Scientific report for “The Women and Science Chair at Université Paris Dauphine-PSL”

Social influences on emotional responses to STEM: Encouraging women to approach STEM through social-environmental changes

Abstract

Women are underrepresented in STEM (Science, Technology, Engineering, and Mathematics), and their increased participation in these fields could benefit society and the economy. Explicit self-reports measure conscious attitudes, but these can be unreliable due to social desirability or positive self-perception. The impact of different types of female role models (parental, educational-expert, public) on implicit attitudes has rarely been examined, along with the responses of men, who still dominate in STEM. Three studies aim to explore the impact of these role models on men’s and women’s implicit attitudes towards women in STEM using two sensors: Affectiva and EEG (implicit) and self-report (explicit). We found that all types of role models had an impact on implicit negative emotions, which were not correlated with explicit negative emotions.

Specifically, for men, having a parental role model working in STEM reduced implicit (not explicit) negative emotions towards women in STEM, compared to those without any STEM role-model as a parent. Similarly, for women, a female STEM educational-expert role model led to lower implicit (not explicit) fear towards women in STEM compared to men in STEM. For men, a female STEM educational expert led to higher explicit (not implicit) fear than a male educational-expert role model. A female public role model demonstrated an increase in male participants' avoidance toward women in STEM, while a male public role model demonstrated an increase in female participants' avoidance toward women in STEM. These findings stress the importance of using implicit measures in socially sensitive topics, such as the impact of female role models on implicit emotions toward women in STEM.

The problem and its importance

Despite efforts to promote women's recruitment and retention in science, technology, engineering, and mathematics (STEM), women are still underrepresented in both STEM academic studies and in the STEM labor market (Jiang, 2021; McWhirter & Cinamon, 2020). For example, women who study for a BSc comprised 30% of all STEM students in the USA (Casad et al., 2019), 29% in Israel (CHE, 2021), and 25% in Europe (Fatourou et al., 2019). Although STEM fields are currently male dominated, promoting gender diversity can increase team innovation and efficiency (Botella et al., 2019) and positively affect the entire economy (Charlesworth & Banaji, 2019). Thus, it is important to devise effective solutions to this problem.

Why are women underrepresented in STEM?

The under-representation of women in STEM was initially ascribed to biological, cognitive gender differences (see the reviews of Avolio et al., 2020; Wang & Degol, 2017), but significant aptitude differences between men and women concerning science—and, in particular, mathematics—have not been found (Avolio et al., 2020; Else-Quest et al., 2010). Essentially, gender differences in STEM seem to be of a socio-cultural origin, based on cultural gender-related attitudes and beliefs (Wang & Degol, 2017), and socialization processes are known to shape gender differences in vocational preferences and choosing STEM as a career (Kahn & Ginther, 2017; Leslie et al., 2015). Socially constructed *attitudes* toward women’s abilities affect the women’s chances of being hired in STEM fields (Friedmann & Efrat- Treister, 2022), either because women have a lower preference for selecting any STEM training or because employers see them as less fit than men for the work these fields demand and, therefore, do not attempt to attract, hire, or retain them (Miner et al., 2018). We aim to capture women’s and men’s implicit and explicit attitudes toward women working in STEM and explore the less-biased role model effect on implicit attitudes.

Explicit and implicit measures of attitudes

We make an important—in fact, critical—distinction between the ability of explicit versus implicit measures to elucidate attitudes underlying gender-related stereotypes. Explicit emotions require a conscious effort and awareness, whereas implicit attitudes are believed to be evoked automatically without monitoring or awareness (Greenwald & Krieger, 2006). Stereotypical attitudes and beliefs toward women in STEM were commonly measured by explicit self-reports, which focus on conscious awareness (Cheryan et al., 2011). However, these explicit measures are fundamentally limited, as respondents may be unwilling to state their true position out of fear of appearing biased, or they may even lack awareness of their true attitudes (Charlesworth & Banaji, 2019). As gender stereotypes are known to exist at both explicit and implicit levels, with the implicit level being more impactful than the explicit level (Blommaert et al., 2012), it has been suggested that socially sensitive topics (that may relate to implicit biases) should be examined by using primarily implicit measures (Kim et al., 2018). Implicit attitudes can be measured in two ways: cognitive and emotional aspects. Implicit cognitive gender biases are commonly measured by the Implicit Association Test (IAT) and its variations (Jackson, 2011). The IAT, which measures the *cognitive* component of attitudes, evaluates the strength between two perceived associations (e.g., women and scientists) under the assumption that individuals will respond on a computer test more rapidly when they are exposed to two concepts that they perceive to be associated (e.g., women and teachers) than to concepts that they perceived to be not (or, less) associated. The IAT is considered an implicit *cognitive* test because it only explores thoughts and beliefs: it does not evaluate the emotions toward these concepts (Smeding, 2012; Young et al., 2013). Conversely, the implicit *emotional* dimension underlying implicit attitudes toward women in STEM is yet to be evaluated and is the focus of this proposal. We believe that this dimension is critical for our understanding of the causes underlying the underrepresentation of women in STEM because emotions determine the formation of beliefs and attitudes (Banytė et al., 2007) and are one of the strongest predictors of evaluative attitude, motivation, and behavior (Oz et al., 2015; Russell, 2009). To measure implicit emotional attitudes, we will use visual Affectiva (Affectiva, 2017; Lei et al., 2017; Castellanos et al., 2018). This software measures implicit emotions when exposed to a stimulus (see further details below). Past research has looked at the outcome of possible interventions explicitly, which may not have the ability to capture implicit attitudes toward women in STEM.

Intervention to increase women’s participation in STEM

To reduce gender-related stereotypical attitudes and increase women’s participation in STEM, different interventions have been created by researchers and practitioners (Bird & Rhoton, 2021; Friedmann, 2018). Most interventions were aimed at the women themselves, attempting to increase their self-confidence, science skills, and interest in STEM fields (Botella et al., 2019; Casad et al., 2018). Other, less common interventions have typically targeted social agents that impact women’s choice of field—e.g., their family members, the education system in which they learned, or the labor market (Friedmann & Efrat-Triester, 2022)—for instance, by providing booklets about STEM to parents of daughters to improve their perceptions about these fields (Kim et al., 2018). As societal norms influence women's attitudes as well as those of others regarding the fit of women to STEM fields, we propose addressing this social issue by using a social intervention. Specifically, we propose exposing women and men to female role models and measuring their *implicit* emotional responses to observations of women working in STEM. Female role models were proven successful in increasing women's positive explicit emotions toward STEM (Martin, 2012) and their motivation to engage in STEM fields (Moss-Racusin et al., 2021), but how such role models impact the *implicit* emotions of men and women toward women in STEM has yet to be examined with socially sensitive topics. This examination is important as it was suggested that implicit and explicit responses do not correlate (Petty et al., 2009). In the past, various female role-model interventions have been used in attempts to counter the negative stereotypes of women's lack of fit with STEM fields.

Female role-model interventions

Various female role-model interventions have been utilized and discussed in the literature as a well-intentioned attempt to counter negative stereotypes of women's lack of fit in STEM fields. Exposure to successful female role models in STEM fields serve to convey information that women in STEM careers can both succeed and have a fulfilled personal life (González-Pérez, Mateos de Cabo, & Sáinz, 2020). The social learning theory of Bandura (1969) explains how exposure to a role model whose behavior gains rewards (punishments) may encourage (discourage) the observer to behave in the same way.

Some scholars have suggested that mere exposure to a successful female scientist is sufficient to positively affect attitudes toward women in STEM (Betz & Sekaquaptewa, 2012). Such exposure can take place either by holding meetings with female STEM professionals who present themselves and their work (e.g., Stout et al., 2011; Hughes et al., 2013) or by reading biographies or watching short videos of female STEM professionals from industry or the academy (Betz & Sekaquaptewa, 2012; Moss-Racusin, et al., 2018). However, attitudes and behaviors are more likely to be swayed by influential individuals and thus, the influence of significant role models has been recognized as a factor in the development of individual approaches to the STEM fields (George, 2000). Sjaastad (2012) has classified the types of role models into three main types, which are dependent on the following three circles of relatedness:

Parental role model (1st relatedness; i.e., a mother who works in a STEM field). Family is the most important setting impacting children's motivational beliefs (Wigfield et al., 2006; Xie & Shauman, 2003). Early on, cultural, and familial influences often unconsciously reinforce traditional role patterns, children's academic motivation, achievements, and career interests through experiences and values transmitted in the home environment (Spera, 2005).

Professional-expert role model (2nd relatedness; i.e., a STEM female educator). Teachers have been viewed as role models by providing students with positive STEM experiences, helping them to discover their STEM abilities (Sjaastad, 2012). Female role models can also improve women's feeling of belonging in STEM fields (Blickenstaff, 2005) and increase women's involvement and interest in STEM professions (Solanki & Xu, 2018).

Public role model (3rd relatedness; i.e., female scientist public figure). Changing the perception of STEM as being un-feminine, includes introducing general female role models, for example, like mathematician/actor/author Danica McKellar who highlights the feminine side of math in three books aimed at middle and high school girls (Betz & Sekaquaptewa, 2012).

The results of the impact of the three types of female role models on attitudes are summarized in Table 1. As can be seen from the table, most research has focused on *explicit* attitudes and claims that the role model effect is positive. Moreover, the literature suggests that the primary impact of the role model on attitudes was focused on *women*'s personal approach to STEM (using various dependent variables, such as interest in STEM, sense of fit in science-related subjects, and choice of STEM), neglecting men's views on women in STEM.

Table 1. Literature review on types of professional role model impact on attitudes towards STEM

Authors	Effect (+/-)	Implicit/ Explicit	Sample	Dependent variable	Key findings
1st degree – close relatedness					
van Langen, Rekers-Mombarg & Dekkers, 2006	Positive for girls	Explicit	987 Dutch pupils from 55 pre-university schools	Number of examination subjects chosen from {physics, chemistry, and pure mathematics}	Their family background influences the choice of STEM subjects by girls, while the choice by boys is not.
Sjaastad, 2012	Positive	Explicit	5,007 Norwegian university students in STEM education	Students' sources of inspiration for choosing a STEM-related education in university\college	Parents engaged in STEM are models for their children, making STEM familiar, providing support for their choice.
Ardies, De Maeyer, & Gijbels, 2015c	Positive	Explicit	2,973 Belgium pupils from 6th to 7th grades	Pupils attitude towards technology instrument	Children who have a parent working in a STEM career report more positive attitudes and greater future orientation towards STEM.
Cheng et al., 2017	Positive for girls	Explicit	15,000 US high school students using a longitudinal data set from 10th grades to age 26	Represents the different student non-cognitive skills measures, i.e., growth mindset, self-efficacy and effort	Girls of mothers with a STEM profession were 7% more likely to work in the "hard sciences," explain longer-term outcomes in early adulthood; graduating with a STEM degree and working in the STEM field.
Jacobs, Ahmad, & Sax, 2017	Positive	Explicit	Nearly 1 million US first-year students, from the period 1976 through 2011	Men's and women's self-reported plans to pursue a career in engineering (versus all other majors)	Maternal role models and growth mindsets can help close the gender gap (pattern of increasing salience of mothers with respect to the career plans of their children, especially their daughters).
Maltese & Cooper, 2017	Positive	Explicit	7,970 US individuals ranging from 18 to 92 years old	Undergraduate degree in STEM	There is no singular pathway into STEM fields, self-driven interest is a large factor in persistence, especially for males; females rely more heavily on support from others.
Lloyd et al., 2018	No impact	Explicit	6,492 Australian students expressed an interest in pursuing STEM studies and careers	Aspirations towards STEM studies and careers	Supportive parental environment may not relate to encouraging girls to pursue STEM, as the impact of parents' role modeling on children's STEM aspirations is complex.
Peters, Abukmail, & Willis, 2019	No impact	Explicit	419 US pupils from 9th grade	School subject preference, and future education and career goals	Whether the parent worked in a STEM career was not related to what the student intended for employment following high school.
Ardies, Dierickx, & Van Strydonck, 2021	Positive	Explicit	2197 Belgium parents of pupils from 6th grade	Girls' choice for a career in STEM	The fathers' profession does not appear to be a major factor in the choice of study, since some of the participating fathers have a STEM profession and some do not. Girls who chose STEM courses tend to have a mother in a STEM profession.
Aidy, Steele, Williams,	No impact	Implicit (IAT)	658 Canadians: 329 adolescents	Daughters' implicit and/or explicit	Measuring implicit responses to an academic stereotype using IAT,

Lipman, Wong & Mastragostino, 2021.			and at least one of their parents	academic-gender stereotypes	mothers’ implicit attitudes were not correlated with those of the daughters.
2nd degree – educator expert - medium relatedness					
Zirkel, 2002	Positive	Explicit	80 UK students longitudinal study of 12-14-year-olds	Performed better academically up to 24 months later, reported more achievement-oriented goals, enjoyed achievement-relevant activities to a greater degree, thought more about their futures	Role models with a similar background to the participants may encourage girls to imagine being in these positions.
Hazari, Tai, & Sadler, 2007	Positive	Explicit	3,694 surveys of undergraduate science programs require introductory physics coursework	Factors from high school that influence male and female physics performance in university, and success in introductory physics course	High school physics and affective experiences that differentially predicted female and male performance.
Sjaastad, 2012	Positive	Explicit	5,007 Norwegian university students in STEM education	Students’ choice of STEM	Teachers were a major source of inspiration for Norwegian university students’ STEM-related educational choice.
Young, Rudman, Buettner & McLean, 2013	Positive	Implicit (IAT)	320 American students	Attitudes toward science, identification with science, and gendered stereotypes about science	Female professor who is perceived as a positive role model was associated with implicit positive STEM attitudes for both genders.
Hughes et al., 2013	Positive	Explicit	53 U.S. girls and boys from 7th to 8th grades	STEM identity, interest, self-concept, and perceptions of STEM professionals	Higher self-concepts in science and math following a summer camp featuring a real-life female role model.
Shin, Levy & London, 2016	Positive	Explicit	1,035 American STEM and non-STEM undergraduate students	Academic sense of belonging and positive impact on academic self-efficacy	A female professor was associated with increased explicit motivation toward STEM.
Maltese & Cooper, 2017	Positive	Explicit	7,970 American individuals	Sparking STEM interest and persistence in STEM fields	Girls attribute an increasing amount of STEM influence to their teachers, unlike boys who commonly report independent interest in STEM.
O’Brien et al., 2017	Positive	Explicit	175 U.S. girls from 5th to 8th grades	Sense of fit in science	Positive effects of same-sex role models on middle school girls’ attitudes toward science after attending a one-day science outreach program led by advanced students, postdoctoral researchers, or faculty working at a local university-led workshop.
Riegle-Crumb et al., 2017	Positive	Explicit	357 U.S. girls and boys from 9th to 12th grades	Gender/STEM stereotypical beliefs	Female teachers reduced gender/STEM stereotypes of junior and senior high-school male students who held strong stereotypical beliefs.

Del Carpio & Guadalupe, 2018	Positive	Explicit, Implicit (IAT)	6,183 Peruvian and Mexican female applicants' programmers	Application rates to STEM careers	The female role model increases application rates of females in high-tech firms.
Emerson, Mcgoldrick, & Siegfried, 2018	No impact	Explicit	159 American economics departments' institutions over 10 years	Undergraduate female majors	No evidence of a positive role model effect of presence of women faculty in attracting a more gender-diverse set of undergraduate majors.
Moss-Racusin, et al., 2018	Positive	Explicit	501 U.S. participants and 331 STEM faculty	Awareness of gender bias, attitudes toward women in STEM	The videos reduced gender bias and increased awareness of gender bias, positive attitudes toward women in STEM. The exposure to narratives were particularly impactful for emotions, while the expert interviews most strongly impacted awareness and attitudes.
Breda et al., 2020	Positive	Explicit	20,000 French girls and boys from 9th-12th grades	Perceptions of STEM and educational STEM choices	Female educators have a positive impact on the female students' enrollment in STEM fields.
McGuire et al., 2020	No impact	Explicit	1,569 UK and U.S. kids and youth visiting in informal science learning sites	Stereotype awareness, endorsement, and flexibility toward STEM	Stereotypes do not change based on an interaction with an educator (male or female) in an informal science learning site.
3rd degree – public figure - far relatedness					
McIntyre, Paulson, & Lord, 2003	Positive	Explicit	268 US college students	Performance on a difficult mathematics test	Women performed better on math tests after reading about other women's successes.
Dasgupta & Asgari, 2004	Positive	Implicit-cognitive	154 US female students in women's and co-ed colleges	Participants' gender (stereotypes) IAT scores	Reading about famous female leaders weakens women's implicit "male-leader" stereotypes.
Stout et al., 2011	Positive	Explicit	274 US female students	Test performance (Study 1) explicit identification, explicit attitudes, and explicit stereotypes regarding Math and English (Study 2) participants' expected course grades (Study 3)	Exposing women to successful women in STEM boosts female STEM students' identification and expectations for achievement in these fields.
Beaman et al., 2012	Positive	Explicit	8453 Indian adolescents aged 11-15 and their parents in 495 villages	Adolescent girls' career aspirations and educational attainment	Exposure to a successful female politician boosts girls' grades and career aspirations.
Sjaastad, 2012	No Impact	Explicit	5,007 Norwegian university students in STEM education	Students' sources of inspiration for choosing a STEM-related education in university\college.	Celebrities were reported to have a minor influence on STEM-related educational choices, as they did not have any interpersonal relationship with the person making the choice.
Betz & Sekaquaptewa, 2012	Negative	Explicit	189 U.S. girls from 6th-7th grades	Current interest in mathematics, self-rated ability, and	The effect of a general role model was negligible as the role model success may seem unmatchable

				expectations of success	and can make students feel threatened rather than motivated.
González-Pérez et al., 2020	Positive	Explicit	304 Spanish girls, from 6th to 12th grades	Girls’ beliefs that they can be successful in STEM fields increases their likelihood of choosing a STEM career	Female role-model sessions significantly increase the positive impact of expectations of success on STEM choices. The higher the counter stereotypical character of the sessions, the higher the relationship between expectations of success in the choice of STEM.

Most studies examined this socially sensitive topic using self-reports; however, people do not often express biases explicitly (Friedmann & Efrat-Treister, 2023). Thus, we see the importance of exploring women's and men's *implicit* emotional attitudes toward women working in STEM when exposed to the different types of female role models. Accordingly, we propose investigating the following research questions more comprehensively (See Figure 1):

R1a: Does the presence of a *parental* female (vs. a male role model vs. no parent in STEM) impact *implicit* emotional responses, when exposed to women working in a STEM profession, differently for the genders?

R1b: Does the presence of a *parental* female (vs. a male role model vs. no parent in STEM) impact *explicit* emotional responses, when exposed to women working in a STEM profession, differently for the genders?

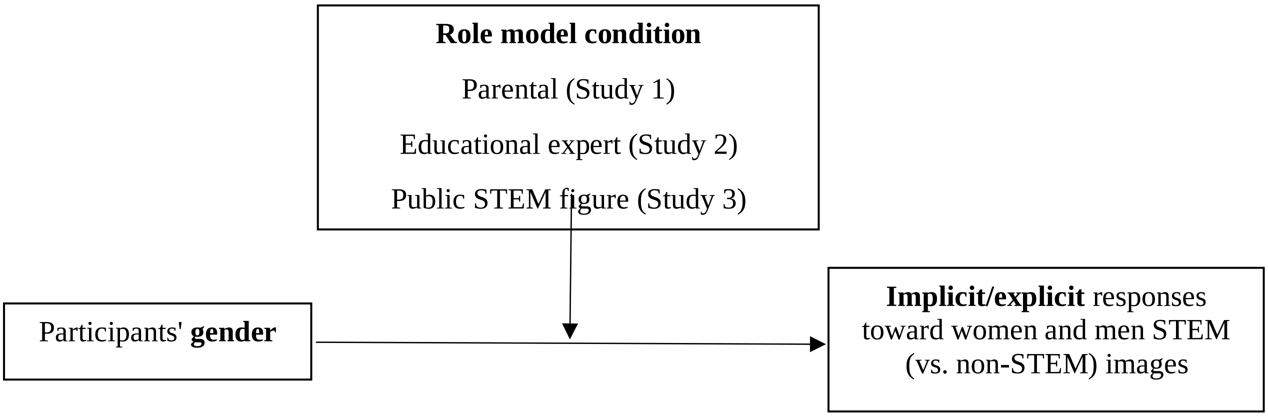
R2a: Does the presence of a *professional-expert* female (vs. a male role model) impact *implicit* emotional responses, when exposed to women working in a STEM profession, differently for both genders?

R2b: Does the presence of a *professional-expert* female (vs. a male role model) impact *explicit* emotional responses, when exposed to women working in a STEM profession, differently for the genders?

R3a: Does the presence of a *public figure* of a female (vs. a male role model) impact *implicit* emotional responses, when exposed to women working in a STEM profession, differently for the genders?

R3b: Does the presence of a *public figure* of a female (vs. a male role model) impact *explicit* emotional responses, when exposed to women working in a STEM profession, differently for the genders?

Figure 1. Conceptual model



Objectives and significance of the research

The proposed study will address three main gaps in the current state-of-the-art research relating to the implicit emotional responses of individuals to an intervention comprising exposure to female role models in STEM professions. **First**, where attitudes were explored previously, the effect of role-model interventions has largely focused either on *explicit* responses or on *implicit cognitive* responses (Cheryan et al., 2011); implicit emotional attitudes, which are essential for measuring sensitive topics (Kim et al., 2018), were seldom addressed. **Second**, the impact of female role models was mainly examined in women's personal attitudes toward STEM, *and scarcely on men's (and women's) views of women who work in STEM professions*. This aspect is important because female role models can change men's (the dominant decision-makers in STEM fields) implicit emotional response toward women in STEM (Friedmann & Efrat-Treister, 2023). **Third**, the literature examined the effect of different types of role models within different circles of relatedness, but rarely tested all three types in tandem.

To bridge these gaps, the overall goal of the proposed study is to explore the impact of these three types of STEM role models on both women's and men's explicit and implicit emotional responses toward women who are in STEM professions. To achieve this goal, we will address three specific aims: **Aim 1** will test for possible gender differences in implicit and explicit responses to women in STEM professions in the presence of female role models; **Aim 2** will explore the gap between implicit and explicit responses toward women working in STEM in the presence of female role models; **Aim 3** will differentiate between the impact made by the three types of female role models (parental, educational-expert, public).

Pretest

Sample and design

Overall, 23 undergraduate students in business administration were recruited through the university panel of experimental studies in exchange for course credit for a 15-minute session (M_{age}=24.58, *SD*=2.06, 52.1% women). The participants filled out a consent form and were presented with 16 pictures of women and men, four in STEM (e.g., engineer, computer programmer, scientist and doctor) and four in non-STEM professions (e.g., cleaner, gardener, teacher and cook) per gender. Each image was presented for 10 seconds, alternating with white screens for two seconds, in between the images. After each picture, participants were asked to describe each figure in detail and classify the profession of the person in the picture as STEM or non-STEM. Then, they were asked to rate their feelings toward each image explicitly. Finally, they were asked about their science-related self-efficacy (Sherer & Adams, 1983), self-science distance (Based on McBride et al., 2020), and demographics.

Analyses

In a one-sample binomial test, all pictures were classified correctly as STEM or non-STEM when we compared observed binary probabilities to the hypothesized proportion above 0.5 ($p < 0.05$).

Results

All sixteen pictures of the model's gender were identified 100% correctly. In seven pictures, more than 85% of participants identified and described the specific occupation correctly (e.g., women doing science in a laboratory, or a woman scientist, chemist, or lab researcher). These included scientists, programmers, physicians, teachers, and cleaners. However, the pictures of the gardener, cook, and engineer and their description included an action done by these figures, but not necessarily related to their occupation (e.g., the gardener was described as 40% of the time taking care of his\her plants at home, the cook was described 30% of the time as cooking in his\her own home, or the engineer was evaluated nearly 25% of the time as a construction worker). For further details, see Table 2.

Table 2. Studies' stimuli examination: correct identification of gender and occupation

	Men (11 total)			Women (12 total)			Total (23 total)		
	Correct gender	Correct STEM\ Non-STEM	Correct occupation	Correct gender	Correct STEM\ Non-STEM	Correct occupation	Correct gender	Correct STEM\ Non-STEM	Correct occupation
Chef (male)	11 (100%)	10 (90.9%)	10 (90.9%)	12 (100%)	12 (100%)	7 (58.3%)	23 (100%)	22 (95.6%)	17 (73.9%)
Cleaner (male)	11 (100%)	11 (100%)	11 (100%)	12 (100%)	12 (100%)	9 (75%)	**23 (100%)**	**23 (100%)**	**20 (86.9%)**
Teacher (male)	11 (100%)	8 (72.7%)	9 (81.8%)	12 (100%)	8 (66.7%)	10 (83.3%)	**23 (100%)**	**16 (69.5%)**	**19 (82.6%)**
Gardner (male)	11 (100%)	6 (54.5%)	7 (63.6%)	12 (100%)	8 (66.7%)	7 (58.3%)	23 (100%)	14 (60.8%)	14 (60.8%)
Chef (female)	11 (100%)	10 (90.9%)	7 (63.6%)	12 (100%)	11 (91.6%)	8 (66.7%)	23 (100%)	21 (91.3%)	15 (65.2%)
Cleaner (female)	11 (100%)	9 (81.8%)	10 (90.9%)	12 (100%)	10 (83.3%)	10 (83.3%)	**23 (100%)**	**19 (82.6%)**	**20 (86.9%)**
Teacher (female)	11 (100%)	9 (81.8%)	9 (81.8%)	12 (91.6%)	8 (66.7%)	9 (75%)	**23 (100%)**	**17 (73.9%)**	**18 (78.2%)**
Gardener (female)	11 (100%)	6 (60%)	5 (45.5%)	12 (100%)	10 (83.3%)	10 (100%)	23 (100%)	16 (69.5%)	15 (65.2%)
Physician M.D. (male)	11 (100%)	10 (90.9%)	8 (72.7%)	12 (100%)	11 (91.6%)	11 (91.6%)	23 (100%)	21 (91.3%)	19 (82.6%)
Engineer (male)	11 (100%)	10 (90.9%)	9 (81.8%)	12 (100%)	11 (91.6%)	7 (58.3%)	23 (100%)	21 (91.3%)	16 (69.5%)
Programmer (male)	11 (100%)	11 (100%)	11 (100%)	12 (91.6%)	10 (83.3%)	10 (83.3%)	**23 (100%)**	**21 (91.3%)**	**21 (91.3%)**
Scientists (male)	11 (100%)	10 (90.9%)	11 (100%)	12 (100%)	11 (91.6%)	11 (91.6%)	**23 (100%)**	**21 (91.3%)**	**22 (95.6%)**
Physician M.D. (female)	11 (100%)	10 (90.9%)	9 (81.8%)	12 (100%)	11 (91.6%)	12 (100%)	23 (100%)	21 (50%)	21 (91.3%)
Engineer (female)	11 (100%)	11 (100%)	9 (81.8%)	12 (100%)	11 (91.6%)	10 (83.3%)	23 (100%)	22 (80%)	19 (82.6%)
Programmer (female)	11 (100%)	11 (100%)	11 (100%)	12 (100%)	12 (100%)	11 (91.6%)	**23 (100%)**	**23 (100%)**	**22 (95.6%)**
Scientists (female)	11 (100%)	10 (90.9%)	10 (90.9%)	12 (100%)	12 (100%)	12 (100%)	**23 (100%)**	**22 (95.6%)**	**22 (95.6%)**

As the scientist, programmer, teacher, and cleaner gained higher correct classifications by participants, we chose to focus on these four professional types as STEM and non-STEM images.

Study 1- Parental role model

Sample and design

Overall, 94 English-speaking participants were recruited for the study (28 had only a mother who worked in STEM, 36 had only a father who worked in STEM, and 30 participants had no parents who worked in STEM). Initially, we had 97 respondents, but we excluded three non-binary participants, as we focused on differences between women and men (M_{age}=37.97, SD=10.57, 49.5%

women). Participants were recruited through the Prolific platform in February-March 2022 in exchange for an acceptable fee on the platform for a 20-minute session. See Table 3 for sample description.

Table 3. Demographics of the Study 1 sample

	Mother in STEM (n=28)		**Father in STEM (n=36)**		**None in STEM (n=30)**		
	n	**%**	**n**	**%**	**n**	**%**	χ^2
Gender							
Male	15	52.8%	19	53.6%	12	40%	1.41
Female	13	46.4%	17	47.2%	18	60%	
Family status							
Married	17	60.7%	19	52.8%	13	43.3%	3.41
Divorced	1	3.6%	5	13.9%	5	16.7%	
Singled	10	35.7%	12	33.3%	12	40%	
Do they work?							
Yes	28	100%	38	100%	30	100%	Na
No	0	0%	0	0%	0	0%	
Do they work in STEM?							
Yes	8	28.6%	15	41.6%	11	36.7	1.18
No	20	71.4%	21	58.4%	19	63.3	
Income							
Significantly lower than average	6	21.4%	5	13.9%	6	20%	8.11
Slightly lower than average	1	3.6%	5	13.9%	6	20%	
Average	7	25.0%	6	16.7%	8	26.7%	
Slightly higher than average	7	25.0%	14	38.9%	7	23.3%	
Significantly higher than average	7	25.0%	6	16.7%	3	10%	
Do they have children?							
Yes	12	42.9%	16	44.4%	14	46.7%	.09
No	16	57.1%	20	55.6%	16	53.3%	
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	***F***
Age	36.61	10.32	39.83	10.20	38.47	10.74	.76
Education (No. of years)	16.21	2.59	16.42	2.18	14.87	2.42	3.897*
Science-self efficacy	4.51	1.25	4.49	1.09	4.14	1.13	.97
Self-science distance	4.36	1.77	4.25	1.67	4.00	1.55	.35

*p<0.05

Measurements

The study design was three role model conditions (mother in STEM/father in STEM/none in STEM) × two genders (women vs. men) predicting implicit and explicit emotions (negative and positive). Participants were invited to participate in research on the topic of occupations.

We asked participants to refer to their childhood period up to age 18. The participants were asked to classify their parents' occupations into twelve sectors. We screened out participants whose fathers and mothers worked in STEM occupations. The participants who had only a mother in STEM, a father in STEM, or no parents working in STEM fields continued to answer the questionnaire. Those qualified to participate in the study were primed to describe their parents' main occupation in an open question (minimum 150 characters). The participants were presented with white screens for 3 seconds, and then an image of woman scientists for 10 seconds. Participants' visuals were recorded while watching the white screen (used as neutral stimuli) and the image, and later analyzed using Affectiva software to track the individual's emotional state, a measure of implicit emotions. First, they were asked to describe the picture they saw using as many as possible, specifically referring to the person and his profession (See Studies' materials in Appendix A, scientist, computer programmer, cleaner, teacher, males and females). They were then asked to classify the profession of the person in the picture as STEM or non-STEM. Then, the participants were asked to rate their feeling toward the image of female scientists through explicit self–report measures. The feelings indication described to what extent the picture evoked each of the 11 feelings on a scale of 0 (not at all) to 100 (very much). The 11 feelings were: Anger, sadness, disgust, joy, surprise, fear, contempt, engagement, attention, overall negative feelings, and overall positive feelings. These explicit feelings are the same feelings Affectiva software recorded implicitly. Then, they were asked about their science-related self-efficacy, using the Sherer and Adams (1983) scale when asking the participants about scientific achievements in school. An example item is: “Compared to others in my age group, I was good at science,” rated on a scale of 1 (false) to 6 (true). We also measured their self-science distance, asking participants to write the number of the picture that best describes their relationship with science, with seven circles of “self” and “science” that vary in the distance between the circles, where “1” represents non-overlapping circles, up to “7” with the most overlap (based on McBride et al., 2020). Last, we asked them several demographic questions, such as their gender, age, income, education, whether they worked, and whether their current occupation was a STEM/non-STEM profession.

Analyses

We first examined the descriptive and correlations between all study variables. We then used repeated measures ANOVA with the four images of women/men working in STEM/non-STEM as dependent variables, the condition (no parent in STEM, a mother in STEM, or a father in STEM) as subject factors while controlling for science self-efficacy, science self-distance, and current STEM occupation. This analysis was done for both implicit and explicit emotions separately. Then, we focused on the female scientist images alone, and ran an interaction model (Hayes, 2017; Model 1) four times. Each analysis had a different dependent variable: implicit negative, explicit negative, implicit positive, and explicit positive emotions toward a female scientist. To clarify all possible differences in all analyses, we ran t-tests and ANOVAs.

Results

The descriptive and correlations of implicit and explicit negative responses are presented in Table 4.

Table 4. Study 1 descriptive and correlations of study variables- Women in STEM stimuli

Women participants

		1	2	3	4	Mean	SD
None in STEM	1. implicit negative	1.00				4.16	11.96
	2. explicit negative	0.32	1.00			42.86	34.44
	3. science self-efficacy	-0.08	-0.02	1.00		4.32	1.13
	4. science self-distance	-0.43	0.22	0.14	1.00	3.50	1.38
Mom in STEM	1. implicit negative	1.00				2.00	4.90
	2. explicit negative	-0.41	1.00			28.15	26.20
	3. science self-efficacy	0.50	0.13	1.00		4.40	1.39
	4. science self-distance	0.43	0.36	.778**	1.00	3.92	1.98
Dad in STEM	1. implicit negative	1.00				4.08	16.53
	2. explicit negative	-0.34	1.00			41.76	31.98
	3. science self-efficacy	0.18	0.10	1.00		4.24	1.08
	4. science self-distance	-0.24	.513*	0.37	1.00	3.53	1.66

Men participants

		1	2	3	4	Mean	SD
None in STEM	1. implicit negative	1.00				13.64	20.46
	2. explicit negative	-0.16	1.00			41.29	30.60
	3. science self-efficacy	0.21	0.53	1.00		3.88	1.13
	4. science self-distance	0.21	0.08	0.26	1.00	4.75	1.55
Mom in STEM	1. implicit negative	1.00				1.40	4.14
	2. explicit negative	0.08	1.00			47.97	31.20
	3. science self-efficacy	0.31	0.34	1.00		4.61	1.16
	4. science self-distance	0.30	0.51	.534*	1.00	4.73	1.53
Dad in STEM	1. implicit negative	1.00				4.99	15.87
	2. explicit negative	0.40	1.00			51.08	34.69
	3. science self-efficacy	-0.29	-0.31	1.00		4.72	1.07
	4. science self-distance	-0.17	-0.19	0.42	1.00	4.89	1.52

* Correlation is significant at the 0.05 level (2-tailed).
** Correlation is significant at the 0.01 level (2-tailed).

Table 4 shows that only for men and women who had a mother in STEM was the association positive. Further analysis showed that parental role model condition moderated the relationship between explicit science self-efficacy and explicit science-self distance [$b_{\text{Science self-efficacy}} = 0.12$, $p= 0.63$; $b_{\text{Science self-efficacy} \times \text{Mother in STEM}} = 0.80$, $p= 0.02$; $b_{\text{Science self-efficacy} \times \text{Father in STEM}} = 0.57$, $p= 0.10$]. In other words, explicitly, it seems that for those who had a mother in STEM there was a strong relationship between their science self-efficacy and their identification with science.

The results of the repeated measures ANOVA showed that condition by gender by image interaction was significant (*F*(6,168)=2.161, *p*=0.049 (See Figure 2a). Deeper examination showed that the interaction of condition by the image was significant only among males *F* (6,78)=2.375, *p*=0.037) but not among females *F* (6,82)=0.894, *p*=0.503). In the no-parent condition, males had higher implicit negative responses toward women in STEM images (*M*=13.64, *SD*=20.46) than did female participants (*M*=4.16, *SD* =11.96, *t*(28)=1.604= *p*=0.06). Also, in the mother in STEM condition, female participants had marginally higher implicit negative responses to women in non-STEM images (M= 8.08, SD=18.46) than male participants did (*M*=.85, *SD*=1.86), *t*(26)=-1.41, *p*=0.09).

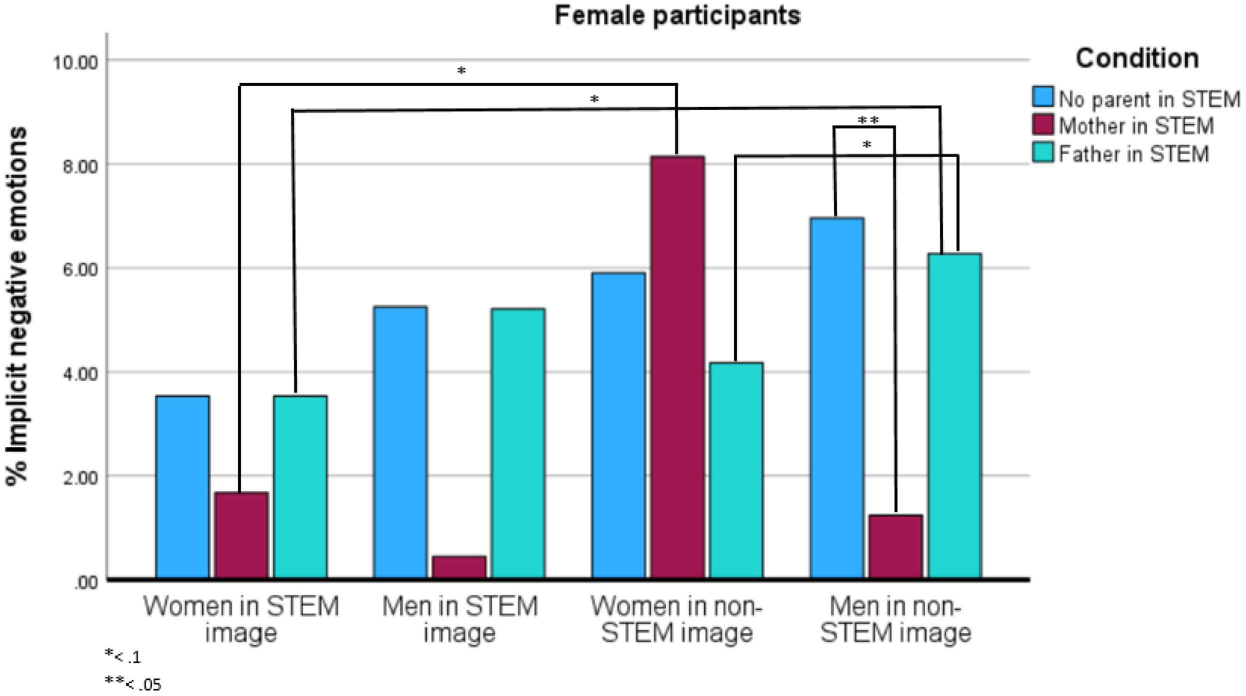
When examining only male participants in the no-parent in STEM condition, their implicit negative response toward men in STEM images was marginally lower (*M*=8.30, *SD*=19.98) *t*(11)=1.47, *p*=0.08) than when exposed to women in STEM images, and significantly lower compared to when exposed to women in non-STEM images (*M*=8.30, *SD* =19.98), *t*(11)=-1.82 *p*=0.04).

Women who had a mother in STEM had marginally negative emotions when confronted with women in non-STEM images (*M*=8.08, *SD*=18.46) as compared to women in STEM (*M*=1.99, *SD*=4.89, *t*(12)=-1.445, *p*=0.08) and compared to a men in STEM images (*M*=0.66, *SD*=1.51, *t*(12)=-1.44, *p*=0.08).

Women who had a father in STEM had marginally higher negative emotions when confronted with men in non-STEM images (*M*=6.67, *SD*=16.03) as compared to women in non-STEM images (*M*=3.85, *SD*=10.01, *t*(16)=-1.541, *p*=0.07) and then when compared to women in STEM images (*M*=0.407, *SD*=16.52, *t*(16)=-1.44, *p*=0.09).

When examining the differences between the parental role model conditions within each gender separately, it seems that male participants in the no-parent in STEM condition had higher implicit emotions toward women in STEM images (*M*=13.64, *SD* =20.46) compared to those who had a mother in STEM (*M*=1.39, *SD* =4.13, *t*(11.72)=2.04, *p*=0.03). Those who had no parents in STEM were also more negative toward women in non-STEM images (*M*=15.86, *SD* =28.77) than those who had a mother in STEM (*M*=.85, *SD* =1.86, *t*(11.07)=1.81, *p*=0.04).

Female participants in the no-parent in STEM condition had higher negative emotions toward men in non-STEM images (*M*=7.39, *SD*=14.25) than those who had a mother in STEM (*M*=1.39, *SD* = 2.41, *t*(18.33)=1.75, *p*=0.04).



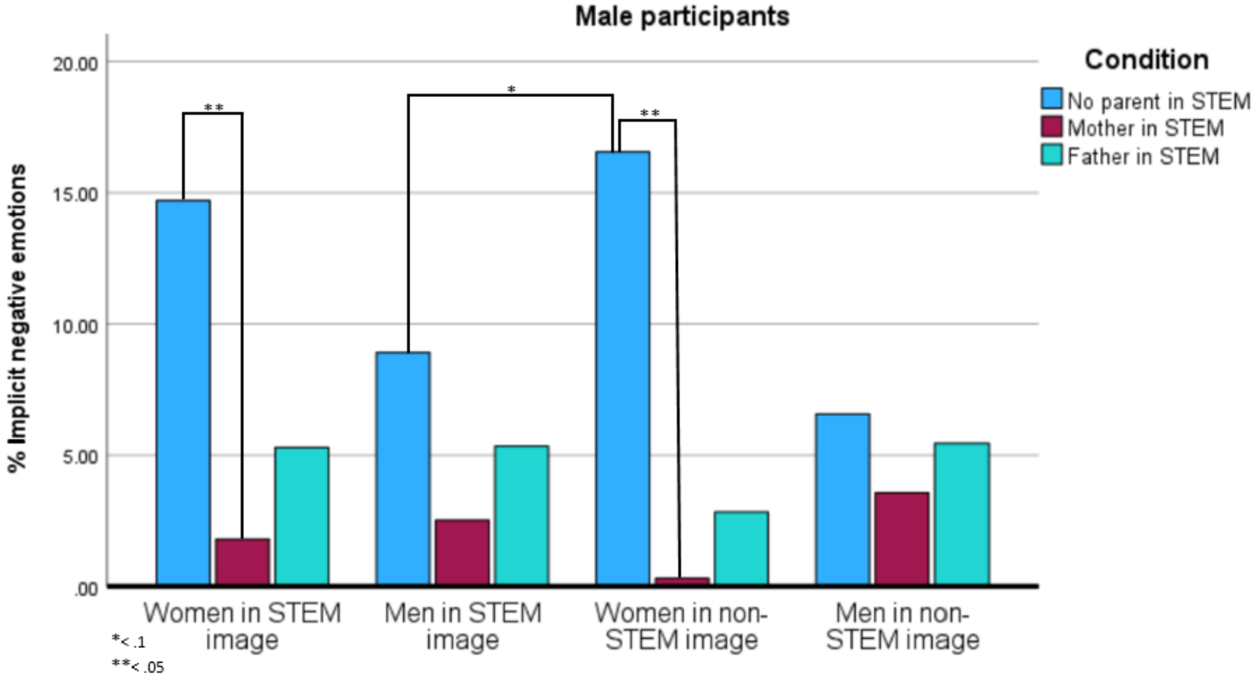


Figure 2a. Implicit negative emotions toward the images by parental role model condition and gender.

The same analysis was run with explicit negative emotions. The results of the repeated measures ANOVA showed that condition by gender by image interaction was not significant (*F*(6,168)=1.190, *p*=0.314. See Figure 2b.

Explicitly, female participants who did not have any parent in STEM said they had more negative emotions when confronted with women in STEM images (*M*=42.86, *SD* =34.43) than with men in STEM images (*M*=32.08, *SD* =32.62, *t*(17)=2.49, *p*=0.01) or compared to male non-STEM images (*M*=34.03, *SD* =31.28, *t*(17)=2.14, *p*=0.02). Females with no parents in STEM had higher negative emotions toward women in non-STEM images (M= 45.19, SD=31.71) than male in STEM images (*M*=32.08, *SD* =32.62, *t*(17)=-2.64, *p*=0.009) or male in non-STEM images (*M*=34.03, *SD* =31.28, *t*(17)=2.49, *p*=0.01).

Female participants who had a mother in STEM had more explicit negative emotions when confronted with women in STEM images (*M*=28.15, *SD* =26.19) compared with men STEM images (*M*=18.96, *SD* =20.27, *t*(12)=1.86, *p*=0.04). They also had higher negative emotions in the women in STEM compared to men in non-STEM (*M*=16.04, *SD* =15.01, *t*(12)=2.28, *p*=0.02). A similar pattern was evident among men who had a father in STEM, as they too had higher negative emotions toward women in STEM images (*M*=41.76, *SD* =32.79) compared with men in STEM images (*M*=29.76, *SD*=28.39, *t*(16)=2.42, *p*=0.01) or men in non-STEM images (*M*=31.61, SD=27.56, *t*(16)=2.31, *p*=0.02).

Female participants who had no parents in STEM had higher explicit negative emotions when confronted with women in non-STEM images (*M*=45.19, *SD*=31.71) compared with those who had a mother in STEM (*M*=20.26, *SD*=21.599, *t*(28.94)=2.60, *p*=0.007). As we found implicitly, female participants who had no parent in STEM had higher explicit negative emotions when confronted with men in non-STEM images (*M*=34.02, *SD*=31.28) compared with those who had a mother in STEM (*M*=16.04, *SD*=15.01, *t*(25.85)=2.124, *p*=0.022). These explicit negative emotions toward men in non-STEM images were also lower for female participants who had a mother in STEM (*M*=16.04, *SD*=15.01) compared to those who had a father in STEM (*M*=31.61, *SD*=27.56, *t*(28)= 1.835, *p*=0.04).

Male participants who did not have any parents in STEM said they had more negative emotions when confronted with women in STEM images (*M*=41.29, *SD*=30.60) than with women in non-STEM images (*M*=30.66, *SD*=27.49, *t*(11)=2.74, *p*=0.01) or compared to male non-STEM images (*M*=26.83, *SD*=30.08, *t*(11)=2.374, *p*=0.02). These participants also had explicitly higher negative emotions to women in STEM images as compared with men in STEM images (*M*=31.54, *SD*=32.77, *t*(11)=1.62, *p*=0.07). Male participants who had a mother in STEM had marginally more negative emotions when confronted with women in STEM images (*M*=47.96, *SD*=31.20) compared with women in non-STEM images (*M*=42.53, *SD*=25.95, *t*(14)=1.391, *p*=0.09). Similar patterns were evident among men who had a father in STEM, as they, too, had higher negative emotions toward women in STEM images (*M*=41.76, *SD*=32.79) compared with women in non-STEM images (*M*=32.79, *SD*=31.78, *t*(18)=1.89, *p*=0.04).

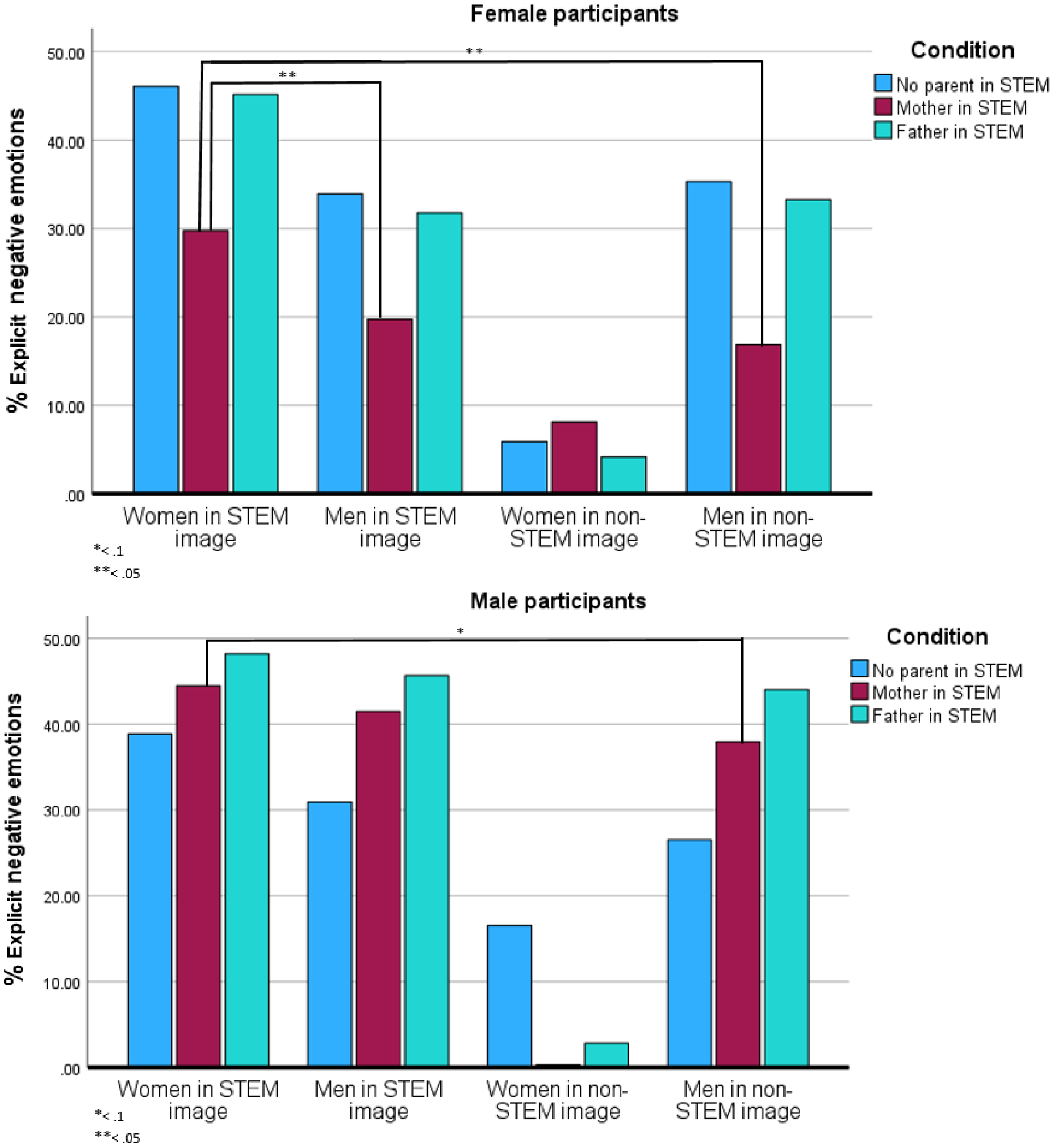


Figure 2b. Explicit negative emotions toward the images by parental role model condition and gender.

We further expected that women (vs. men) who had mothers working in STEM fields would have more implicit positive (less implicit negative) emotions compared to the other conditions when faced with an image of a female scientist. Contrary to our expectation, we found that only men with no parents working in STEM had higher implicit negative emotions towards the female scientist image, compared to men with one parent (mother or father) in STEM [$b_{\text{Gender × Mother-STEM}} = 17.82$, $p = 0.05$; $b_{\text{Gender × Father-STEM}} = 17.29$, $p = 0.04$; See Table 5a]. No effects were observed for men when examining explicit negative emotions. In contrast to men, women had relatively low implicit negative emotions toward images of female scientists beyond conditions. There were no effects for women or men when examining implicit and explicit positive emotions (see Table 5b). As we can see from Figure 3, when examining the no-parent in STEM condition, men had more implicit negative emotions than women [$M_{\text{men}}=20.19$, $SD=26.59$; $M_{\text{women}}=4.52$, $SD=19.19$; $t_{18.53}=-1.76$, $p=0.05$]. Only among men, implicit negative emotions differ between the conditions [$F_{2,43}=5.58$, $p<0.001$]. For them, the highest implicit negative emotions were in the no-parent in STEM condition [$M_{\text{Mother-STEM}}=0.50$, $SD=1.94$, $M_{\text{None-STEM}}=20.19$, $SD=26.59$; $t_{11.10}=-2.56$, $p=0.013$; $M_{\text{Father-STEM}}=4.59$, $SD=13.06$; $M_{\text{None-STEM}}=20.19$, $SD=26.59$; $t_{14.41}=-1.89$, $p=0.039$]. See Table 5a and Figure 3.

Table 5a. Parental role model conditions by gender predicting *negative* emotions toward a female scientist (Hayes, model 1)

	Implicit				Explicit			
	Coeff	Se	t	p	Coeff	Se	t	P
Constant	22.58	7.93	2.85	0.01	20.00	16.76	1.19	0.24
Gender	-19.10	6.32	-3.03	0.00	15.87	13.34	1.19	0.24
Mother in STEM	-21.13	6.46	-3.27	0.00	10.99	13.64	0.81	0.42
Father in STEM	-16.92	6.08	-2.78	0.01	14.86	12.84	1.16	0.25
Gender × Mother in STEM	**17.82**	8.78	2.03	0.05	-34.37	18.55	-1.85	0.07
Gender × Father in STEM	**17.29**	8.20	2.11	0.04	-17.18	17.31	-0.99	0.32
Science self-efficacy	1.91	1.65	1.16	0.25	-1.87	3.49	-0.54	0.59
Science-self distance	-2.06	1.23	-1.68	0.10	6.12	2.59	2.36	0.02
Current STEM occupation	0.03	3.70	0.01	0.99	-9.30	7.82	-1.19	0.24
R^2	**0.16**			0.05	0.13			0.16

Table 5b. Parental role model conditions by gender predicting *positive* emotions toward a female scientist (Hayes, model 1)

	Implicit				Explicit			
	Coeff	Se	t	p	Coeff	Se	t	P
Constant	-3.25	5.15	-0.63	0.53	3.85	4.82	0.80	0.43
Gender	5.64	4.10	1.38	0.17	-4.91	3.84	-1.28	0.20
Mother in STEM	-1.26	4.19	-0.30	0.76	-5.44	3.92	-1.39	0.17
Father in STEM	-1.15	3.94	-0.29	0.77	-5.42	3.69	-1.47	0.15
Gender × Mother in STEM	-5.50	5.70	-0.97	0.34	2.77	5.34	0.52	0.61
Gender × Father in STEM	-5.57	5.32	-1.05	0.30	4.08	4.98	0.82	0.42
Science self-efficacy	1.40	1.07	1.31	0.20	0.98	1.00	0.97	0.33
Science-self distance	-0.38	0.80	-0.47	0.64	-0.31	0.75	-0.41	0.68
Current STEM occupation	-0.76	2.40	-0.31	0.75	1.62	2.25	0.72	0.47
R^2	0.29			0.43	0.24			0.71

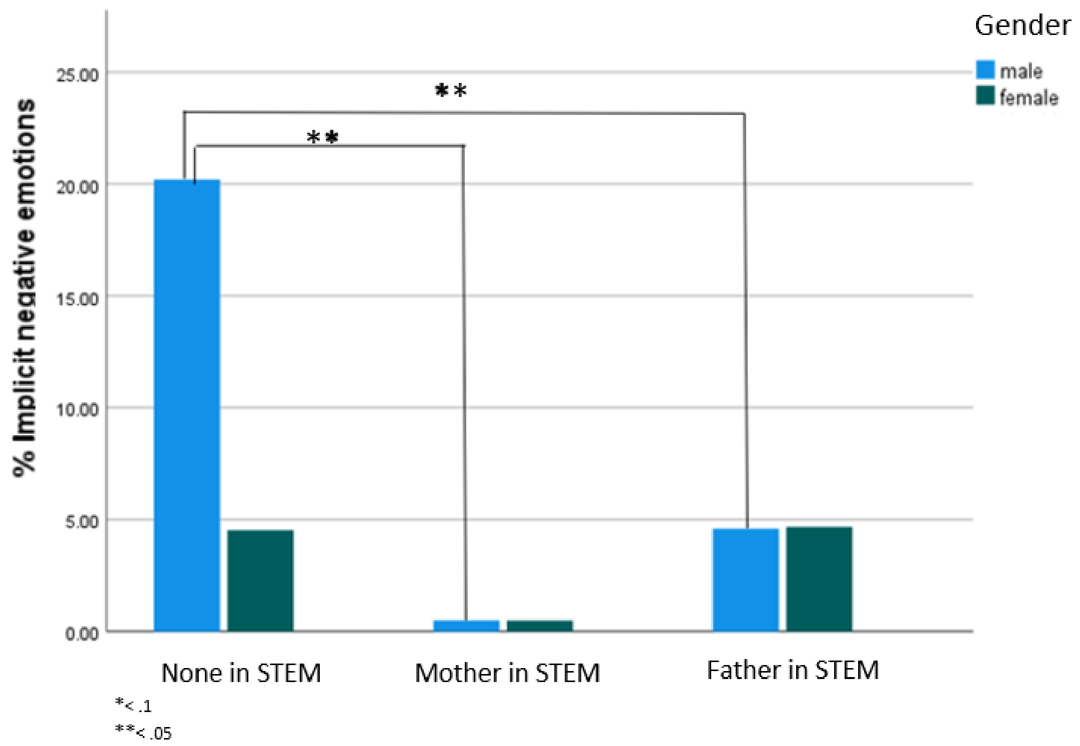


Figure 3. Implicit negative emotions toward a female scientist by condition and gender.

Discussion

These observations demonstrate that a female parental role model in STEM had the same implicit effect as a male parental role model for men participants. Specifically, men who had a STEM parental role model (mother/father) had less negative effect toward women working in STEM images than those with no parents in STEM. Women participants with female parental role models in STEM had lower implicit and explicit negative emotions toward men in non-STEM image compared to women who did not have any parent in STEM. This is important, as having men working in non-STEM occupations may impact gender egalitarianism in professions. Furthermore, only women participants who did not have any parent in STEM said they had more negative emotions when confronted with women in STEM images than with men in STEM or men in non-STEM images. Implicitly they responded similarly to all images of women.

Again, explicitly, and not implicitly, women participants who had a mother in STEM said they have more explicit negative emotions when confronted with women in STEM images compared with men in STEM or non-STEM images. This might be related to their negative childhood experiences of their mother's absence, and also perhaps due to the gendered struggles of a previous generation of women breaking through in these professions, which was even less common only a few decades ago. Explicitly, men who had a father in STEM had higher explicit negative emotions toward women in STEM image compared with men in STEM or non-STEM images. Explicitly, men or women who had a mother in STEM had a stronger relationship between their science self-efficacy and their identification with science compared with those who did not have any parent in STEM.

Study 2- Educational expert role model

Sample and design

Overall, 136 students were recruited for the study (69 were assigned to the female-educator role model condition and 67 were assigned to the male-educator role model condition). Initially, we had 151 respondents, but we excluded 15 that had less than 5% attention in the interview stimuli (M_{age}=24.39**,** *SD*=1.58, 78.7% women). Participants were recruited through the university platform in January 2023 in exchange for an acceptable fee on the platform for 20-minutes session. See Table 6 for sample description.

Table 6. Demographics of the Study 2 sample

	Female role model (n=69)		Male role model (n=67)		
	n	%	n	%	χ2
Gender					1.89
Male	18	26.08%	11	16.4	
Female	51	73.92%	56	83.6	
Current work status					2.383
Yes	30	43.37%	38	56.71%	
No	39	56.63%	29	43.29%	
Parental STEM role model					.563
Yes	32	46.37%	31	46.2%	
No	37	53.63%	36	43.8%	
	Mean	*SD*	*Mean*	*SD*	*t*
Age	24.43	1.49	24.34	1.68	.336
Role model's capabilities	5.11	0.91	5.24	1.11	-.704
Science-self efficacy	3.48	1.20	3.85	1.39	-1.67
Self-science distance	3.62	1.42	3.66	1.43	-.137

*$p<0.05$

Measurements

The participants, undergraduate students in business administration, answered an online questionnaire for a credit point after filling out a consent form and connecting with the computer camera (for the Affectiva sensor). Then, they read one of two conditions randomly, and information about a female/male STEM lecturer (See Appendix B). The text was structured as a personal interview of an official university faculty member named Dr. Yuval Reznik (this is typically an Israeli unisex name) and designed as a page in the university's newspaper accompanied by photos of this STEM researcher in his/her chemistry laboratory. We recorded their facial responses while they read the interview (% of attention served as a screener). After one minute they were asked to describe the interview, they had just read. Then, they were asked to evaluate their perceived capabilities compared to that of the role model (perceived capabilities) on three aspects using the question: "When you compare yourself to Dr. Yuval Reznik, how much do you think you are capable of being like him\her?" (e.g., being as popular, talented, or ambitious) on a Likert scale = 1 Not at all, 7=very much (adopted from 2010, Ivaldi & O'Neill). Then, they were presented with pictures of women or men in two STEM professions (i.e., computer programmer or scientist). Each image was presented for 10 seconds with white screens of two seconds intermittently between the images. After each picture, they were asked to classify the profession of the person in the picture as STEM or non-STEM, for manipulation check. Like Study 1, we asked participants to rate their feelings toward each image explicitly. They were asked about their science-related self-efficacy (Sherer & Adams, 1983), self-science distance (based on McBride et al., 2020), and demographics, including their work status and whether their parents worked in STEM (and open questions about each profession).

Analyses

We first examined the descriptive and correlations between all study variables. We then used repeated measures ANOVA with the four images of women/men working in a STEM/non-STEM field as dependent variables, the condition (female/male STEM educator) as subject factors while controlling for science self-efficacy, science self-distance, current work status, parental role model in STEM and their perceived capabilities. This analysis was performed separately for both implicit and explicit emotions (22 models).

Then, we focused on the female scientist images alone, and ran an interaction model (Hayes, Model 1) of gender by condition, with the same control variables. Each analysis had a different emotion as a dependent variable (implicit or explicit) (22 models).

In the results, we present only the significant interactions. To clarify all possible differences in all analyses, we ran t-tests and ANOVAs.

Results

See descriptive and correlations in Table 7.

Table 7. Study 2 descriptive and correlations

		Women participants								
		1	2	3	4	5	6	7	*Mean*	*SD*
Female educational role model	1. implicit negative	1.00							2.68	8.98
	2. explicit negative	0.23	1.00						6.48	10.79
	3. implicit fear	-0.04	-0.06	1.00					0.19	0.91
	4. explicit fear	-0.09	0.64**	0.23	1.00				2.88	4.60
	5. science self-efficacy	-0.11	-0.26	0.08	-0.17	1.00			3.52	1.21
	6. science self-distance	0.00	-0.20	0.07	0.01	0.34*	1.00		3.50	1.41
	7. perceived capabilities	-0.16	-0.11	-0.23	-0.11	0.33*	0.05	1.00	5.11	0.96
Male educational role model	1. implicit negative	1.00							1.55	3.82
	2. explicit negative	0.14	1.00						8.77	13.32
	3. implicit fear	0.12	-0.04	1.00					1.29	6.31
	4. explicit fear	0.10	0.56**	0.05	1.00				5.56	9.87
	5. science self-efficacy	-0.22	-0.04	0.08	0.05	1.00			3.82	1.39
	6. science self-distance	-0.14	-0.06	0.01	0.02	0.62**	1.00		3.58	1.37
	7. perceived capabilities	-0.10	0.14	0.01	0.08	0.15	0.19	1.00	5.09	1.02
									Men participants	
		1	2	3	4	5	6	7	*Mean*	*SD*
Female educational role model	1. implicit negative	1.00							6.96	19.19
	2. explicit negative	-0.08	1.00						8.83	15.38
	3. implicit fear	0.20	-0.11	1.00					0.90	2.34
	4. explicit fear	-0.04	0.37	-0.25	1.00				5.33	7.24
	5. science self-efficacy	-0.32	-0.06	-0.13	0.01	1.00			3.45	1.19
	6. science self-distance	-0.24	-0.18	0.11	0.02	0.60**	1.00		3.95	1.50
	7. perceived capabilities	-0.48*	-0.02	-0.04	0.32	0.46*	0.36	1.00	5.05	0.86
Male educational role model	1. implicit negative	1.00							4.43	10.44
	2. explicit negative	-0.06	1.00						3.75	7.24
	3. implicit fear	-0.21	-0.12	1.00					0.53	1.05
	4. explicit fear	-0.32	0.68*	-0.09	1.00				2.29	3.15
	5. science self-efficacy	0.09	0.40	-0.14	0.22	1.00			4.08	1.51
	6. science self-distance	-0.20	0.40	0.50	0.11	0.59*	1.00		4.42	1.51
	7. perceived capabilities	0.41	-0.21	0.14	-0.32	0.02	0.21	1.00	5.89	1.21

* Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

Looking at the gender differences per condition separately, we found that when presented with a female educational role model, women had higher implicit fear (*M*=1.05, *SD*=3.03) than men (*M*=0.21, *SD*=41, *t*(54.25)=1.793, *p*=0.039) when observing men in STEM images. Women participants in the female educational role model condition had less implicit fear toward women in STEM images (*M*=0.19, *SD*=0.92) than men in STEM images (*M*=1.06, *SD*=3.08, *t*(50=-1.903, *p*=0.031). Furthermore, women participants when observing women in STEM images had marginally lower fear in the female educational role model condition (*M*=0.19, *SD*=0.92) than in the male educational role model condition (*M*=1.37, *SD*=6.52), *t*(57.45)=-1.338, *p*=0.093).

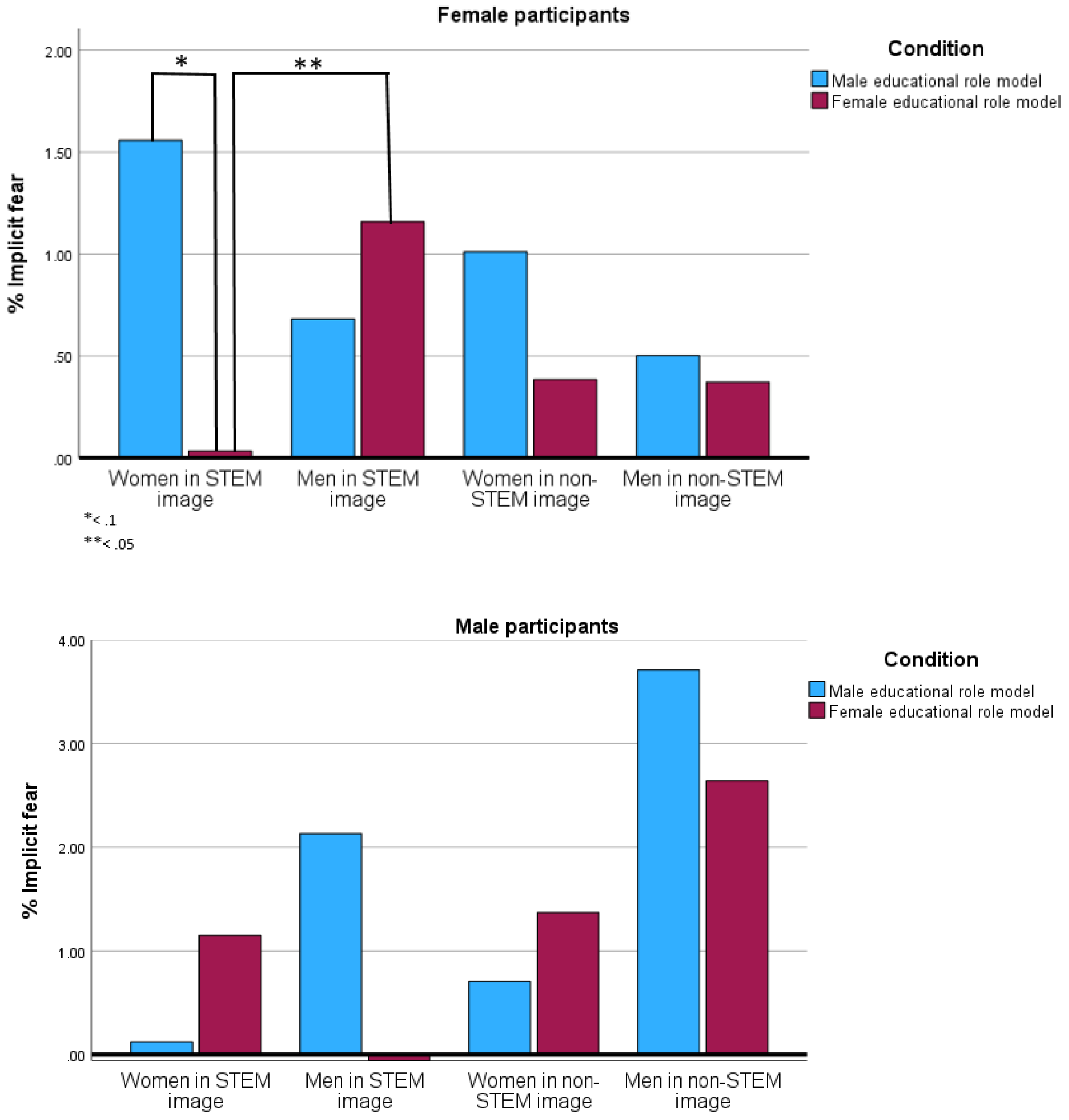


Figure 4a. Implicit negative emotions toward the images by educational role model condition and gender.

We ran the same analysis with explicit fear toward the four images. The condition by gender by image interaction was not significant (F(3,125)=1.336, *p*=0.303). See Figure 4b.

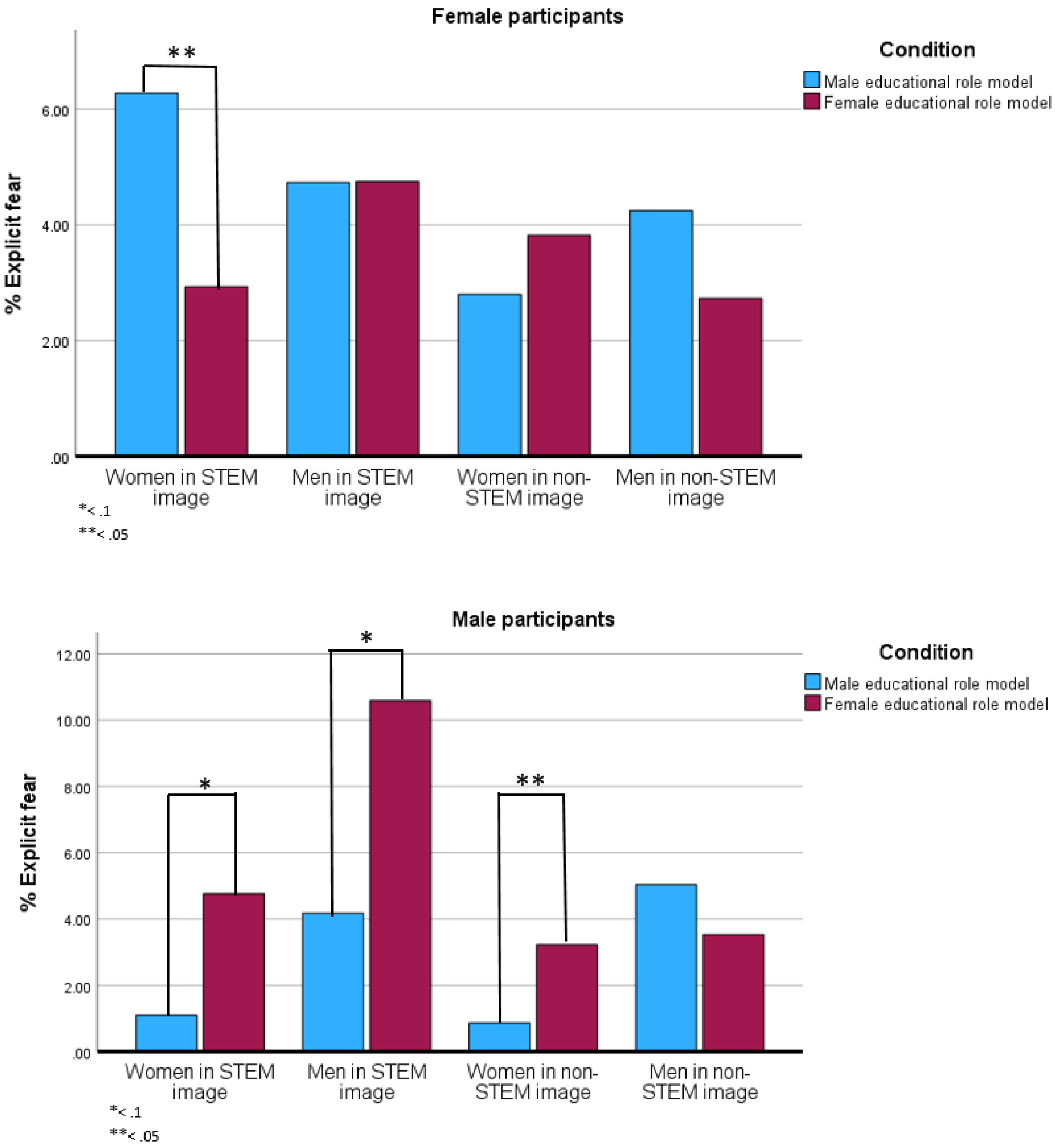


Figure 4b. Explicit negative emotions toward the images by educational role model condition and gender.

Examining the specific differences, we found that among men, the female educational role model condition triggered higher explicit fear compared to the male educational role model condition when exposed to three images: when observing women in non-STEM images ($M_{\text{female educational role model}}$=3.05, *SD*=5.25; $M_{\text{male educational role model}}$ =0.68, *SD*=0.98, *t*(18.89)=1.864, *p*=0.035), when observing women in STEM images ($M_{\text{female educational role model}}$ =4.58, *SD*=5.98; $M_{\text{male educational role model}}$ =2.04, *SD*=3.18, *t*(26.64)=1.488 *p*=0.074), and when observing men in STEM images ($M_{\text{female educational role model}}$ =10.55, *SD*=13.07; $M_{\text{male educational role model}}$ =3.40, *SD*=9.68, *t*(27)=1.565, *p*=0.065). While among women participants, the female educational role model condition led them to explicitly report lower fear compared to the male educational role model condition, in the women in STEM image ($M_{\text{female educational role model}}$ =3.14, *SD*=4.74; $M_{\text{male educational role model}}$ =5.94, *SD*=10.30, *t*(78.81)=-1.83, *p*=0.035).

We also examined implicit and explicit disgust emotions toward female scientists. The results are presented in Table 8 and Figure 5a (implicit) and 5b (explicit).

Table 8. Gender by condition interaction when predicting implicit/explicit disgust toward female scientists

	Implicit disgust women scientist				Explicit disgust women scientist			
	Coeff	Se	t	p	Coeff	Se	t	p
Constant	0.77	1.25	0.61	0.54	1.54	3.77	0.41	0.68
Gender (0=male, 1= female)	0.58	0.69	0.84	0.39	-0.33	2.07	-1.60	0.87
Condition (0=male role model, 1=female role model)	1.33	0.77	1.72	0.90	0.76	2.33	0.33	0.74
Gender × Condition	**-1.80**	0.88	-2.04	0.04	-1.77	2.64	-0.67	0.50
Science self-efficacy	-0.22	0.15	-1.55	0.12	-0.38	0.43	-0.87	0.38
Science-self distance	0.25	0.13	1.87	0.06	-0.39	0.41	-0.98	0.33
Current work (0=no, 1=yes)	-0.43	0.35	-1.23	0.22	-1.43	1.06	-1.35	0.18
Parental role model (0=no, 1=yes)	-0.48	0.33	-1.44	0.15	1.94	0.99	1.94	0.05
Perceived capabilities	-0.11	0.18	-0.65	0.51	0.88	0.53	1.66	0.09
R^2	**0.11**			0.048	0.08			0.24

Figure 5a. implicit disgust toward the female scientist by educational role model condition and ge

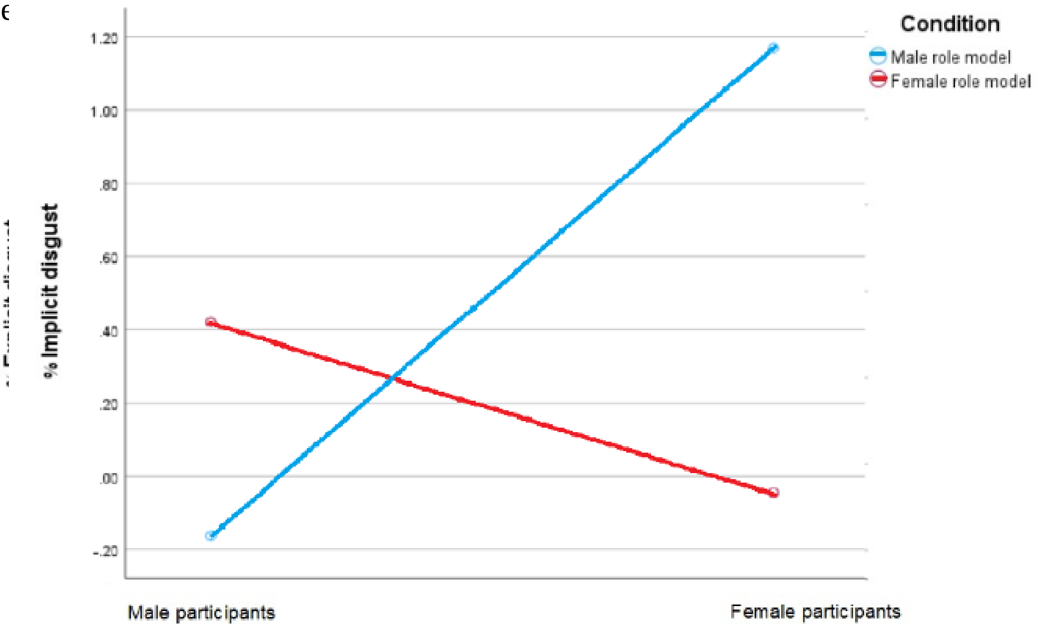


Figure 5b. explicit disgust toward the female scientist by educational role model condition and gender

Further analysis showed that the female educational role model condition led to marginally lower implicit disgust toward a female scientist among women (*M* $_{\text{women}}$= 0.00, *SD*=0.000) than men (*M*=1.38, *SD*=4.04, *t*(17)= -1.45, *p*=0.083).

Discussion

For women participants, female educational expert role models in STEM were shown to cause lower implicit fear toward women in STEM images than men in STEM images. This was not apparent explicitly. However, explicitly, but not implicitly, male participants had higher levels of fear toward women in non-STEM images in the female educational expert role model in STEM compared to the female educational expert role model in STEM. We also found the female educational role model condition led to marginally lower implicit disgust toward a female scientist among women than men.

Study 3- Public role model

Sample and design

The initial sample used was 113 Hebrew-speaking students that were recruited for the lab study; however, there were missing data (18.5% of the sample) in frontal alpha asymmetry measures (*FAA*) of at least one of the two measurements (baseline white screen, when exposed to women in STEM stimuli). This is common in EEG studies due to the sensor's sensitivity (Hagad et al. 2019). FAA is a measure of adopting approaching vs. avoiding motivations (Allen et al. 2004). In this study, we also used Affectiva software to detect negative emotions in facial expressions.

Thus, the sample with full FAA measures was 94 participants. We excluded four participants that had two standard deviations above or below the mean FAA values (Leys et al., 2013). Thus, we had 88 participants in our sample: 40 in the female public-role model condition, and 48 male public-role model condition (M_{age}=24.37, *SD*=1.77, 68.2% women; see Table 9). Participants were recruited through the university poll of respondents in June-July 2022 in exchange for course credit for a 20-minute session.

Table 9. Demographics of the Study 3 sample

	Female public role model (n=40)		Male public role model (n=48)		$\chi 2$
	n	%	n	%	
Gender					
Male	12	30%	16	33.3%	.459
Female	28	70%	32	66.7%	
Non-Binary	0	0%	0	0%	
Family status					
Single	16	40%	18	37.5%	.416
In a relationship	22	55%	30	62.5%	
Do they work part-time as students?					
No	21	52.5%	21	43.8%	.273
Yes	19	47.5%	27	56.3%	
Do they have a female STEM educator?					
No	5	12.5%	8	16.7%	.425
Yes	34	85%	40	83.3%	
Do they have a mother/father who worked in STEM?					
No	25	62.5%	28	58.3%	.430
Yes	15	37.5%	20	41.7%	
	Mean	SD	Mean	SD	t
Age	24.50	1.78	24.27	1.77	.602
Education (No. of years)	12.10	.447	12.25	.700	-1.19
Science-self efficacy	4.23	1.14	3.92	1.08	1.31
Self-science distance	3.87	1.47	3.73	1.45	.452

$^{*}p<0.05$

Measurements

The study design comprised two conditions (female/male public role model condition) × two stimuli (women vs. men working in STEM images) × two genders, predicting approach tendencies toward a female working in STEM stimuli. Motivational approach and avoidance tendencies were measured by frontal alpha asymmetry measure (FAA) (Allen et al., 2004), which is the difference in alpha band power at left and right sites over the frontal cortex (Davidson et al., 1990). FAA is a well-studied neural correlate of ongoing motivational processes measured as more left frontal alpha activity (i.e., lower relative left alpha power, higher FAA) which is associated with approach motivation. However, more right frontal activity (i.e., relatively lower right alpha power, lower FAA) is associated with avoidance or withdrawing motivation (Perone et al., 2020). Data for FAA computations were collected with Neuroelectrics Enobio 8 channel EEG device with a temporal resolution of 500 Hz. The emotion-specialized electrode configurations were F7 and F8, which were spread over the frontal lobes using a headband, and which collected data analyzed in the iMotion platform as the FAA indicator (Park et al., 2019).

We first collected participants' baseline FAA values before exposing them to the stimuli by asking them to look at a white screen for eight seconds. We computed FAA values by subtracting the values when exposed to women in STEM stimuli from the baseline FAA values (Castellanos et al., 2018).

Participants' frontal brain region activations were recorded along with their visuals. The study began with an eight-second white screen followed by a one-minute video of a male or a female Nobel prize winner in chemistry. Then participants were asked to describe the video. In the following step they were presented with pictures of women or men in two STEM professions (i.e., computer programming or chemistry). Each image was presented for 10 seconds with intermittent white screens of two seconds in between the images. After each picture, they were then asked to classify the profession of the person in the picture as STEM or non-STEM for manipulation check. Then, they were asked to rate their feeling toward each image explicitly as before. They were asked about their science-related self-efficacy, self-science distance as before, and demographics including whether their parents worked in STEM (and open questions for each parents' profession) and whether they have had, or have, a STEM female educator in the past/present.

Analyses

For examining H3, we ran Hayes's interaction model two times. Each analysis had a different dependent variable: FAA values when exposed to women in STEM stimulus and when exposed to men in STEM stimulus. In the analyses, similar as before, we controlled for science self-efficacy, and science self-distance. As the sample was comprised of students, and the professions might look hypothetical for them, we controlled for whether they had any occupational experience. Additionally, we controlled for the other two types of role models: whether they had a parent in STEM or not, and whether they had a female STEM educator.

Results

The descriptive and correlations of Study 3 variables are presented in Table 10. H3 expected that women (vs. men) that were in the female role model condition would have more approach (less avoidance) tendencies toward the women in STEM stimuli compared to women that were in the male role model condition. Supporting our expectations, we found that the interaction was evident only when examining approaches toward a female role model [female role model condition: $b_{\text{Gender} \times \text{Condition}} = 0.66$, $p= 0.03$; male role model condition: $b_{\text{Gender} \times \text{Condition}} = 0.25$, $p= 0.46$; See Table 11 and Figure 6a and 6b for the women in STEM and men in STEM images, accordingly]. The GSR results were non-significant; see Table 12 and Figure 7a and 7b for the women in STEM and men in STEM images, accordingly.

Table 10. Study 3 descriptive and correlation-

			Women participants						
			1	2	3	4	5	Mean	SD
Public female role model	Women in STEM stimuli	1. implicit negative	1.00					2.87	5.34
		2. explicit negative	-0.08	1.00				3.07	9.87
		3. science self-efficacy	-0.09	-0.02	1.00			4.12	1.14
		4. science self-distance	-0.08	-0.05	0.53**	1.00		3.66	1.42
		5. FAA	-0.12	-0.05	-0.11	0.07	1.00	0.26	1.39
	Men in STEM stimuli	1. implicit negative	1.00					4.12	7.88
		2. explicit negative	-0.23	1.00				4.62	7.99
		3. science self-efficacy	-0.06	0.07	1.00			4.12	1.14
		4. science self-distance	-0.04	-0.08	0.53**	1.00		3.66	1.42
		5. FAA	-0.11	0.06	-0.11	0.07	1.00	0.26	1.39
Public male role model	Women in STEM stimuli	1. implicit negative	1.00					5.06	11.29
		2. explicit negative	-0.15	1.00				1.69	3.07
		3. science self-efficacy	0.16	0.01	1.00			3.90	1.18
		4. science self-distance	0.26	-0.04	0.44**	1.00		4.00	1.56
		5. FAA	-0.29	-0.10	0.16	-0.03	1.00	-0.14	0.68
	Men in STEM stimuli	1. implicit negative	1.00					3.82	7.62
		2. explicit negative	-0.11	1.00				3.95	8.63
		3. science self-efficacy	0.19	0.13	1.00			3.90	1.18
		4. science self-distance	0.20	0.15	0.44**	1.00		4.00	1.56
		5. FAA	-0.21	-0.09	0.16	-0.03	1.00	-0.14	0.68
			Men participants						
			1	2	3	4	5	Mean	SD
Public female role model	Women in STEM stimuli	1. implicit negative	1.00					1.77	4.10
		2. explicit negative	0.03	1.00				4.68	7.85
		3. science self-efficacy	-0.32	-0.67**	1.00			4.18	1.09
		4. science self-distance	-0.26	-0.59*	0.79**	1.00		4.29	1.54
		5. FAA	0.10	0.01	-0.06	0.23	1.00	0.02	0.34
	Men in STEM stimuli	1. implicit negative	1.00					0.98	2.07
		2. explicit negative	0.11	1.00				3.68	4.92
		3. science self-efficacy	-0.18	-0.55*	1.00			4.18	1.09
		4. science self-distance	-0.19	-0.63*	0.79**	1.00		4.29	1.54
		5. FAA	0.02	-0.16	-0.06	0.23	1.00	0.02	0.34
Public male role model	Women in STEM stimuli	1. implicit negative	1.00					1.63	3.59
		2. explicit negative	0.27	1.00				4.24	6.81
		3. science self-efficacy	-0.12	0.11	1.00			3.88	1.16
		4. science self-distance	-0.04	0.16	0.40	1.00		3.62	1.28
		5. FAA	-0.08	-0.25	0.03	-0.27	1.00	0.01	0.37
	Men in STEM stimuli	1. implicit negative	1.00					1.92	4.61
		2. explicit negative	0.30	1.00				7.95	10.66
		3. science self-efficacy	-0.50*	-0.08	1.00			3.88	1.16
		4. science self-distance	-0.17	0.33	0.40	1.00		3.62	1.28
		5. FAA	-0.11	-0.39	0.03	-0.27	1.00	0.01	0.37

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 11. Public role model conditions by gender predicting FAA values toward a female vs. a male working in STEM stimuli (Hayes, model 1)

	FAA women in STEM stimuli				FAA men in STEM stimuli			
	Coeff	Se	t	P	Coeff	Se	t	p
Constant	-0.03	0.32	-0.09	0.93	-0.29	0.35	-0.83	0.41
Gender (0=male, 1= female)	-0.33	0.19	-1.77	0.08	-0.10	0.21	-0.41	0.68
Condition (0=male role model, 1=female role model)	-0.40	0.25	-1.58	0.12	-0.11	0.28	-0.49	0.63
Gender × Condition	**0.66**	0.30	2.17	0.03	0.25	0.33	0.74	0.46
Science self-efficacy	0.06	0.07	0.77	0.45	-0.02	0.08	-0.19	0.84
Science-self distance	0.06	0.06	1.16	0.25	0.11	0.06	1.79	0.08
Current work (0=no, 1=yes)	0.18	0.14	1.33	0.19	0.045	0.15	0.31	0.76
Parental role model (0=no, 1=yes)	-0.48	0.15	-3.21	0.01	-0.39	0.16	-2.47	0.016
Education role model (0=no, 1=yes)	-0.27	0.19	-1.39	0.17	0.04	0.21	0.28	0.86
R^2	**0.18**			0.04	0.10			0.37

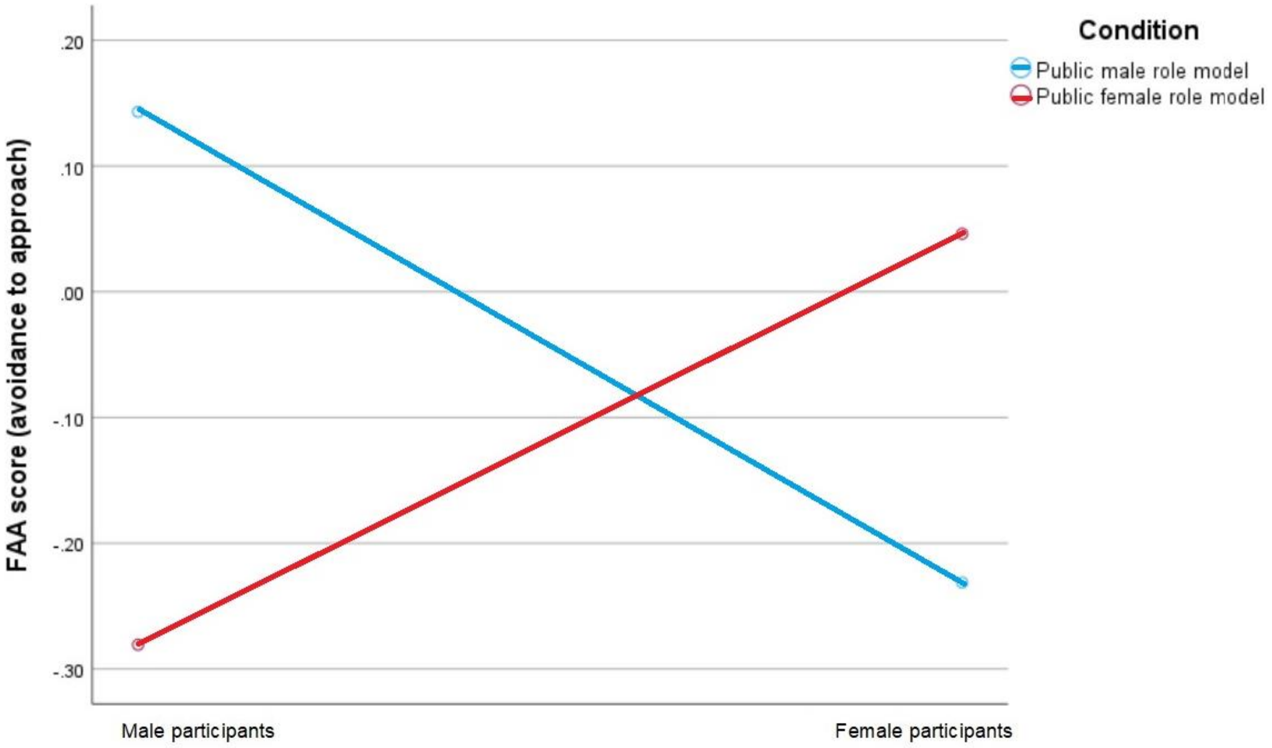


Figure 6a. Condition by gender interaction when predicting approach and avoidance tendency (FAA scores) toward women in STEM images.

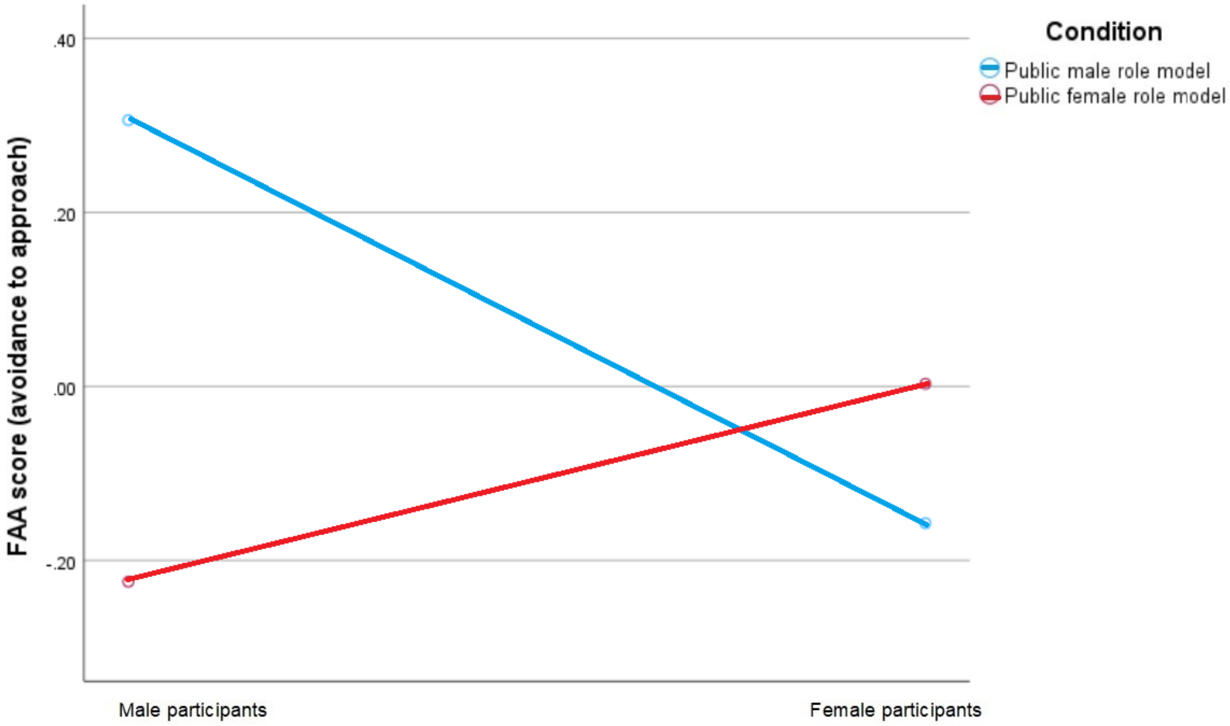


Figure 6b. Condition by gender interaction when predicting approach and avoidance tendency (FAA scores) toward men in STEM images.

Table 12. Public role model conditions by gender predicting maximum GSR peak values toward a female vs. a male working in STEM stimuli
(Hayes, model 1)

	Max GSR women in STEM stimuli				Max GSR men in STEM stimuli			
	Coeff	Se	*t*	*p*	Coeff	Se	*t*	*p*
Constant	0.001	0.053	0.014	0.99	0.010	0.05	0.19	0.85
Gender (0=male, 1= female)	-0.052	0.034	-1.54	0.13	-0.035	0.03	-1.16	0.25
Condition (0=male role model, 1=female role model)	0.012	0.052	0.24	0.81	0.01	0.05	0.24	0.82
Gender × Condition	0.007	0.060	0.11	0.91	0.005	0.054	0.094	0.93
Science self-efficacy	0.007	0.012	0.59	0.56	0.007	0.010	0.59	0.56
Science-self distance	0.008	0.010	0.84	0.41	0.006	0.009	0.64	0.52
Current work (0=no, 1=yes)	-0.005	0.024	-0.20	0.84	-0.018	0.022	-0.82	0.41
Parental role model (0=no, 1=yes)	0.001	0.025	0.042	0.97	0.002	0.023	0.07	0.95
Education role model (0=no, 1=yes)	-0.012	0.034	-0.37	0.71	-0.01	0.03	-0.41	0.68
R^2	0.17			0.60	0.06			0.73

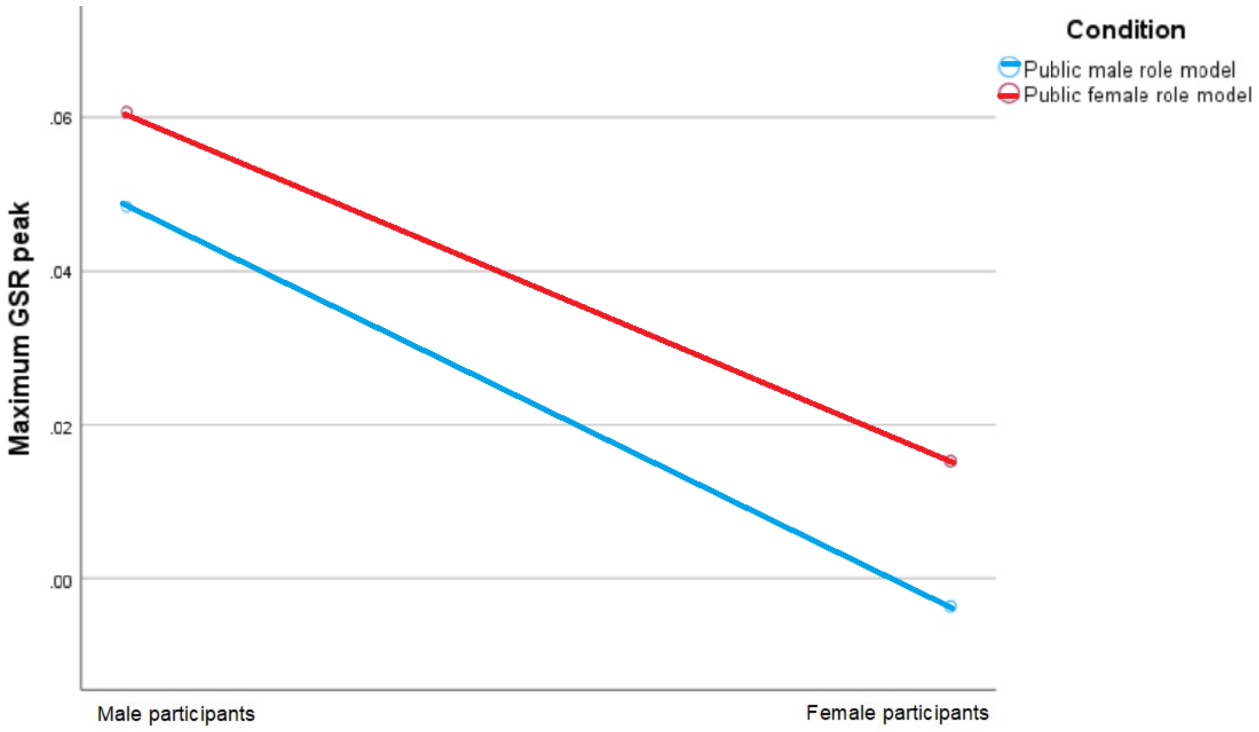


Figure 7a. Condition by gender interaction when predicting emotional arousal (maximum GSR peak amplitude) toward women in STEM images.

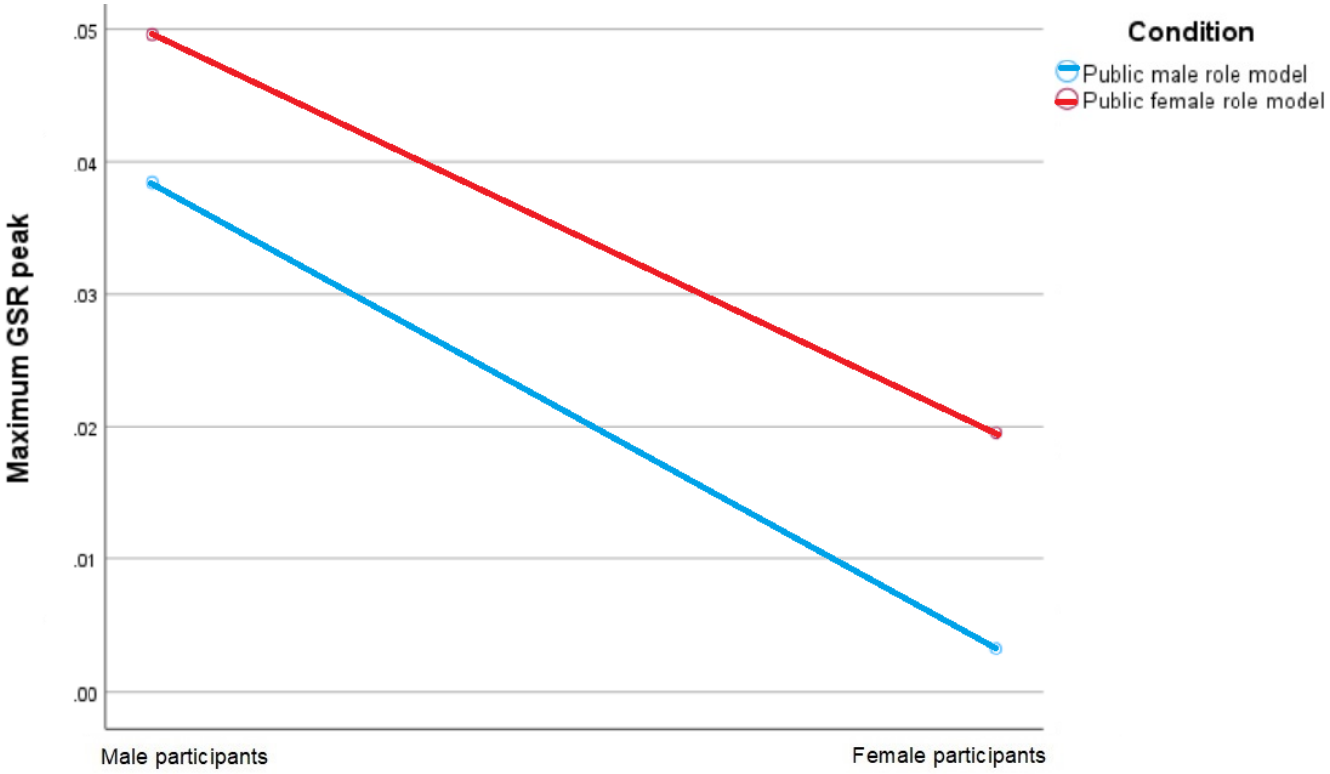


Figure 7b. Condition by gender interaction when predicting emotional arousal (maximum GSR peak amplitude) toward men in STEM images.

Discussion

Public role models by gender interaction when predicting approach and avoidance tendency (FAA scores) toward women in STEM images was significant, showing a pattern of more avoidance toward women in STEM image among women in the public male role model condition than the public female role model condition. However, men displayed a pattern of more avoidance toward women in STEM images in the public female role model condition than the public male role model condition.

Future studies and limitations

There are several factors that may impact the effectiveness of the female role model intervention that should be measured in future studies. For example, if the female role model is not perceived as feminine, it may limit the effectiveness of the intervention (Betz & Sekaquaptewa, 2012). Thus, successful interventions should change not only the perception that *women* are able to succeed in STEM, but could also display *feminine women* being successful, thus countering stereotypes about women's ability, as well as femininity, in these fields. Furthermore, another possible factor may be the nature of the relationship with stereotyped role models, as this may matter more than mere contact alone (Tropp & Pettigrew, 2005; van Dick et al., 2004). Similarly, Conner and Danielson (2016) found the relationship with the role model was more important than the role model's gender. If we consider a female role model in STEM who does not display admirable, inspiring qualities, she will probably not influence or make an impact on positive STEM attitudes of young women. Indeed, it has been suggested that an effective role model is a person that an individual wants to be like, and who makes them feel that the role model is a person worthy of emulation (Romero, 1995). Others have claimed that the effect of role models is dependent on the perception of the role model's success as matchable or unmatchable in young women's perceptions, and if they feel threatened rather than motivated the intervention may, understandably, not be effective (Betz & Sekaquaptewa, 2012).

Conclusion

Women are underrepresented in STEM and their increased participation could benefit society and the economy. Conscious attitudes towards women in STEM are often measured by explicit self-reports, but these can be unreliable due to social desirability or positive self-perception. The impact of different types of female role models (parental, educational-expert, public) on implicit attitudes has rarely been examined, along with the responses of men, who traditionally and historically dominate STEM. Three studies aim to explore the impact of these role model types on implicit attitudes of both women and men towards women working in STEM images. We found that for men, having a female or male parental role model in STEM reduced implicit (but not explicit) negative emotions towards women in STEM, compared to those without any parent in STEM. For women participants, the female STEM parental role model elicited lower negative implicit and explicit emotions towards men in non-STEM professions compared to women who did not have any parent in STEM. This is important as accepting men working in non-STEM occupations may impact gender-egalitarianism in various professions.

Aligned with social desirability expectations, only explicitly female participants who did not have any parent in STEM said they had more negative emotions when confronted with women in STEM than with men in STEM or non-STEM. Implicitly, they responded similarly to all women participating in the study. Furthermore, we found that having a mother in STEM positively affects science self-efficacy and identification with STEM for both men and women. A female STEM educational role model leads to lower implicit fear towards women in STEM for women (compared to men in STEM), but higher explicit fear of men (compared to male educational role models). We also found the female educational role model condition led to marginally lower implicit disgust toward a female scientist among women than men. Female and male public role models affect approach and avoidance tendencies towards women in STEM differently for both genders: A female public role model demonstrated an increase in male participants' avoidance toward women in STEM, while a male public role model demonstrated an increase in female participants' avoidance toward women in STEM.

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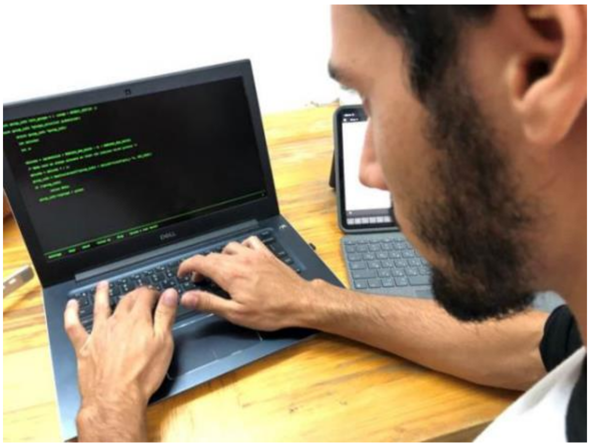
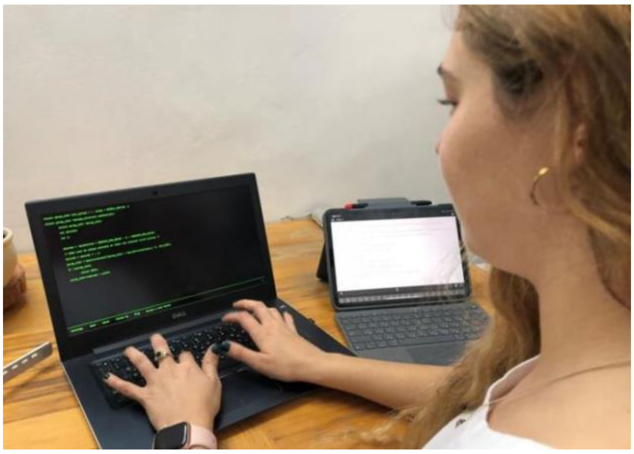
Appendix A.

Studies STEM and Non-STEM occupations images

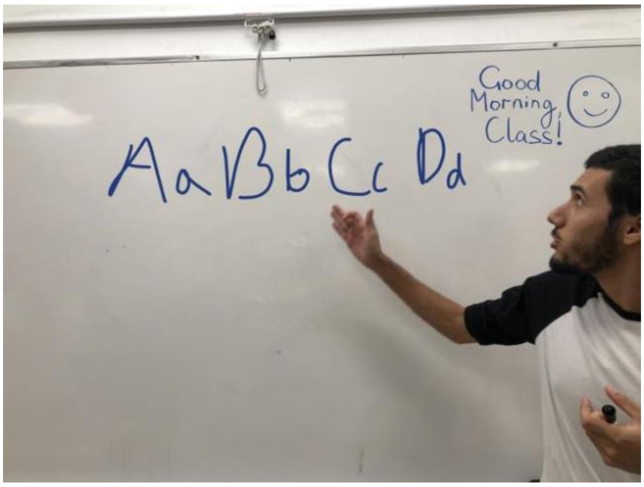
Scientists

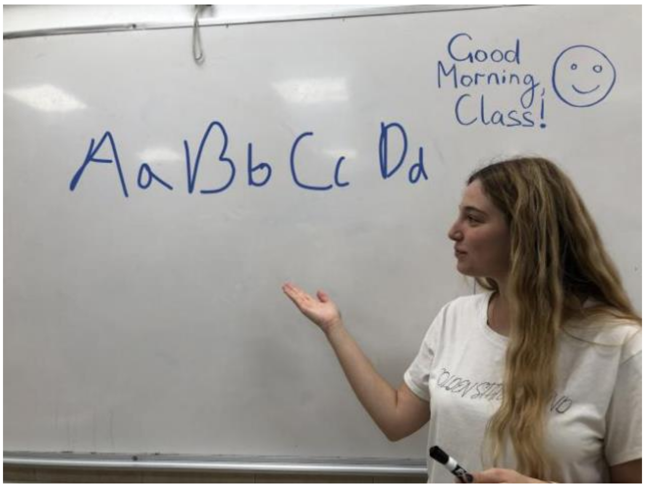
Computer programmer





Teacher





Cleaner

Appendix B.

אוניברסיטת
בן-גוריון בנגב

ד"ר יובל רזניק

**חברת סגל במחלקה לכימיה
בפקולטה למדעי הטבע**

החיים שלי לפני אב"ג:

נולדתי בקיבוץ להב, גדלתי באילת ולמדתי בבית ספר מעלה שחרות בקיבוץ יטבתה. את התואר הראשון בכימיה במגמה לכימיה של חומרים מתקדמים ואת התואר השני בהנדסה כימית למדתי באוניברסיטת בן-גוריון. את הדוקטורט PhD למדתי באוניברסיטת קרדיף בבריטניה, בכימיה פיזיקלית. לאחר מכן עשיתי פוסט-דוקטורט במכון ויצמן למדע, שבו חקרתי כיצד בעלי חיים מנצלים קריסטלים על מנת להשתמש באור.

למה דווקא אב"ג?

את צעדי המחקר הראשונים שלי עשיתי כסטודנטית במחלקה לכימיה באב"ג והחזרה לכאן היא סגירת מעגל בשבילי. אין מקום טבעי יותר עבורי, נולדתי וגדלתי בדרום הארץ, כך שמבחינתי אני חוזרת הביתה.

מה אני חוקרת:

במהלך הדוקטורט שלי התוודעתי לקריסטלים והוקסמתי מהם. משהו בסדר ובסימטריה של קריסטלים משך אותי מאוד. בשלב מאוחר יותר במחקרים שעשיתי עם פרופ' ליאה אדדי ופרופ' סטפן ויינר במכון ויצמן, גיליתי שגם בעלי חיים מייצרים קריסטלים. לאורגניזמים יש יכולת לשלוט באופן מופלא בצורה, בגודל ובמבנה של אותם קריסטלים ולכן הם יכולים להשתמש באסטרטגיות שהן הרבה מעבר ליכולותיה של הכימיה. חומרים אלו משמשים למגוון פונקציות ביולוגיות וזה ריתק אותי. החזון שלי הוא להבין כיצד אורגניזמים שולטים בתהליכי קריסטליזציה וכך לחשוף טכניקות חדשות של קריסטליזציה בהשראת הביולוגיה, לשם סינתזה של חומרים אורגניים חדשים.

תובנה שלי מתחום המחקר:

הרבה מתחום הכימיה מוקדש להמצאות, ליצירה של דברים חדשים. במהלך לימודי נחשפתי להתרגשות שבתגלית מדעית. במעבדה שלי אנחנו חוקרות מערכות אופטיות במערכת הביולוגית. יש מקום גם להמצאות וגם לגילוים חדשים במדע, אבל עבורי אין ריגוש גדול יותר מלגלות דברים חדשים על הטבע.

משהו שלא כתוב ב CV-שלי:

אני אוהבת מאוד לטייל ונהנית לטייל עם המשפחה שלי. אנחנו גם חובבי סקי, ולא מוותרים על חופשת סקי אחת לשנה.

מקור השראה:

בתחומי חיים שונים אני שואבת השראה ממקומות או מאנשים שונים. מבחינה מקצועית, המנחות והמנטוריות שליוו (ועדיין מלוות) אותי הם לגמרי מקור להשראה.

כשאהיה גדולה:

כמו הרבה ילדים, כשהייתי צעירה רציתי להיות אסטרונאוטית. כיום, אין מאושרת ממני להיות חוקרת, זו באמת עבודת חלומותיי. אבל, תמיד חשבתי שאעסוק במקצוע עם אוריינטציה טכנולוגית. זה לא השתנה הרבה גם היום.

אם לא הייתי חוקרת, הייתי עוסקת ב...

היי-טק כנראה, או מנהלת בכירה בחברת ביוטק גדולה.

בקיצור נמרץ :

– פאודה או האח הגדול? *פאודה*
– יוגה או קרוספיט?
לא ניסיתי אף אחד מהם אבל נראה לי שאני יותר טיפוס של יוגה
– הפועל או מכבי? *מכבי*
– רביד פלוטניק או נועה קירל?
אני לא מכירה כל כך, אבל ממה שכן שמעתי – רביד פלוטניק
– סטייק או טופו?
סטייק, אבל מעדיפה דג
– מיטיבי לכת או ספא?
מיטיבי לכת
– רכב או רכבת?
רכבת
– אירופה הקלאסית או הודו?
הודו. לא הייתי ואשמח לנסוע
– ים או בריכה?
ים. במיוחד הים של אילת.
– לילה או בוקר? *בוקר*
– חורף או קיץ? *קיץ*
– עיר או כפר? *כפר*
– סרט או הצגה? *הצגה*
– שיחת טלפון או הודעת טקסט?
הודעת טקסט
– מתוק או מלוח?
גם וגם, העיקר שיהיה טעים
– אנדרואיד או אייפון?
אנדרואיד
– כלב או חתול?
כלב. ליתר דיוק כלבה (:
– פייסבוק או טוויטר?
אין לי טוויטר, אז פייסבוק

ד"ר יובל רזניק

חבר סגל במחלקה לכימיה
בפקולטה למדעי הטבע

החיים שלי לפני אב"ג:

נולדתי בקיבוץ להב, גדלתי באילת ולמדתי בבית ספר מעלה שחרות בקיבוץ יטבתה. את התואר הראשון בכימיה במגמה לכימיה של חומרים מתקדמים ואת התואר השני בהנדסה כימית למדתי באוניברסיטת בן-גוריון. את הדוקטורט PhD למדתי באוניברסיטת קרדיף בבריטניה, בכימיה פיזיקלית. לאחר מכן עשיתי פוסט-דוקטורט במכון ויצמן למדע, שבו חקרתי כיצד בעלי חיים מנצלים קריסטלים על מנת להשתמש באור.

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תובנה שלי מתחום המחקר:

הרבה מתחום הכימיה מוקדש להמצאות, ליצירה של דברים חדשים. במהלך לימודי נחשפתי להתרגשות שבתגלית מדעית. במעבדה שלי אנחנו חוקרים מערכות אופטיות במערכת הביולוגית. יש מקום גם להמצאות וגם לגילוים חדשים במדע, אבל עבורי אין ריגוש גדול יותר מלגלות דברים חדשים על הטבע.

משהו שלא כתוב ב CV-שלי:

אני אוהב מאוד לטייל ונהנה לטייל עם המשפחה שלי. אנחנו גם חובבי סקי, ולא מוותרים על חופשת סקי אחת לשנה.

מקור השראה:

בתחומי חיים שונים אני שואב השראה ממקומות או מאנשים שונים. מבחינה מקצועית, המנחים והמנטורים שליוו (ועדיין מלווים) אותי הם לגמרי מקור להשראה.

כשאהיה גדול:

כמו הרבה ילדים, כשהייתי צעיר רציתי להיות אסטרונאוט. כיום, אין מאושר ממני להיות חוקר, זו באמת עבודת חלומותיי. אבל, תמיד חשבתי שאעסוק במקצוע עם אוריינטציה טכנולוגית. זה לא השתנה הרבה גם היום.

אם לא הייתי חוקר, הייתי עוסק ב...

היי-טק כנראה, או מנהל בכיר בחברת ביוטק גדולה.

בקיצור נמרץ :

– פאודה או האח הגדול? *פאודה*
– יוגה או קרוספיט?
לא ניסיתי אף אחד מהם אבל נראה לי שאני יותר טיפוס של יוגה
– הפועל או מכבי? *מכבי*
– רביד פלוטניק או נועה קירל?
אני לא מכיר כל כך, אבל ממה שכן שמעתי – רביד פלוטניק
– סטייק או טופו?
סטייק, אבל מעדיף דג
– מיטיבי לכת או ספא?
מיטיבי לכת
– רכב או רכבת?
רכבת
– אירופה הקלאסית או הודו?
הודו. לא הייתי ואשמח לנסוע
– ים או בריכה?
ים. במיוחד הים של אילת.
– לילה או בוקר? *בוקר*
– חורף או קיץ? *קיץ*
– עיר או כפר? *כפר*
– סרט או הצגה? *הצגה*
– שיחת טלפון או הודעת טקסט?
הודעת טקסט
– מתוק או מלוח?
גם וגם, העיקר שיהיה טעים
– אנדרואיד או אייפון?
אנדרואיד
– כלב או חתול?
כלב. ליתר דיוק כלבה (:
– פייסבוק או טוויטר?
אין לי טוויטר, אז פייסבוק