership will lead to increased gender diversity, which, in turn, will lead to better decision-making and innovation (Lorenzo *et al.*, 2018; Simons *et al.*, 1999), which could then result in increased profits for the organisation. Unfortunately, science, technology, engineering and mathematics disciplines tend to be viewed as stereotypically masculine domains where women face barriers, such as gender bias and discrimination (Von Hippel *et al.*, 2011). Related to this type of gender bias is a phenomenon known as stereotype threat.

Stereotype threat, defined as "the concrete, real-time threat of being judged and treated poorly in settings where a negative stereotype about one's group applies" (Steele *et al.*, 2002, p. 385), occurs when a negative stereotype regarding a group under test becomes salient in the context of that test, adversely affecting the performance of the subject (Steele and Aronson, 1995). For example, if a stereotype that a group with which the subject identifies is unskilled in mathematics becomes salient in a testing situation, the fear of performing poorly in said mathematics test and conforming to that negative stereotype will divert the subjects' attention onto task-irrelevant worries, inducing anxiety and resulting in poor performance. If the stereotype is not made salient, however, no drop in performance is observed.

Research has also shown that people have preconceived notions of what it means to be a leader, and these often include being White and being male. This can result in biased

perceptions and evaluations of people who do not fit the preconceived image of a leader (Koenig *et al.*, 2011). These stereotype-based expectations of inferiority can be problematic to women's careers and can contribute to a shortage of female leaders (Block *et al.*, 1995), as short-term exposure to such a threat can result in avoidance of duties or tasks where the threat will be experienced and chronic exposure could result in dis-identification with the entire profession (Hoyt and Murphy, 2016).

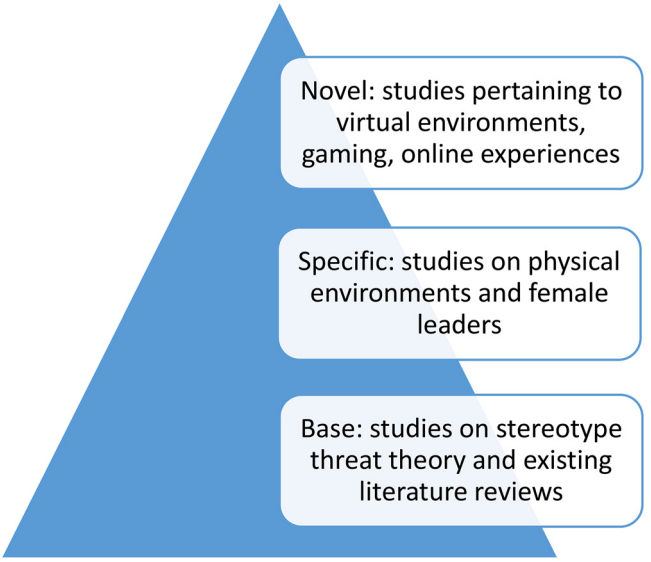
The study aims to contribute to the body of research on stereotype threat by establishing whether virtual backgrounds used in video conferencing software are inherently identity-safe or whether their use could have negative performance impact on marginalised groups. This study specifically reports on stereotype threat for female leaders in a post-pandemic corporate work environment. The aim of the study was to address a gap in the existing research on the relationship between stereotype threat and video conferencing software, specifically the virtual background feature, which may then inform practical implications in terms of corporate workplace practices. That is, the moderation of virtual backgrounds available to employees in a firm for video conferencing.

Participants in this study were male and female technology workers who occupy leadership positions in a financial management and human capital management software vendor. Participants were selected across two sites: Dublin, Ireland and Pleasanton, California. A leadership test was administered, similar to the one found in Bergeron *et al.* (2006), followed by semi-structured interviews.

As the first study to examine stereotype threat being cued via the medium of video conferencing virtual backgrounds, the research showed promising novel results as well as avenues for further investigation. It was found in the leadership experiment that female leaders exposed to the male-gendered background image scored lower on average than male leaders or female leaders exposed to a female-gendered background image, and also attempted the fewest tasks on average. Findings also showed that female leaders had a lowered sense domain identification and specifically female leaders exposed to the male-gendered background showed signs of increased anxiety and lower performance expectations. The qualitative findings indicated five separate themes reflecting themes and concepts present in the literature. These results were triangulated to reveal a compelling consistency with the literature.

Literary context

The basis of the literature consultation was identifying keywords which resulted in 26 articles being systematically reviewed for practical implications of stereotype threat on organisations, specifically the physical environment, solo status and minority representation and technologies. The aim of the review was to confirm a gap in the existing body of literature on stereotype threat relating to video conferencing software and explore how this concept could translate into implications for today's corporate landscape. A list of search terms was drawn up. Each search term consisted of the keywords "Stereotype Threat" and one or more other keywords, such as "Physical Environment", "Video Conferencing" or "Role Models". Sixteen search terms in total were used. Once the articles were identified they were divided into three groups. "Base" articles pertained to the theory of stereotype threat underpinning the research. "Specific" articles focused on physical environments and female leaders. "Novel" articles were focused on technology and pertained to virtual environments, gaming and online experiences. A pyramid diagram (Figure 1) was chosen to reflect the amount of articles reviewed at each layer. In total, 11 base articles, eight specific articles and seven novel articles were synthesised.



Source: Original figure created for this study

Figure 1. Three layers of research: base, specific and novel

The literature review which underpins the research design first examined the theory's origins (Allport *et al.*, 1954; Katz *et al.*, 1964), followed by the seminal research of Steele and Aronson (1995) examining bias in standardised testing of African American students. Next, the review examined the spread of the theory to other social groupings. Spencer *et al.* (1999) expanded the theory to a new group and an associated negative stereotype of that group, that of mathematical ability in women. Aronson *et al.* (1999) applied the theory to White men who were found to perform more poorly on a mathematics test when they believed they would be compared with Asian men. Also, in 1999, Stone *et al.* (1999) posited that since sports and athletics were likely one of the few domains in which White men are stereotyped negatively, stereotype threat would also hinder athletic performance when evoked. They showed that when a golf game was described as a test of decision-making, Black participants underperformed compared to White participants. When the same test was framed as evaluative of physical ability, however, Black participants performed better than their White colleagues. Bergeron *et al.* (2006) again examined stereotype threat on females when they examined bias in perceptions of leadership ability via a leadership task. It is this task and those results which have been replicated in this paper albeit with a slightly altered focus: that of the medium through which stereotype is cued in the subjects.

The review went on to examine the mediators of low performance under stereotype threat, including reduced effort (Steele *et al.*, 2002), lowered performance expectations (Stangor *et al.*, 1998), increased levels of anxiety (Bosson *et al.*, 2004), reduced working memory (Schmader *et al.*, 2008) and the act of negative thought-suppression (Wegner, 1994; Wenzlaff and Wegner, 2000). Next, the review examined coping mechanisms identified in the literature relating to stereotype threat, including avoidance (Davies *et al.*, 2005), disengagement (Nussbaum and Steele, 2007), disidentification (Hoyt and Murphy, 2016) and identity bifurcation (Pronin *et al.*, 2004).

The literature review then examined the role of physical cues to stereotype threat. Research has shown that holding of solo status in a group setting can negatively impact the degree to which people want to contribute or participate in that setting, leading to lowered

performance (Murphy *et al.*, 2007). The physical environment was also found to be a cue for stereotype threat, as it can indicate characteristics of the group members who normally inhabit an area (Cheryan *et al.*, 2009). If one's identity is incompatible with those stereotypes, then he or she can feel a compromised sense of belonging in the environment. Note also that women tend to be more attuned to the presence of objects in an environment perhaps putting them particularly at risk (McBurney *et al.*, 1997). This logically leads to the question, that:

Q1. If the physical environment can cause stereotype threat to be experienced, what about a post-pandemic virtual working environment?

To examine this, the literature review looked at technology as a medium for stereotype threat. Much recent research has found that different technologies could be a medium for stereotype threat, such as television commercials (Davies *et al.*, 2005), video recordings (Van Loo and Rydell, 2014), virtual environments (Abdou and Fingerhut, 2014) and even video games (Fordham *et al.*, 2020). What was not examined, however, was the use of video conferencing software to trigger stereotype threat. It is this medium, therefore, which was explored in this study, in an effort to close this gap in the literature.

The research question derived from the literature review was subsequently identified as:

RQ1. Will female leaders, performing a leadership exercise on a video conferencing call, experience decreased performance, lowered expectations, increased anxiety and lowered self-efficacy?

Methodology

A mixed method approach was adopted for the research, comprising a research experiment, a survey and semi-structured interviews. A mix of experimental and survey data research is common in the stereotype threat literature, from the first Steele and Aronson (1995) paper through to research focused on modern technology (Abdou and Fingerhut, 2014). Indeed, the leadership experiment and the survey questions have both seen use in previous literature and full credit is provided to the authors of said techniques here. Figure 2 shows a summary of the research stages. Participants in the research were 22 volunteers (11 men and 11 women) from the leadership population of a large multinational. Stereotype threat was not mentioned in any correspondence with the participants prior to joining the call in which the experiment and survey were administered. Male participants were assigned randomly between two groups, one of which would be exposed to a male-gendered virtual background during the leadership call and one of which would be exposed to a female-gendered virtual background during the leadership call. The same was done for the female participants.

On the video conference call, the experimenter had a male-gendered or female-gendered virtual background displayed behind them, depending on which condition the participant has been assigned to. In the male-gendered condition, this was a collage of three famous male leaders. In the female-gendered condition, this was a collage of three famous female leaders. The backgrounds were created specifically for this exercise by the authors. Note that care was taken to choose internationally recognised leaders familiar to participants both in the USA and Ireland. The male-gendered image used portraits of Bill Gates, Steve Jobs and Barack Obama. In the female-gendered image portraits of Sheryl Sandberg, Angela Merkel and Hillary Clinton were used.

The experimenter welcomed the participants and informed each that they were about to take part in a leadership survey and exercise, which would result in a leadership score being sent to them. Although a score would not in fact be sent to them, it was important that the

Source: Original figure created for this study

Figure 2.
Stages of the research

test was described as evaluative of ability in the domain. The experimenter then referenced the virtual background to draw attention to it, saying: "Since it is a test of leadership and decision-making ability, I have set my background to be leaders I admire greatly".

The participants were then engaged by the experimenter in pleasantries, during which time enquiries were made as to their tenure in the firm, their current area of employment and the size of their organisation. The experimenter feigned taking note of each answer. This exposed each participant to the background image for a set period of time before beginning.

Survey

Firstly, the participants were asked to respond to a short 12-statement survey. The goal of the survey was to assess a number of measures relevant to the domain of stereotype threat.

Participants were first asked to self-report their current thoughts of competence and self-worth. Four statements similar to those found in Steele and Aronson (1995) were adapted and expanded. The participants were asked to rank their agreement with these statements on five-point Likert scales anchored by the statements *not at all* (1) and *extremely* (5):

- I feel confident about my abilities as a leader.
- I feel self-conscious making tough decisions.
- I feel about as competent a leader as others.
- I feel anxious thinking about my status as a leader.

Participants then expressed their agreement with four statements on a seven-point Likert scale from *strongly disagree* (1) to *strongly agree* (7) relating to their domain identification with that of a leader. The results of the responses to these four statements were later examined to ensure no pre-existing difference relating to domain identification between the male and female participants. The four statements are:

(1) I am good at executive decision-making activities.
(2) It is important to me that I am good at executive decision-making activities.
(3) I enjoy problem-solving as part of my role.
(4) I perform well on analytic or executive decision-making activities.

Finally, participants expressed their agreement with statements designed to measure state anxiety, similar to Spencer *et al.* (1999), on a seven-point Likert scale from *strongly disagree* (1) to *strongly agree* (7). Anxiety is an oft-discussed mediator of stereotype threat in the literature and a higher presence of it in one group could indicate that stereotype threat has been triggered. These statements are:

- I can handle this test.
- I am uncertain that I have the leadership experience to do well on this test.
- Taking this test could make me doubt my leadership ability.
- If I do not do well on this test, others may question my ability.

Research experiment

Once the survey was completed, the experimenter gave the participant access to the next phase of the experiment, that of the leadership task. The quantitative exercise being a leadership test was preferred to a mathematical test, which is also common in the literature, due to the fact that stereotypes about females being deficient at mathematics is less prevalent in Europe as it is in the USA and for stereotype threat to activate, one must be aware of the negative stereotype about a group of which one is a member. However, the stereotype of leaders being predominantly White and male has been asserted to be present in most Western countries (Koenig *et al.*, 2011). The leadership test, therefore, should trigger stereotype threat more readily and consistently than a mathematical test when both European and American participants are used. A survey was also chosen as an additional quantitative method. This is common in the literature to assess related aspects of stereotype threat, such as domain identification, levels of anxiety and expected performance.

The task is an inbox item task, based upon one previously used by Bergeron *et al.* (2006) and Block *et al.* (1995). Since the original task materials were not available, the task contents, including the specific wording of the documents used, were re-created by the authors. This was done while keeping as many of the scenarios used by these papers the same wherever possible.

The participant was first asked to read a document labelled "Instructions" which could be found in the link supplied by the experimenter. This document allowed for a uniform description of what was being asked of the participants. It explained that they were assuming the role of someone who had recently taken on the position of a human resources manager, and the e-mails they would be expected to answer formed a list of outstanding action items left on their predecessors "to-do" list. The participants were informed that they had to reply to as many e-mails as possible in the time limit and that some would require a decision to be made. Once the participant had asked any clarifying questions they may have

had, they were informed that they had 50 min to complete the task and that they would be given a warning when they had 15 min remaining.

Before the first participant was given the leadership task and survey, a pilot session was held with a colleague of the authors. As a result of this trial, the time limit for the leadership exercise was increased from 45 min to 50 min. This was because the participant in the trial run felt that the time limit of 45 min was overly challenging. It was agreed that an extra 5 min would lessen the difficulty while still keeping the experiment somewhat challenging, as stereotype threat is seen to manifest in more difficult tasks and examinations rather than easy ones. Additionally, this trial run resulted in several improvements to the wording of the instructions document and in the experiment materials.

The experimenter next asked the participants to keep the video conference window open and visible while reviewing the materials and completing the exercise. The justification given for this request was so that the experimenter could get their attention and ask probing questions if needed during the course of the exercise. In reality, this request was made to continue to expose the participants to the background images throughout the call.

Within the link sent to the participant were two folders, alongside the instructions document. The first folder contained seven company policy documents (e.g. guidelines for promotions, fictional staff performance ratings, etc.). The second folder acted as the participant's inbox and contained 24 actionable documents in the form of e-mails. Of these 24, five were standalone and unrelated to the rest. The remaining 19 comprised six "sets" of interrelated e-mails relating to issues of maternity leave, recruiting, sexual harassment, requests for training, selecting a research firm and appointing a new manager internally. The relationships between the e-mails meant that the participants had a volume of information to absorb before formulating a reply.

For example, one e-mail informed the participant that one of the managers in the compensation department is leaving. A second e-mail requested the participant to make a recommendation for the highest qualified replacement. A third was from a female employee and was a sexual harassment complaint against a male employee (Mark). A fourth was from Mark requesting information about a compensation training course. A fifth e-mail, also from Mark, requested a leave of absence to go on a compensation training course. A sixth memo was from an employee, Michelle, who is about to get married and move to a different city.

In making decisions about who to nominate as the new manager and whether to allow Mark's leave of absence request, participants not only had to take into account the information from each of the e-mails but also had to consider any relevant information in the set of policy documents from the first folder. Specifically, one of them relayed a company policy about sexual harassment (any employee accused would immediately be under investigation), one contained conditions for leaves of absence (one regulation states that no-one under investigation is allowed a leave of absence) and one contained performance ratings (among ratings of 17 employees, top ratings went to Michelle, Mark and May, respectively). Therefore, the correct decisions given by the participant for these two issues should be to nominate May as a candidate for compensation manager (the other top two candidates are either relocating or soon will be under investigation) and to deny Mark's leave of absence due to the upcoming investigation.

In addition, the participant was expected to respond to all of the e-mails. The decision-making required by this task simulates some of the complexity inherent in the role of a typical people leader. For each set of e-mails, the participant was directed to respond in writing, indicating a decision or plan of action. Space was left at the bottom of each memo for a reply to the sender. All e-mails were interspersed in a random order so that it was not immediately apparent that there were interrelationships. Each individual's score (the

number of correct decisions made and the number of e-mails replied to) was recorded in a spreadsheet. The participant was then debriefed and thanked for their participation.

Semi-structured interviews

Semi-structured interviews were selected for their qualitative ability to garner the independent thought of each participant (Newcomer *et al.*, 2015), which is particularly valuable in this instance given that the lived experience of each participant is different. Stereotype threat is a subconscious, social psychological phenomenon (Williams *et al.*, 2016) and so the interviews in this study were held after the quantitative research had been completed. The primary focus of these interviews was to ascertain non-numerical data, such as the validity on the stereotype of leadership, and to gain more insight into the lived experience of female leaders in the organisation, specifically whether they had been exposed to stereotype threat in the past and what, if any, coping mechanisms they have used or seen being used by their female colleagues. In this situation, semi-structured interviews are said to be useful as they allow the interviewer some latitude to spot useful leads and pursue them (Newcomer *et al.*, 2015).

The interviews were conducted with the female leaders who were exposed to the male-gendered background on the Zoom call. Of those six participants, one declined, leaving five interviewees. In each interview, the interviewer first asked if the interview could be recorded. The interviews were conducted over Zoom, which provided a transcript of the interview, and this proved useful when subsequently coding the interview. The interviewee was asked a series of questions relating to the leadership experiment call, to determine if the virtual background stood out as a factor in their thinking or performance during the task. Stereotype threat was then described to the interviewee and probing questions aimed at discussing their personal experience of being a female leader were asked. Topics, such as stereotypes of leadership, exclusion based on gender and the support networks of the interviewees were discussed. Interview transcripts were then thematically analysed using Braun and Clarke's (2006) six-phase framework.

Finally, reassurance was given that there are ways to counteract the pernicious effects of stereotype threat and the interviewees were reminded that any decrease in performance of the effected group usually dissipates once the threat is removed. To better understand the context of the interviewee responses in the interviews, Table 1 outlines a brief profile of each participant.

Qualitative researchers generally study fewer people, but delve more deeply into those individuals, settings, subcultures and scenes, hoping to generate a subjective understanding of how and why people perceive, reflect, role-take, interpret and interact (Baker and Edwards, 2012).

Interviewee A	Female leader, working six years in management role in current company, based in the USA. Team size of more than 20 employees
Interviewee B	Female leader, working two years in management role in current company, based in Ireland. Team size of more than ten employees
Interviewee C	Female leader, working one year in management role in current company, based in Ireland. Team size of under ten employees
Interviewee D	Female leader, working four years in management role in current company, based in Ireland. Team size of more than ten employees
Interviewee E	Female leader, working eight years in management role in current company, based in Ireland. Team size of more than team employees

Table 1.
Interviewee profiles

Source: Authors

While the size of the sample pool was limited by the researchers' time available for data-gathering, a variety of factors have also influenced the sample size of data qualitative gathered; this is not measured only by the numbers of interviews but also by the presence of participan observation, which took place through the experiments on gender stereotype. A small number of participants have been very valuable and we argue, represent adequate numbers for this research study.

Data analysis

In this study, the analysis was complimentary, as the lived experience of the interviewees added context and a greater understand of the personal impact felt by those exposed to stereotype threat to the quantitative findings. The analysis was also somewhat developmental, as the quantitative findings did inform the direction of some questions in the semi-structured interviews.

The data show that female leaders did in fact score lower on average at a leadership task when a male-gendered background was displayed. This group achieved the lowest average score and also attempted the least amount of tasks on average. As expected, the male groups did not show signs of stereotype threat, as there is no negative stereotype pertaining to being male in the area of leadership. The survey data also show that female leaders exposed to a male-gendered background image on a video conference call were more critical of their own abilities, had lowered performance expectations and experienced higher anxiety than male leaders or female leaders exposed to a female background.

Quantitative findings – statistical analysis of task and survey results

The authors have chosen statistical method "analysis of variance" (ANOVA) to analyse the differences between the means of the four groups in the experiment. It allows us to answer the question whether the differences in performance in the experiment and the differences in confidence in the survey answers between the groups are greater than would be expected to be caused by chance. Two-factor ANOVA with replication requires the same amount of results in each data set. For two data sets (male leaders exposed to a female background and female leaders exposed to a male background) there were six results, and for two data sets (male leaders exposed to a male background and female leaders exposed to a female background) there were five results. To make them equal, one result from each of the former data sets was discounted from the data set. One male leader who was exposed to the female background image was discounted due to English being a secondary language for this participant, which unfortunately caused him to take considerably more time to complete the exercise. One participant in the female group exposed to the male background was also discounted. This individual was a director rather than a manager, something that was not noticed while volunteers were being accepted. She outranked all other participants in both job title and years of experience. This participant recorded by far the largest score, seven points clear of her nearest rival. For consistency across the data sets her score was removed. Removing these two outliers allowed for four sets of five results on which ANOVA tests could be carried out.

Examining the total score for the experiment, the female participants exposed to the male background had the lowest average score, of 15.8. The median score for this group equalled the lowest score in both of the groups of male managers. However, this was not shown to be statistically significant using a two-factor ANOVA with replication (Table 2). Interestingly, the lowest overall score was recorded in the female group exposed to female background.

Female leaders exposed to the male-gendered background were also shown to have attempted to answer the least amount of memos, averaging just 12 answered memos out of 24.

Both male groups answered 14 on average and the female group with the female-gendered background answered 13.

Analysing the results of the first four survey questions gives an indication of the self-worth felt by the participants during the experiment. All four groups felt about the same amount of confidence in their abilities as a leader. Both groups of female leaders indicated they felt self-conscious when making tough decisions, more so than both groups of male leaders. A two-factor ANOVA with replication indicates there being a non-significant difference between the sex-typed groups, as indicated by the low *p*-value in Table 3.

All groups indicated they felt about as competent as other leaders, however, the female group exposed to the male-gendered background again scored lowest on average. The male group exposed to the female-gendered background scored the highest. Asked about feeling anxious as to their status as a leader, the female group exposed to the male-gendered background scored joint highest indicating more anxiety. The male group exposed to the female-gendered background had the least feelings of anxiety. This was not shown to be a significant effect.

The second group of four survey questions examined the domain identification of the participants. Each of the four groups agreed they were good at making decisions with no significant difference among them. Each of the four groups also agreed that it was important to them that they were good at making decisions. However, again it was seen that the female group exposed to the male-gendered background had the lowest scores on average for this second question. All groups indicated that they enjoy problem-solving as part of their role. In the final domain affiliation question, the female group exposed to the male-gendered background again had the lowest average scores when asked if they perform well on analytic or decision-making activities. This was not shown to be a significant effect.

Table 2.
ANOVA results for leadership task performance

ANOVA Source of variation	SS	df	MS	F	*p*-value	F crit
Sample	48.05	1	48.05	1.93554884	0.18319671	4.49399848
Columns	1.25	1	1.25	0.05035247	0.82529153	4.49399848
Interaction	0.45	1	0.45	0.01812689	0.89457869	4.49399848
Within	397.2	16	24.825			
Total	446.95	19				

Notes: SS = the sum of squares due to the source; DF = the degrees of freedom in the source; MS = Mean squares; each F ratio is computed by = dividing the MS value by another MS value; calculating the P value is derived from F and the two degrees of freedom
Source: Original table created for this study

Table 3.
ANOVA results for Q2: I feel self-conscious making tough decisions

ANOVA Source of variation	SS	df	MS	F	*p*-value	F crit
Sample	4.05	1	4.05	3.11538462	0.0966319	4.49399848
Columns	0.45	1	0.45	0.34615385	0.56451202	4.49399848
Interaction	0.45	1	0.45	0.34615385	0.56451202	4.49399848
Within	20.8	16	1.3			
Total	25.75	19				

Source: Original table created for this study

The final set of four questions examined state anxiety in tie participants as well as expected performance in the experiment. Interestingly, for every question in this group the female leaders exposed to the male-gendered background were revealed to have more anxiety about the experiment and lowered expectations of performance compared to all others groups.

Looking at the answers for the first question, phrased as a statement of confidence, we can see that female leaders exposed to the male-gendered background image score lower than the other three groups. A two-factor ANOVA of these results shows a non-significant interaction effect of sex and background. Note the low *p*-value in Table 4 denoting interaction significance.

The next statement in this group was "I am uncertain I have the leadership experience to do well on this test". This statement was included as a measure of performance expectations. Here, a significant effect of participant gender was seen in the results using a two-way ANOVA (Table 5). Both groups of female leaders indicated more uncertainty than their male counterparts. This indicates lowered expected results in both female groups, with the female leaders exposed to the male-gendered background showing the most uncertainty.

The third statement in this group was "Taking this test may cause me to doubt my leadership ability". Again, the female leaders exposed to the male-gendered background were the group who agreed with this the most, although the result was once again deemed not statistically significant using a two-way ANOVA (Table 6).

The final statement on the survey was "If I don't do well on this test, others may question my ability". Once more, the female leaders exposed to the male-gendered background agreed with this sentiment the most, indicating a concern over perceived status and lowered sense

ANOVA

Source of variation	SS	df	MS	F	*p*-value	F crit
Sample	0.2	1	0.2	0.26666667	0.61263993	4.49399848
Columns	0.2	1	0.2	0.26666667	0.61263993	4.49399848
Interaction	1.8	1	1.8	2.4	0.1408868	4.49399848
Within	12	16	0.75			
Total	14.2	19				

Source: Original table created for this study

Table 4. ANOVA results for Q9: I can handle this test

ANOVA

Source of variation	SS	df	MS	F	*p*-value	F crit
Sample	20	1	20	8.60215054	0.00975041	4.49399848
Columns	0.8	1	0.8	0.34408602	0.56566515	4.49399848
Interaction	0.2	1	0.2	0.08602151	0.77306725	4.49399848
Within	37.2	16	2.325			
Total	58.2	19				

Source: Original table created for this study

Table 5. ANOVA results for Q10: I am uncertain I have leadership experience to do well

of belonging in the role. Although, this was not shown to a degree that was found to be statistically significant using a two-way ANOVA (Table 7).

Of the 12 statements in the survey the female leaders exposed to the male-gendered virtual background were either the most negative (six) or joint-most negative (four) in ten of them. The two statements in which they were not most negative were both in the domain identification section.

Although certain quality indicators for quantitative research, such as convergent and divergent validity and Cronbach's alpha were not conducted at this point in the study, these can be considered in future work along with analysis of the means that are significantly different from each other via the Tukey test.

Qualitative findings – thematic analysis

Once the interview transcripts were recorded, they were thematically analysed using Braun and Clarke's (2006) six-phase framework. This framework was chosen for its flexibility and accessibility, as well as its ability to highlight similarities and differences across the interviewees' responses. Transcripts were first coded, a process which took several iterations. Themes were then identified across the transcripts and named. The main themes discussed were:

- the stereotype of leadership;
- lack of belonging in the workplace;
- the personal impacts of solo status and "unbelonging";
- coping mechanisms used; and
- the role of men as allies.

These are depicted in Figure 3.

Table 6.
ANOVA results for Q11: This test could make me doubt my leadership ability

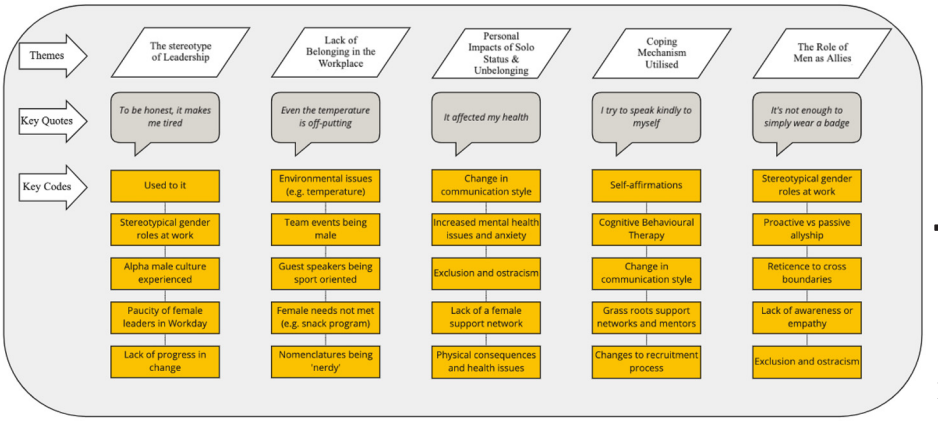
ANOVA Source of variation	SS	df	MS	F	*p*-value	F crit
Sample	6.05	1	6.05	1.98360656	0.17814612	4.49399848
Columns	6.05	1	6.05	1.98360656	0.17814612	4.49399848
Interaction	0.05	1	0.05	0.01639344	0.89971528	4.49399848
Within	48.8	16	3.05			
Total	60.95	19				

Source: Original table created for this study

Table 7.
ANOVA results for Q12: If I do not do well, others question my ability

ANOVA Source of variation	SS	df	MS	F	*p*-value	F crit
Sample	1.8	1	1.8	0.6728972	0.42409626	4.49399848
Columns	5	1	5	1.86915888	0.19047326	4.49399848
Interaction	0.2	1	0.2	0.07476636	0.7880175	4.49399848
Within	42.8	16	2.675			
Total	49.8	19				

Source: Original table created for this study



Source: Original figure created for this study

Figure 3.
Forming themes from coding qualitative data

"To be honest, it makes me tired": the stereotype of leadership

This theme consisted of several codes relating to awareness of the stereotype of leadership being masculine, experiences of gender role issues at work and a lack of representation felt by these women in leadership across the company. Not included in this theme is any commentary on ability or specifics about the leadership role itself.

Uniformly, the interviewees were aware of the stereotype of leadership being White and being male. Interviewees indicated they have been aware of this since early in their careers and frequently used terms like "I'm used to it" or "it's extremely common in places I've worked". One interviewee stated "I don't really see myself represented in the company higher up" (Interviewee D, video conference interview, 5th July 2022).

Another interviewee felt that female leaders are often grouped together when evaluated in a way which male leaders were not. She explained that when someone has a bad experience with a female leader, it effects the brand and esteem of the other female leaders. "One's failure is shared when the leader is female but not when the leader is male" (Interviewee C, video conference interview, 6th July 2022). Assumption of gender roles was also discussed. One interviewee described her assumed role during meetings when she was beginning her career in the organisation:

> I was a developer at the time, and I think I was the only girl on the team and for some reason there was this expectation that when we had a team meeting I would take the notes. It was just assumed. It even took me a while to realise it (Interviewee A, video conference interview, 5th July 2022).

One interviewee, when asked to recall the Zoom background that was used during the experiment, indicated that she would be surprised if the organisation produced gendered leadership backgrounds, indicating a belief that the organisation is aware of gender issues in leadership and sensitive to such issues:

> Yes, I remember. It was a leadership slide and they were all men. I'm used to that sort of thing. At least if it's a personal thing that tells me about your way of thinking. It would be far worse if the company brought out a series of leadership slides and none were women (Interviewee B, video conference interview, 4th July 2022).

These findings indicate that the stereotype of leadership being White and male in the Western world still holds, despite many efforts over the past decade to alter and improve upon it.

"Even the temperature is off-putting": lack of belonging in the workplace

The second theme was a reoccurring one in all interviews. It pertains to the environment being more suited to males than females, reminiscent of the findings in Cheryan *et al.* (2009). Included here are several codes related to the physical environment, such as the office temperature being low for females but not for males and the names of meeting rooms being associated with stereotypical male interests, such as sports or fictional characters from popular science fiction. Also included are team norms, such as team events and recruiting new members. Not included are interpersonal interactions or team dynamics.

All of the interviewees expressed dissatisfaction with various aspects of the workplace and a feeling of not belonging. Examples were varied and ranged from minor to quite impactful. For example, one interviewee stated that she was frequently cold in the office and felt that the temperature was more suited to males. She explained that she kept a blanket at her desk, and often had a cup of tea nearby "not to drink, but to use as a hand warmer" (Interviewee B, video conference interview, 4th July 2022). Another interviewee stated that team names and meeting rooms were frequently named after "nerdy" things, like planets, video games or niche trivia.

Another pointed out the snack programme was oriented around protein bars and healthy snacks, which she felt did not cater to women's needs when periodically they require sugary snacks like chocolate. Team outings were often voted on by the team, and one interviewee claimed that democratic votes are not a good way to decide these things when a team that is 90% male. Frequently activities like go-karting are selected, and another interviewee stated that she would have been unable to attend had she not been able to change it because she was pregnant at the time.

"It affected my health": personal impacts of solo status and "unbelonging"

This theme consists of codes which indicate the effects of stereotype threat cross the boundary from work life to personal life. It includes mental health concerns, behavioural changes and impacts to physical health. Three of the interviewees were clear that these experiences had effected them outside of the workplace. Two of the interviewees described that their communication style had changed over time since they had become a people leader. Another said she had noticed a similar change in a female colleague. One of the interviewee described a situation where she was communicating with family member in a direct manner, as she would in work, to avoid ambiguity. Her family member, unaccustomed to this new direct way of communicating, was taken aback asked her if they had offended her in some way and if she was angry with them.

A more serious example of a personal impact was described by one interviewee when, for a time, she felt that she may have to sacrifice having a family for her job:

> It became really clear to me that there were very few female managers that have children. Out of the many product managers I had worked with none of them had kids and I genuinely did think like you know that this career is maybe just not compatible with that choice (Interviewee C, video conference interview, 6th July 2022).

The interviewee went on to say she was happy the organisation had brought in bonding leave for male employees who have become fathers, as it removes a "stigma" around females taking maternity leave. Another interviewee described a situation in which, as the sole

female leader in the department, she was ostracised by the other male leaders. She described in detail the effects it had on her mental health and, eventually, her physical health as well:

> I was constantly on edge. I was scanning everything for a threat. Even the most inconsequential comments I could read into it and imagine an insult that mightn't be there. It was exhausting (Interviewee E, video conference interview, 15th July 2022).

The effects of stereotype threat for these three interviewees have impacted them in ways which go beyond simple career concerns and have real health implications.

"I try to speak kindly to myself": coping mechanisms used

This theme arose from codes, such as self-affirmation use, cognitive behavioural therapy and support networks. It describes ways in which the interviewees are seen to counter the effects of stereotype threat in work.

Each of the women interviewed outlined ways in which they have sought to bring about positive change for themselves and their female colleagues. One interviewee described the importance of having someone to talk to in work, a role model or a mentor, as well as being kind to oneself and using self-affirmations to remind oneself of one's value and right to be in that role.

Four out of the five interviewees mentioned how important role models are. Although one interviewee expressed concern about the extra burden that puts on the shoulders of these role models:

> It's not like [senior female leaders] don't have enough to do. They also have this weight of all of our expectations to shoulder too. There are so few senior female leaders, we need to share that load around (Interviewee B, video conference interview, 4th July 2022).

Nevertheless, role models were seen as vitally important to prospective female leaders and leaders new in their role. Several interviewees stated they were part of a mentorship programme, with one indicating that she is a mentor for "several female developers".

One of the interviewees was a member of a group of female leaders in the organisation. She explained that this group was set up locally in the Ireland office to address visibility of female leaders, bias against female leaders and improve the recruiting process. The latter came up on several occasions in the interviews and was criticised for having too many men on the interview panels, as well as signalling to female candidates a sense that they may not fit in at the organisation. Finally, two interviewees described using cognitive behavioural therapy techniques, although not described as such. One described how she would imagine herself in the future when her current troubles would be behind her (time projection). Another described how she is often critical of herself, more-so than she would be of a colleague in the same situation, and how she tries to stop this way of thinking when she becomes aware of it (double-standard dispute).

"It's not enough to simply wear a badge": the role of men as allies

This theme focused on the role of men and the part they play in the stereotype threat felt by female leaders. It involved codes like empathy, exclusion and visibility. The theme did not include any relationship with males outside of the workplace, such as family members or spouses.

Four of the five interviewees chose to speak about the role men could play in combating stereotype threat and improving the feeling of belonging for female leaders. One interviewee felt like most men were "passive allies" instead of proactive ones:

> Maybe the men could take more of an initiative to get more involved. I think men could do a lot to show more support. And I know men don't want to be stepping on toes and are afraid of coming across into 'our thing', but really the silence is worse because now I don't know if they even care (Interviewee B, video conference interview, 4th July 2022).

Another interviewee expressed a similar thought, explaining that she does not see enough male leaders taking female developers under their wing and giving them encouragement and guidance. A third suggestion was for men to take part in a reverse mentoring programme that was set up in the organisation in Ireland where male leaders could be mentored by female individual contributors. In this way it was felt they would gain greater insight into the daily challenges of female employees in the company.

Discussion of findings

The experiment data supports the theory that female leaders experienced greater anxiety when exposed to a male gendered virtual background image. Performance expectations were also lower in the stereotype threat group, although not to a statistically significant degree that would be generalisable. Qualitative themes indicate that the stereotype of leadership being White and male is still a widely known issue. The themes also suggest that the female leaders interviewed have been exposed to stereotype threat, and have experienced low ambient belonging in their workplaces.

Female leaders and stereotype threat in video conferencing calls

The data show that female leaders did in fact score lower on average at a leadership task when a male-gendered background was displayed. This group achieved the lowest average score and also attempted the least amount of tasks on average. The survey data also show that female leaders exposed to a male gendered background image on a video conference call were more critical of their own abilities, had lowered performance expectations and experienced higher anxiety than male leaders or female leaders exposed to a female background.

The result of the leadership experiment is consistent with the findings of Bergeron *et al.* (2006) who also used a managerial in-basket task when comparing male and female participants under stereotype threat. Whereas they found statistically significant findings in relation to task performance quality and task performance quantity, the findings here cannot be generalised to the wider public, due in some degree to the small sample size. Nevertheless, the findings do seem to indicate that the male background image had enough of an effect that performance decreases were seen among female leaders exposed to it.

The implication of the experiment, that video conferencing software could be a medium through which stereotype threat can be triggered, is consistent with other findings pertaining to technological media in the literature. In a similar vein to Cheryan *et al.* (2011) demonstrating that virtual reality classroom environments could trigger stereotype threat, and Abdou and Fingerhut's (2014) findings that the same can be said for virtual waiting rooms, it is likely that virtual backgrounds in video conferencing software could also be a viable medium to trigger the phenomenon. It should be noted that the evolution of the work environment from the office to home workspaces has somewhat mimicked Cheryan's own research, which started by examining whether the physical environment of classrooms could induce stereotype threat (2009), before moving onto virtual reality classrooms (2011). Here, the same is demonstrated in a workplace context, an interesting finding for the literature on pandemic working environments.

The survey data gave some indication as to why this performance decrease was seen. Lowered performance expectations have been seen in the literature as a sign that the

experiment participant is experiencing stereotype threat (Spencer *et al.*, 1999; Stangor *et al.*, 1998; Steele and Aronson, 1995). Previously Bandura (1986) and more recently Spencer *et al.* (2016) showed that lowered expectations can undermine performance by a decrease in motivation and withdrawal of effort. This is one explanation for why the participants experiencing lowered performance expectations in their survey answers did not perform as well on the leadership test – they were experiencing stereotype threat.

Another indication that the participants were experiencing stereotype threat was the consistency with which their survey answers indicated higher anxiety levels than the other groups. In all four statements pertaining to anxiety, the female leaders exposed to the male-gendered background indicated higher anxiety levels than the other groups. Anxiety has long been associated with stereotype threat and several studies in the literature highlight that the anxiety which arises from stereotype threat activation has negative effects on performance (Abdou and Fingerhut, 2014; Cadinu *et al.*, 2005; Spencer *et al.*, 1999).

Domain affiliation being uniform across all groups was another important finding. Stereotype threat occurs when someone cares about a domain in relation to the self and conflates success in that domain as a measure of self-worth (Steele, 1997). Low identification with the domain could lead to poor performance for reasons other than stereotype threat, such as boredom or disinterest. Establishing the domain identification of the participants is often seen in the literature as a way of validating the participant selection process.

Although the findings were not enough to be statistically certain that the background images evoked stereotype threat and lowered the performance of some participants, there are enough converging signs that would indicate this is the case and it is certainly an area for further study.

Drilling deeper into the lived experience of stereotype threat

The findings from the interviews opened a depth of insights into the lived experience of leadership stereotype threat for female leaders in the workplace.

The interviews confirmed that the leadership stereotype still exists as a threat in the working climate for female leaders. When the interviewer expanded upon what that may mean for them in terms of responses and career impact, the knowledge did not seem to surprise the interviewees. In most of the interviews, the interviewee would appear to be aggrieved when discussing the stereotype. Each accepted it, but that acceptance caused discomfort or a sense of unfairness. One interviewee also recalled being disappointed that the experimenter would choose a male-gendered virtual background before she was aware that it was part of the experiment. Notably, this was not discussed until there was a direct question put to her about it, indicating a need to ignore it or accept it despite the fact that she felt it was somewhat tone deaf during a call about leadership.

One interviewee maintained that female leaders are held accountable for failures other members of their gender perpetrate, which is not the case for male leaders. In a wider context, this recently became apparent following the Theranos scandal when Elizabeth Holme's widely publicised failure was sufficient to cause adverse effects on other women in the organisation (Agnihotri and Bhattacharya, 2020). This indicates that the stereotype of leadership being White and male in the Western world still holds true, despite many efforts over the past decade to alter and improve upon it.

Each interviewee had examples of when they felt like they did not belong in their workplace. They also shared the reasons of why they sometimes felt this lack of "ambient belonging". Sometimes it was due to the actions of their team mates. Sometimes it was due to physical environment attributes, such as temperature, which has been shown to negatively affect women more than men (Parkinson *et al.*, 2021). Common in each is a sense

of not being equal; that their experience is worth less and can be sacrificed for sake of the majority. Even more concerning is the volume of these examples, with each one adding a little more discomfort, an extra tax on showing up each day.

These experiences tie back to the work of Cheryan *et al.* (2009) on ambient belonging. Stereotypes can be communicated just through physical signs present in an environment. In effect the environment behave like gatekeepers, preventing people who feel like they may not belong from joining the group associated with the environment. Chronic exposure to such an environment may be putting the female leaders in the organisation at risk of disidentification with their roles, which can undermine long-term motivation and ambition, potentially leading to an early exit from the domain for some (Steele, 1997).

It also became clear that this experience was effecting three of the interviewees outside of the workplace. This was not altogether unexpected, as the literature does indicate, particularly for people who hold solo status that stereotype threat can cause behavioural responses which are not bounded by the work environment. One common example is females in leadership positions adopting more of a masculine communication style (Von Hippel *et al.*, 2011), as was seen in the interviews, particularly with interviewee B, who herself has solo status among her leadership team. While this coping mechanism may be beneficial in the short-term, long-term effects include impact to personal relationships and colleagues viewing them as less likeable or warm (Lawson *et al.*, 2022). Colleagues are also less likely to comply with their requests. In other words, the long-term effectiveness of interviewee B in her role may diminish despite her best efforts as "fitting in".

Research findings regarding the relationship between stress and stereotype threat also presented themselves during the interviews. Interviewee C's recount of being in a situation where she questioned having a family is a perfect example of a stressful situation unfairly felt by one group over another.

The work of Murphy *et al.* (2007) which showed that women under stereotype threat exhibit more cognitive and physiological vigilance could also be seen in the replies of one of the interviewees. Women in this heightened state reported feeling a lower sense of belonging and less desire to participate in the surroundings. This matches closely with interviewee D's experience while holding solo status in a stereotypically male organisation. Described by the interviewee as compulsive "scanning", this behaviour makes the victims of identity threat more vigilant to the details of the environment around them and able to recall more cues in their physical context when asked. In the research these women also experienced faster heart rates, greater skin conductance and other physiological symptoms as well as exhaustion. Although these physiological symptoms were not mentioned by interviewee D explicitly, the health impacts noted by her may line up with prolonged experience of these symptoms.

Self-affirmations were identified as being a coping mechanism used by two of the interviewees. Interestingly, it was Claude Steele in 1988 who popularised the idea of self-affirmations, before his work on stereotype threat Steele (1988). The work of Von Hippel *et al.* (2011) over 20 years later showed that this method can indeed be used to prompt behavioural changes in the participant making them more resilient to the effects of stereotype threat, in much the same way as the interviewees are seen to do. Sherman and Cohen (2002) also showed that individuals can overcome threats to their integrity by affirming other positive aspects of themselves. Conscious or not, this coping mechanism is one which can successfully counter the dangers of stereotype threat and should be built into the education programmes in the organisation to help others.

The use and promotion of role models and mentoring programmes is flourishing in the organisation. As seen in the literature via the work of Cortland and Kinias (2019) and

McIntyre *et al.* (2005) role models have been shown to alleviate the effects of stereotype threat. It should be noted that many of these groups in the organisation were started at a grass roots level. Determination and grit have played a role in their creation and success. While it is apparent that female leaders have an extra burden of expectations and standards to carry, in the organisation at least they are rising to meet that challenge.

The role of men was discussed by the interviewees also. It was felt that their male colleagues were not doing enough to assist in making the organisation more of an identity-safe environment. Again, this has been seen elsewhere in the literature. Yoder *et al.* (1998) found that groups led by solo women performed better if someone of high status endorsed the abilities of the woman in front of the group compared to other groups where the solo woman was not legitimised. There is, therefore, scope for male leaders in the organisation to become more involved in advocating female colleagues through mentoring and endorsement.

Awareness of the leadership stereotype, a key prerequisite for stereotype threat, was confirmed and discussed in the interviews, as was the feeling of a lack of ambient belonging in the workplace. Increased anxiety and lowered expectations, which are both documented mediators of lowered performance, were measured in the survey, potentially as a result of the aforementioned awareness that the stereotypical image of a leader does not fit with the participant's own self-image. Finally, lowered performance was recorded as the output during the experiment, likely as a direct result of increased anxiety and lowered working memory as described in the literature. Together, these three findings form a familiar chain of events that has been seen in previous studies. Triangulation of the research findings, including the interviews, the experiment and survey reveals a consistency with the literature that is summarised in Figure 4.

Potential limitations

Certain aspects of the experiment were less than ideal, and improvements can be discussed in relation to the experiment process and also the content of the experiment. By discussing these shortcomings it is hoped that the experiment could be re-run in a more precise manner for different contexts.

The first and most prominent issue with the experiment process was the small sample size. This was due to time constraints and the need for the researcher to travel for work. Although some of the results of the survey indicated a slight effect on the female leaders exposed to the male-gendered background, especially in the state anxiety statements, none of the results were found to be statistically significant for that specific group. However, if the sample set were enlarged, the possibility exists that this effect would become significant if observed over that increased scope.

A subsequent issue with the experiment process was the lack of a standardised lab environment (e.g. monitor setup) for each of the participants. In some cases, participants had dual screens and were able to keep the Zoom window open during the test. Others had a single monitor and although they were asked to keep the Zoom window visible, in the subsequent interviews more than one admitted they had minimised the Zoom window to maximise space for the experiment. This unfortunately meant that despite best efforts, some of the participants had a longer exposure time than others to the background images. Some were exposed throughout the exercise and some only during the introduction and survey completion segments of the call. A more desirable method would have been to designate a specific meeting room in the office as a lab, and bring each participant to the same monitor configuration, removing the variable of image time exposure.

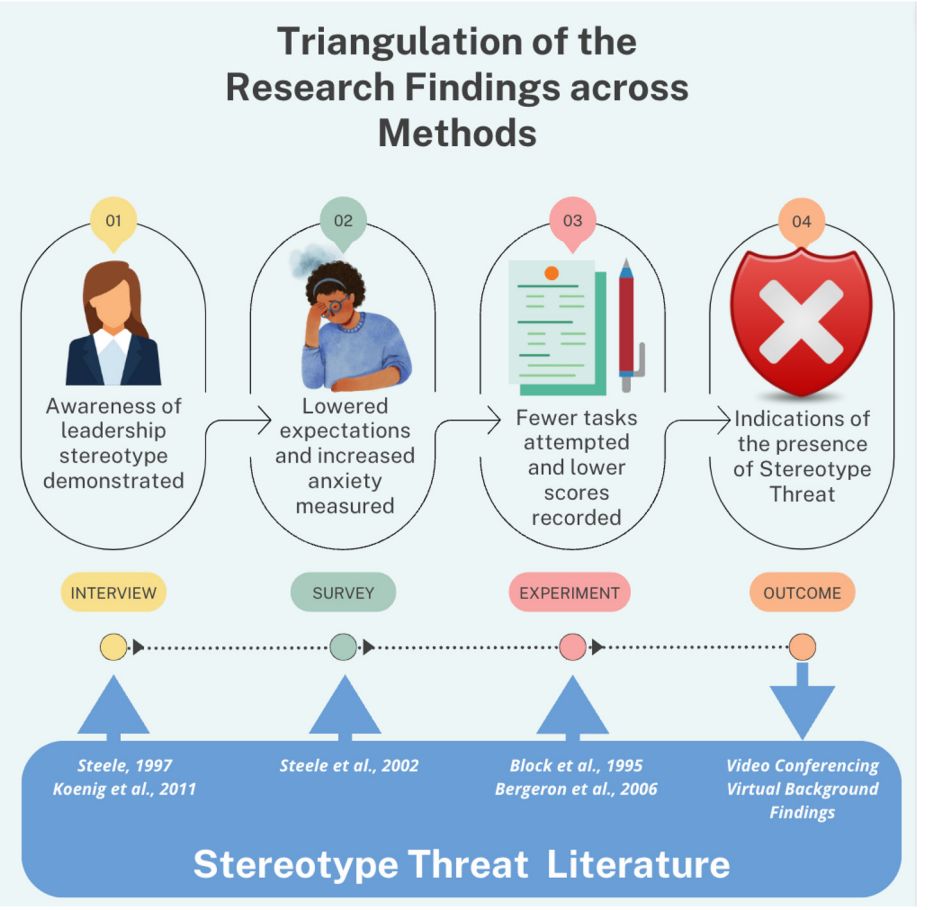


Figure 4.
Triangulation of the research findings across methods

Source: Original figure created for this study

Finally, as already mentioned, a screening process built into participant selection would perhaps have been useful to screen out participants who had trouble reading large amounts of written English in a short period of time, and also people who were of a significantly different job profile.

Practical impact and recommendations

Individual impacts

Some individual impacts were found via the interviews. Male leaders in the organisation need to do more to mentor and endorse their female colleagues. By doing this, they can counter the negative effects of solo status and the subsequent performance degradations of their female counterparts, while also setting an example for other leaders. Participation in mentoring programmes and involvement in initiatives centred around inclusion, belonging and equity should be encouraged and supported. Reverse mentoring should also be encouraged among the population of male leaders to aid in allyship and bias awareness.

Team impacts

Teams should note that a democratic vote is not always the best way to decide on names of teams, projects or meeting rooms. These may skew towards niche interests that can serve to alienate members of the team who do not associate themselves with that interest. Rather, the teams should strive to be fully inclusive and educated on the need for identity-safety. Team events may also serve to alienate members if teams are not mindful of the need to be inclusive. Activities, such as "go-kart" racing and physical or competitive team events have been highlighted as unsuitable for some team members, and should be avoided in favour of inclusivity.

Corporate impacts

Although the findings were not shown to be generalisable to a wider population, female participants exposed to the male background did achieve lower scores on average in the leadership test. They also attempted the least amount of tasks. They were shown to have the highest anxiety levels among the groups, and the lowest performance expectations. Based on these combined results, it would be prudent for organisations to restrict the use of virtual backgrounds. Zoom has an administration function which can allow companies to upload "sanctioned" images for use as virtual backgrounds, but disallows individual users from uploading and using their own. By doing this, companies would be protecting their employees from the effects of stereotype threat performance degradation and the long-term effects associated with that, such as dis-identification from the domain. Therefore, companies would also be protecting the diversity of their workforce, which, in turn, protects the organisation's decision-making, creativity and capacity to innovate.

Future research

Re-running this experiment in a more controlled environment with a larger sample set could yield more definitive, statistically significant results and contribute more to the literature. Explicitly stating the stereotype at the beginning of the exercise may also produce a more distinct difference among the groups. Another avenue to explore would be to compare two different sets of female leaders exposed to a male background image: technology leaders and leaders from outside the technology organisation, such as human resources or talent acquisition. This experiment would examine if female leaders in the technology organisation, which is predominantly male, have developed any resistance to stereotype threat. In effect, it proposes to measure the effectiveness of any coping mechanisms used by that population, such as identity bifurcation. If the measures work, a performance difference would be seen between the two groups and female leaders who have spent their careers in organisations with many other females could be effected more by stereotype threat.

References

Abdou, C.M. and Fingerhut, A.W. (2014), "Stereotype threat among black and white women in health care settings", *Cultural Diversity and Ethnic Minority Psychology*, Vol. 20 No. 3, p. 316.

Agnihotri, A. and Bhattacharya, S. (2020), "Impact of female executives' fraudulent behaviour on other women employees: a contingency framework of stigma by association", *International Journal of Organizational Analysis*, Vol. 28 No. 4, pp. 793-815.

Allport, G.W., Clark, K. and Pettigrew, T. (1954), *The Nature of Prejudice*, Doubleday, New York, NY.

Aronson, J., Lustina, M.J., Good, C., Keough, K., Steele, C.M. and Brown, J. (1999), "When white men can't do math: necessary and sufficient factors in stereotype threat", *Journal of Experimental Social Psychology*, Vol. 35 No. 1, pp. 29-46.

Baker, S.E. and Edwards, R. (2012), "How many qualitative interviews is enough? Expert voices and early career reflections on sampling and cases in qualitative research", National Centre for Research Methods, ESRC.

Bandura, A. (1986), *Social Foundations of Thought and Action: A Social Cognitive Theory*, Prentice Hall, Englewood Cliffs, NJ.

Bergeron, D.M., Block, C.J. and Echtenkamp, A. (2006), "Disabling the able: stereotype threat and women's work performance", *Human Performance*, Vol. 19 No. 2, pp. 133-158.

Block, C.J., Roney, C.J.R., Geeter, J., Lopez, P.D. and Yang, T. (1995), "The influence of goal orientation on anxiety, motivation and performance on a complex task", Paper Presented at the Academy of Management, Vancouver, BC.

Bosson, J.K., Haymovitz, E.L. and Pinel, E.C. (2004), "When saying and doing diverge: the effects of stereotype threat on self-reported versus non-verbal anxiety", *Journal of Experimental Social Psychology*, Vol. 40 No. 2, pp. 247-255.

Braun, V. and Clarke, V. (2006), "Using thematic analysis in psychology", *Qualitative Research in Psychology*, Vol. 3 No. 2, pp. 77-101.

Cadinu, M., Maass, A., Rosabianca, A. and Kiesner, J. (2005), "Why do women underperform under stereotype threat? Evidence for the role of negative thinking", *Psychological Science*, Vol. 16 No. 7, pp. 572-578.

Carter, D.A., Simkins, B.J. and Simpson, W.G. (2003), "Corporate governance, board diversity, and firm value", *The Financial Review*, Vol. 38 No. 1, pp. 33-53.

Cheryan, S., Meltzoff, A.N. and Kim, S. (2011), "Classrooms matter: the design of virtual classrooms influences gender disparities in computer science classes", *Computers & Education*, Vol. 57 No. 2, pp. 1825-1835.

Cheryan, S., Plaut, V.C., Davies, P.G. and Steele, C.M. (2009), "Ambient belonging: how stereotypical cues impact gender participation in computer science", *Journal of Personality and Social Psychology*, Vol. 97 No. 6, p. 1045.

Cook, N. (2022), "Companies that excel at diversity also lead the innovation pack", Alliance for Innovative Regulation.

Cortland, C.I. and Kinias, Z. (2019), "Stereotype threat and women's work satisfaction: the importance of role models", *Archives of Scientific Psychology*, Vol. 7 No. 1, p. 81.

Davies, P.G., Spencer, S.J. and Steele, C.M. (2005), "Clearing the air: identity safety moderates the effects of stereotype threat on women's leadership aspirations", *Journal of Personality and Social Psychology*, Vol. 88 No. 2, p. 276.

Eagly, A.H. and Carli, L.L. (2003), "The female leadership advantage: an evaluation of the evidence", *The Leadership Quarterly*, Vol. 14 No. 6, pp. 807-834.

Erhardt, N.L., Werbel, J.D. and Shrader, C.B. (2003), "Board of director diversity and firm financial performance", *Corporate Governance*, Vol. 11 No. 2, pp. 102-111.

Fordham, J., Ratan, R., Huang, K.T. and Silva, K. (2020), "Stereotype threat in a video game context and its influence on perceptions of science, technology, engineering, and mathematics (STEM): avatar-induced active self-concept as a possible mitigator", *American Behavioral Scientist*, Vol. 64 No. 7, pp. 900-926.

Hoyt, C.L. and Murphy, S.E. (2016), "Managing to clear the air: stereotype threat, women, and leadership", *The Leadership Quarterly*, Vol. 27 No. 3, pp. 387-399.

Kanter, R.M. (1983), *The Change Masters*, Simon and Schuster, New York.

Katz, I., Epps, E.G. and Axelson, L.J. (1964), "Effect upon negro digit-symbol performance of anticipated comparison with whites and with other negroes", *The Journal of Abnormal and Social Psychology*, Vol. 69 No. 1, p. 77.

Koenig, A.M., Eagly, A.H., Mitchell, A.A. and Ristikari, T. (2011), "Are leader stereotypes masculine? A meta-analysis of three research paradigms", *Psychological Bulletin*, Vol. 137 No. 4, p. 616.

Lawson, M.A., Martin, A.E., Huda, I. and Matz, S.C. (2022), "Hiring women into senior leadership positions is associated with a reduction in gender stereotypes in organizational language", *Proceedings of the National Academy of Sciences*, Vol. 119 No. 9.

Lorenzo, R., Voigt, N., Tsusaka, M., Krentz, M. and Abouzahr, K. (2018), *How Diverse Leadership Teams Boost Innovation*, Boston Consulting Group, Boston.

McBurney, D.H., Gaulin, S.J., Devineni, T. and Adams, C. (1997), "Superior spatial memory of women: stronger evidence for the gathering hypothesis", *Evolution and Human Behavior*, Vol. 18 No. 3, pp. 165-174.

McIntyre, R.B., Lord, C.G., Gresky, D.M., Ten Eyck, L.L., Frye, G.J. and Bond, C.F., Jr (2005), "A social impact trend in the effects of role models on alleviating women's mathematics stereotype threat", *Current Research in Social Psychology*, Vol. 10 No. 9, pp. 116-136.

Mannix, E. and Neale, M.A. (2005), "What differences make a difference? The promise and reality of diverse teams in organizations", *Psychological Science in the Public Interest*, Vol. 6 No. 2, pp. 31-55.

Murphy, M.C., Steele, C.M. and Gross, J.J. (2007), "Signaling threat: how situational cues affect women in math, science, and engineering settings", *Psychological Science*, Vol. 18 No. 10, pp. 879-885.

Nemeth, C.J. (1986), "Differential contributions of majority and minority influence", *Psychological Review*, Vol. 93 No. 1, pp. 23-32.

Newcomer, K.E., Hatry, H.P. and Wholey, J.S. (2015), "Conducting semi-structured interviews", *Handbook of Practical Program Evaluation*, Vol. 492, p. 492.

Nussbaum, A.D. and Steele, C.M. (2007), "Situational disengagement and persistence in the face of adversity", *Journal of Experimental Social Psychology*, Vol. 43 No. 1, pp. 127-134.

Parkinson, T., Schiavon, S., de Dear, R. and Brager, G. (2021), "Overcooling of offices reveals gender inequity in thermal comfort", *Scientific Reports*, Vol. 11 No. 1, p. 23684.

Pronin, E., Steele, C.M. and Ross, L. (2004), "Identity bifurcation in response to stereotype threat: women and mathematics", *Journal of Experimental Social Psychology*, Vol. 40 No. 2, pp. 152-168.

Schmader, T., Johns, M. and Forbes, C. (2008), "An integrated process model of stereotype threat effects on performance", *Psychological Review*, Vol. 115 No. 2, p. 336.

Sherman, D.K. and Cohen, G.L. (2002), "Accepting threatening information: self–affirmation and the reduction of defensive biases", *Current Directions in Psychological Science*, Vol. 11 No. 4, pp. 119-123.

Simons, T., Pelled, L.H. and Smith, K.A. (1999), "Making use of difference: diversity, debate, and decision comprehensiveness in top management teams", *Academy of Management Journal*, Vol. 42 No. 6, pp. 662-673.

Spencer, S.J., Logel, C. and Davies, P.G. (2016), "Stereotype threat", *Annual Review of Psychology*, Vol. 67 No. 1, pp. 415-437.

Spencer, S.J., Steele, C.M. and Quinn, D.M. (1999), "Stereotype threat and women's math performance", *Journal of Experimental Social Psychology*, Vol. 35 No. 1, pp. 4-28.

Stangor, C., Carr, C. and Kiang, L. (1998), "Activating stereotypes undermines task performance expectations", *Journal of Personality and Social Psychology*, Vol. 75 No. 5, p. 1191.

Steele, C.M. (1988), "The psychology of self-affirmation: sustaining the integrity of the self", *Advances in Experimental Social Psychology*, Vol. 21, pp. 261-302.

Steele, C.M. (1997), "A threat in the air: how stereotypes shape intellectual identity and performance", *American Psychologist*, Vol. 52 No. 6, p. 613.

Steele, C.M. and Aronson, J. (1995), "Stereotype threat and the intellectual test performance of African Americans", *Journal of Personality and Social Psychology*, Vol. 69 No. 5, p. 797.

Steele, C.M., Spencer, S.J. and Aronson, J. (2002), "Contending with group image: the psychology of stereotype and social identity threat", *Advances in Experimental Social Psychology*, Academic Press, Cambridge, MA, Vol. 34, pp. 379-440.

Stone, J., Lynch, C.I., Sjomeling, M. and Darley, J.M. (1999), "Stereotype threat effects on black and white athletic performance", *Journal of Personality and Social Psychology*, Vol. 77 No. 6, p. 1213.

Van Loo, K.J. and Rydell, R.J. (2014), "Negative exposure: watching another woman subjected to dominant male behavior during a math interaction can induce stereotype threat", *Social Psychological and Personality Science*, Vol. 5 No. 5, pp. 601-607.

Von Hippel, C., Issa, M., Ma, R. and Stokes, A. (2011), "Stereotype threat: antecedents and consequences for working women", *European Journal of Social Psychology*, Vol. 41 No. 2, pp. 151-161.

Wegner, D.M. (1994), "Ironic processes of mental control", *Psychological Review*, Vol. 101 No. 1, p. 34.

Wenzlaff, R.M. and Wegner, D.M. (2000), "Thought suppression", *Annual Review of Psychology*, Vol. 51 No. 1, pp. 59-91.

Williams, A.M., Jussim, L., Jurcevic, I. and Shapiro, J.R. (2016), "Stereotype threat".

Yoder, J.D., Schleicher, T.L. and McDonald, T.W. (1998), "Empowering token women leaders: the importance of organizationally legitimated credibility", *Psychology of Women Quarterly*, Vol. 22 No. 2, pp. 209-222.

About the authors

Dr Roisin Donnelly is Head of the School of Management, People and Organisations in the Faculty of Business in the Technological University Dublin. She has previously worked as a sectoral project manager for the National Forum for the Enhancement of Teaching and Learning in Ireland and Head of Learning Development in the Dublin Institute of Technology. Roisin Donnelly is the corresponding author and can be contacted at: roisin.donnelly@tudublin.ie

Anthony Ryan is Director, Software Development Application at Workday. Anthony completed his Masters study in the Faculty of Business, Technological University Dublin.