Current Psychology (2025) 44:17588–17608
https://doi.org/10.1007/s12144-025-08034-0

Diversity science in action: examining the effectiveness of a pilot leadership intervention for young women via the PETRAS program

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Accepted: 29 May 2025 / Published online: 23 June 2025

Abstract

Although gender is a critical factor in underrepresentation within various professional settings, it remains one of the least examined areas in diversity science. Today, many young women pursue higher education, with a substantial number studying fields directly related to business management. However, few attain leadership positions, facing both external and internal barriers that limit their advancement. This study aims to examine the effectiveness of a leadership intervention exclusively for young women before they fully participate in the labor market. All the programme (classroom sessions, mentorship) was adapted considering each participant diversity (sociocultural background, age, studies). We conducted a mixed methods research (MMR) intervention design at a public Spanish university, combining a quantitative evaluation design (quasi experimental design) with qualitative research, with both pre- and postintervention questionnaires and interviews and intervention ($N=18$) and control ($N=20$) groups. The results indicate a significant increase in the outcome variables (leader identity, self-efficacy, and self-perceived leadership skills) in the intervention group, with a group × time interaction for both leader identity and self-efficacy. Additionally, qualitative analyses of personal interviews reveal key factors that support these changes, such as a shift in participants' understanding of expected leadership behaviours and styles, growing comfort with transformational leadership aligned with communal behaviours, increased awareness of personal strengths and values aiding in the design of their personal development projects, and the realisation that leadership skills can be learned. Moreover, the presence of social support from peers, teachers, and mentors provided a reflective and supportive environment for their growth. Finally, we discuss the practical implications of these results for future programs and society.

Keywords Intervention program · Young women · Leader identity · Leader self-efficacy · Leadership skills · Gender

The framework of diversity science is explored in Plaut's (2010) seminal works, including her target article, "Diversity Science: Why and How Difference Makes a Difference," and her subsequent reply, "Diversity Science: Who Needs It?" These works underscore the importance of diversity, equity, and inclusion (Causadias et al., 2023). Since then, most research has focused on issues of racism, ethnicity, and race (e.g., Causadias et al., 2023), as Plaut did. Additionally, other aspects have been analyzed, including the role of psychological science itself among psychologists of underrepresented backgrounds (e.g., Fish, 2023) and the types of statistical analyses employed in this field (e.g., Loh & Ren, 2024). However, gender as a source of discrimination, which limits employment opportunities to women, has been studied less.

This paper presents a mixed-method study conducted with young women in the Spanish higher education context, grounded in key principles of the Diversity Science (DS) framework to propose concrete actions for reducing gender discrimination against young women aspiring to leadership positions. To do it so, it considers systemic inequalities and

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structural barriers to women's leadership that women leadership programs can face (Ely et al., 2012) by considering the sociocultural context (Mendoza-Denton & España, 2010), i.e., the Spanish sociocultural framework such as sexism. Also, it addresses the intergroup biases and stereotypes in this specific social and organizational/educational context held by these young future women leaders considering their diversity among their -sociodemographic identity, age, and studies. The program is also enriched by the diversity of teachers and mentors. By helping participants to recognize and overcome these structural and internal barriers that prevent them from identifying as leaders, the study aims to better prepare them for future leadership opportunities. Through an evidence-based approach and offering open science materials as an initiative to promote access to minorities and underrepresented groups (Grahe et al., 2020), this study contributes to promoting social justice and driving change toward a more equitable leadership development.

Gender is one factor of structural discrimination that leads to women being underrepresented in leadership positions. Many girls today have a high education level, and many are studying for degrees directly related to business management. In the EU27, 55.47% of bachelor's degree in business administration students are female, and in Spain, 54.43% are female (2023). However, the number of women reaching management positions remains very different from their male counterparts. According to data from the European Institute for Gender Equality, women occupy only 33% of management positions in large European companies (EIGE, Eurostar, 2024). In the case of sociocultural Spanish context, in 2023, the percentage of women occupying positions on the boards of directors of large Ibex-35 companies was 37.3%. However, the distribution according to responsibility modifies these proportions: only 11.8% hold the presidency, whereas 39.4% are female on boards of directors. These figures are due to both internal and structural barriers that women encounter once they enter the labor market. Given this reality, engaging in efforts that help young women become aware of these constraints and prepare for leadership roles could prove beneficial.

A pivotal framework for understanding the underrepresentation of women in management is the 'think manager-think male' paradigm (Koenig et al., 2011), which explains how traditional leadership roles are predominantly associated with male and agentic characteristics. This mismatch between self-perception and the traditional leader prototype is compounded by societal norms and organizational cultures that continue to favor men in leadership styles and the prevalence of stereotypically masculine ideals of leadership behavior (Koenig et al., 2011). These cultural and social prescriptions ultimately influence women´s identities and roles, making them less likely to engage in leadership positions and identify as potential effective leaders (Gartzia et al., 2021).

To some extent, the lack of fit between women´s communal identities and agentic leadership standards explains women´s lack of identification with leadership roles. Thus, whereas women generally display more communal roles and behaviors in leadership than men do (e.g., Eagly et al., 2012), the prevailing agentic ideals about leadership often prevent women from being authentic and feeling attracted to such leadership roles, leading to a lack of identification with the leader role. In cases where women enter managerial roles, they often feel pressured to conform to these masculine traits and standards, with evidence that women´s communal orientations tend to diminish in top managerial roles compared with lower-level roles (e.g., Gartzia, 2024).

These associations generate a biased general stereotype about leadership roles and a perceptual barrier for women aspiring to these positions, given the many remaining gender stereotypes at work and the perceived incongruity between feminine and managerial roles (Eagly & Koening, 2021). As leadership traits such as decisiveness, assertiveness, and dominance are culturally coded as masculine, women often struggle to see themselves in these roles. They are likewise not perceived by others as fitting the leader archetype. This incongruity can result in women experiencing higher levels of scrutiny and bias, reinforcing the cycle of underrepresentation (Eagly, 2007). Therefore, previous research has acknowledged the importance of considering these structural, social and psychological complexities in gender action and gender equality programs in organizations (Gartzia et al., 2021; Laguna-Sáánchez et al., 2021), changing women´s perspectives and identities from a critical gender perspective.

The existence of Women's Leadership Development Programs (WLDP) to train potential women leaders in leadership skills is not new. The high level of satisfaction of the participants is due to the development of professional networks, new opportunities, the development of new tools and projects that support their career development and promotion, and the increase in their confidence, self-efficacy, self-awareness and authenticity, that makes them go beyond their comfort zone and achieve better integration of personal and work life (Deutsch et al., 2023; Herbst et al., 2024; Mucheru et al., 2024; Sayers-Brown et al., 2024). Most of these programs include mentoring for the benefits it brings, both for the development of professional networks and for the increase in self-efficacy, which comes from the fact that future leaders see themselves reflected in women who, at some point, were in a similar situation, serving as a model (vicarious experiences) (Bandura, 1997). In this regard, the systematic literature reviews by Szekely et al. (2024) reveal that several factors influence effective coaching. Leaders'

work identity is a key ingredient for transformative coaching interventions, as are self-efficacy beliefs, character attributes, and the coachee's goal orientation. Moreover, Orsini and Sunderman (2024), after a scoping review of WLDP, highlight the importance of the expansion and the investigations about these programs' leader(ship) identity development, proposing a conceptual model as a basis for beginning to include marginalized social identities as gender, in this leader(ship) identity development. This model incorporates the relevance of group context that influences human learning and leader identity, a person's meaning-making capacity, which makes them perceive relationships among varied social identities and make meaning of those identities in different contexts, and how the identity dimensions are interconnected.

However, this intervention must take place before women enter the workforce. There are leadership development programs in universities (e.g., Brue & Brue, 2016; Cline et al., 2019; Ericksen, 2009; Selzer et al., 2017), which are performed in mixed-gender programs. However, research on the outcomes of WLDP targeting exclusively female college students is scarce. In the case of Ericksen (2009), the research focused on students from diverse backgrounds (science, education, engineering, arts, health sciences) and different racial groups. The results support a positive impact on career transition decision-making, leadership skills, assertiveness and women's empowerment. In addition, focused on recent graduates, Segovia-Pérez et al. (2019) and Laguna-Sáánchez et al. (2021) demonstrated the efficacy of a WLDP focused on leadership skills development.

WLDPs play a crucial role in enhancing young women's leadership. However, some studies suggest that many existing leadership programs are not fully effective. They fail to address the underlying factors that withdraw these women from leadership, such as the mismatch between their perception of a leader and that of themselves (Haber-Curran & Sulpizio, 2017). Therefore, to develop young women's leadership, tailored interventions should be designed to address their unique challenges.

As noted by Ely et al. (2012), the content of leadership programs for young women should be developed through a gender-sensitive lens, integrating gender considerations throughout the program. This approach, known as gender mainstreaming, involves systematically incorporating and addressing gender-related issues in all aspects of leadership development, particularly how gender influences the processes of claiming and ascribing a leadership identity. Thus, the theoretical content taught to develop leadership competencies (e.g., increasing the quality of their social networks, negotiating daily, leading change, and making career transitions) should also raise awareness of the structural gender biases existing in the working context. In summary, these programs should provide strategies to recognize and mitigate the impact of gender stereotypes and to develop leaders' self-efficacy, leadership capacity and leadership identity (Haber-Curran & Sulpizio, 2017). This training should, therefore, not be limited to psychological empowerment but should also be completed with the development of less stereotypically masculine leadership skills that increase women´s interest in these positions.

Addressing these concerns requires understanding how leadership and organizational qualities are generally shaped from a gender perspective and a critical process of self-evaluation and empowerment that helps young women perceive themselves as potential leaders. Therefore, despite the numerous leadership projects and considering the extensive literature analyzing their impact, a gap still exists in this field. Our results offer novel insights into an integrative leadership program by examining the new design, its results and the action success. Hence, this study aims to understand better, firstly, how gender dynamics often influence leadership and organizational traits and second, assess the effect of a vital process of introspection and empowerment that enables young women to recognize their potential as future leaders. The program presented here aims to respond to these goals by enabling these women to envisage themselves as potentially effective leaders in the Spanish context and to be recognized as such by their peers by redefining organizational prototypes and leadership ideals.

Thus, we propose specific actions for reducing gender discrimination against young women aspiring to leadership positions, accompanied by a pretest–posttest evaluation of the changes observed in these women due to implementing these measures. We propose a specific plan of strategies targeted at potential female leaders aimed at mitigating the gender discrimination and psychological constraints faced by young women pursuing leadership roles based on a well-being framework to develop women´s psychological empowerment and gender awareness (Machín & Cifre, 2020; Segovia-Pérez et al., 2019). These actions are designed to address systemic barriers and foster a more equitable environment that supports the advancement of these aspiring female leaders.

Theoretical framework

By being empowered, women can transform at an individual level and participate in transforming the social sphere by critically analyzing the complex and multiple gender dynamics that perpetuate situations of inequality. Empowerment programs are individual-level actions that organizations can develop to support women in achieving leadership positions and generating well-being (Segovia-Pérez et al.,

2019). Similarly, Machín and Cifre (2020) developed an "empowerment program for women leaders" to help women overcome subjective barriers that support decisions related to their professional development, considering their gender roles and increasing their subjective barriers. This psychological empowerment program is related to the well-being model proposed by Seligman (2011), which comprises five elements: P-positive emotions, E-engagement, R-relationships, M-meaning, and A-accomplishment. These five areas of the PERMA model contribute to overall well-being, a positive aspect of mental health.

The PERMA model states that well-being is achieved when people seek for themselves, to be in control of the positive emotions they experience, to have a sense of competence and commitment related to their personal goals, to maintain positive interpersonal relationships, and to live their lives with a sense of transcendence. As Machín and Cifre (2020) state, a well-being framework to develop psychological empowerment for women might give them the psychic energy to undertake new challenges. The results show changes in the perception of gender roles and an increase in their well-being by increasing autonomy and decreasing distress over what they considered inadequate management of family and professional roles.

Byrne et al. (2018) state that leadership occurs at the self-level. To develop effective leadership, therefore, one should also be able to lead oneself and be consistent with one´s values (Odom et al., 2012). The development of personal strengths (Byrne et al., 2018), values (Roberts, 2008), and self-concepts (Odom et al., 2012) is part of the process of self-leadership. From a gender perspective, this approach emphasizes the cultivation of personal and leadership skills that move beyond traditionally masculine stereotypes, favoring qualities that are also communal and more authentic. This shift not only encourages young women to develop a leadership style that resonates with their gender values and strengths but also challenges the conventional agentic archetypes that have historically dominated leadership models (e.g., Eagly et al., 2012).

By encouraging a more inclusive set of leadership attributes (such as empathy, collaboration, and emotional intelligence)this framework fosters a leadership identity that resonates with diverse personal experiences and social identities, allowing for a more genuine and equitable expression of leadership potential. These aspects of self-identities are developed through self-reflection, resulting in greater self-awareness (Odom et al., 2012). Awareness of oneself gives individuals a sense of self-empowerment: having a set of "positive self-perceptions and identity development, enjoyment, and personal agency and self-regulation" (Hassi & Laursen, 2015, p. 323). Thus, a leadership student should know how to be a leader and what it means to be a leader (Roberts, 2008).

As most young women have a professional identity distinct from leadership (Haber-Curran & Sulpizio, 2017), before starting to train them in skills "to lead other people", it is essential that they learn to "lead themselves". The development of leadership skills is a process that evolves (Corriveau, 2020; Haber-Curran & Sulpizio, 2017) and depends on situational and experiential factors, such as leadership identity (Day & Sin, 2011).

Leadership identity is a social construct that reflects an individual's beliefs about being a leader (Lanaj et al., 2021; Zaar et al., 2020). It consists of two dimensions: strength and integration. Strength relates to how strongly an individual identifies with leadership, and integration refers to the extent to which leadership identity is incorporated into one's overall identity (Zaar et al., 2020) and is reflected in public behavior (Day & Sin, 2011; Lanaj et al., 2021).

An individual's leadership identity is shaped by their perceived capabilities, skills, and understanding of leadership (Meeuwissen et al., 2021). By comparing themselves to their notions of leadership, individuals determine whether they see themselves as leaders, influencing the formation of their leadership identity (Zaar et al., 2020).

Leadership identity impacts the motivation to engage in leadership development activities, practice leadership skills, participate in leadership programs, and exhibit leadership behaviors (e.g., Day & Sin, 2011; Zaar et al., 2020). Leadership identity builds on positive experiences in leadership roles. Having a positive evaluation of a leadership experience increases an individual's leadership self-efficacy, prompting them to seek further leadership development opportunities (e.g., Day & Sin, 2011; Haber-Curran & Sulpizio, 2017), creating a cycle of leadership identity development (Day & Sin, 2011).

Leadership self-efficacy is a precursor of leadership identity formation. Leadership self-efficacy is the belief in one's ability to demonstrate effective leadership behaviors (Haber-Curran & Sulpizio, 2017; Momsen & Carlson, 2013). According to Bandura (1997), self-efficacy originates from four primary sources: mastery experiences, observational learning, verbal persuasion, and emotional and physiological responses. Therefore, leadership self-efficacy is cultivated through gaining experience in practicing leadership actions, learning from observing other leaders, receiving encouragement from influential individuals to engage in leadership roles, and experiencing positive emotions related to one's leadership performance (Momsen & Carlson, 2013).

Leadership self-efficacy plays a vital role in shaping individuals' beliefs in their leadership capabilities and readiness to enhance their leadership skills and engage in leadership

responsibilities (Momsen & Carlson, 2013). Strengthening leadership self-efficacy reinforces leadership identity (e.g., Day & Sin, 2011).

Leadership identity and experiences, as well as their interaction with gender, vary across cultures. This demographic diversity refers to the fact that experiences and perceptions are the product of our sex, gender, religion, age, ethnicity, or other aspects of our background (e.g., Page, 2007). In this line, research has shown that leadership conceptualizations must account for both leaders' and followers' social identities and lived experiences within specific cultural contexts. In this regard, leaders of color and women leaders are more likely to embrace their ethnic and gender identities compared to white male leaders. These intersecting social identities, along with the lived experiences associated with minority status, shape leadership practices by presenting both challenges and strengths (Chin, 2013). Furthermore, leadership definitions differ between white women and minority ethnic women. While white women's leadership perspectives align with contemporary leadership models, minority ethnic women define leadership primarily through ethno-cultural lenses, which shape their self-identities and relational approaches. When enacting their leader identities, white women tend to reference historical gender and class barriers, whereas minority ethnic women highlight ongoing challenges related to their ethnic and religious identities (Showunmi et al., 2016).

Within an empowerment framework considering young women transitioning out of university and sustainable well-being over time, we intentionally designed an intervention to target young women's leader identities. The program was developed within the Spanish sociocultural context and the applied setting of higher education while accounting for the diversity of participants' sociocultural backgrounds, ages, fields and levels of study. This diversity was also reflected in the teaching and mentoring team, whose varied backgrounds further enriched the program. The novelty of this intervention was the development of the Sustainable Mainstream Empowerment Program (PETRAS, its acronym in Spanish), where the term 'Mainstream' refers to the concept of gender mainstreaming, meaning that gender considerations are integrated throughout the process. The program combined an 'Empowerment Program' aimed at increasing gender role autonomy with a WLDP designed to enhance leadership skills, all while considering gender at every stage. 'Sustainable' refers to the expectation that the empowerment generated by the program will have a lasting impact over time.Consistent with this, the current study's objective was to evaluate the effectiveness of this pilot intervention of the PETRAS on leader identity in young women based on quantitative and qualitative evidence (by applying mixed methods research). While our study is mainly exploratory, we expect that the leadership-based intervention will positively impact female participants' leadership identity and self-efficacy to lead compared with regular young women finishing their university studies (a control group). This expectation is based on the abovementioned theories of leadership identity development from a gender perspective (e.g., Eagly et al., 2012), which emphasise the need to cultivate personal and leadership skills among young women that move beyond traditional stereotypes, and self-efficacy research (Day & Sin, 2011; Momsen & Carlson, 2013). This research points out how improving self-efficacy can be critical in shaping individuals' beliefs of success in their leadership capabilities and thus enhance their skills and engagement in leadership responsibilities. These approaches inform our investigation into how young women can change their self-efficacy and self-perceived leadership skills throughout the intervention. These theoretical foundations also offer a theoretically grounded understanding of the mechanisms through which leadership development interventions can empower women and reshape their leader identities, addressing a gap in the existing literature, which has often overlooked the dynamic, identity-based outcomes of leadership programs especially designed for early-career women, and leading to the following research questions (RQ):

- RQ1: How do self-efficacy and self-perceived leadership skills emerge and develop through the change process to contribute to young women´s leader identities?
- RQ2: How does the leadership intervention play a role in contributing to young women´s leader identities?

Method

Study design and participants

Following Diversity Science principles, considering the sociocultural context is essential to understanding the barriers women face in accessing leadership positions. This study was conducted at a small (13,000 students) and relatively young (33 years old) public Spanish university located on the Mediterranean coast. The university offers bachelor's, master's, and doctoral programs, structured into five faculties and schools: the Faculty of Health Sciences, the Faculty of Human and Social Sciences, the Faculty of Law and Management Sciences, the School of Technology and Experimental Sciences, and the Doctoral School. All academic activities are concentrated on a single campus.

The region's socioeconomic landscape is dominated by Small and Medium Enterprises (SMEs) primarily engaged in industry (e.g., ceramic tile production), services (e.g., tourism), agriculture (e.g., orange cultivation), and

construction. The service sector is particularly significant, accounting for 57% of the local GDP and employing 68% of the working population. The university maintains a close relationship with its surrounding environment and strives to be an agent of change. While a strong patriarchal culture still persists in many businesses—particularly those outside the service sector—significant progress has been made over the past year in improving women's access to traditionally male-dominated leadership positions. Notably, the Women in Business 2024 report by Grant Thornton highlights that the Valencian Community, where the university is located, leads Spain with 44% of management positions held by women—four points above the national average and a remarkable 13-point increase from the previous year.

We conducted a mixed methods research (MMR) intervention design, combining a quantitative evaluation design (quasiexperimental design) with qualitative research to better understand the context and conditions surrounding the intervention. Using a before-and-after questionnaire and an interview, we explored whether there were changes in the outcome variables. We triangulated these quantitative data using interviews with the participants, explored their expectations about the intervention and obtained examples of the outcome variables (before intervention) and their experiences with learning and changes in those variables (after intervention). During the interviews, the interviewers presented the quantitative scores that the participants obtained for each outcome variable to better understand why they obtained that score in the questionnaire. Additionally, the interview results allowed researchers to adapt the content of their lessons (i.e., which is the leading style that they consider that most women leaders have). Although the originally eligible participants were women under 25 years of age who had recently finished their studies (undergraduate, master's, and PhD students), we had to widen the sample to women under 40 years of age because of the lack of voluntary participation. Thirty-eight participants were recruited from various undergraduate, master's, and PhD programs at the university where the research was conducted. Of the 21 women who participated in the intervention arm (5 were excluded because of age; 12 withdrew primarily because of the course schedule) and completed the baseline assessments, 18 participated in the follow-up assessment (86% response rate). Of the 18 participants, 10 were Spanish, while 8 had other sociocultural backgrounds (7 from Latin America and 1 from Morocco. To compare the program results, we recruited a control group ($n = 22$) with characteristics such as those of the intervention group; 20 of them participated in the follow-up assessment (91% response rate). The complete details of the intervention/control group characteristics are shown in Appendix 1, which shows nonsignificant sociodemographic differences between the groups. Additionally, out of the 28 mentors recruited, 18 mentors participated in the study, with 16 being Spanish and 2 from Latin America.

Procedure

We recruited participants in several ways. First, we sent an email via the official distribution list to all the university students where we performed the research, briefly explaining the PETRAS and the study requirements. Participation in the study began with baseline testing, including the completion of an online questionnaire and a personal interview, followed by weekly engagement in one session (Saturdays, 9:00–14:00) during the fall semester (November 2023-February 2024) and postintervention testing with the same assessment protocol. If their schedule did not permit or if they did not want to commit to the 10-week intervention program, we asked the students to participate in the control group, taking only baseline and postintervention testing. We also recruited participants through program presentations conducted by researchers in undergraduate and master's classrooms, where researchers engaged with final-year students to promote their participation in the study. Additionally, we hired a social media company to disseminate the program through social networks targeting the study's intended population. In both cases, we instructed students interested in participating to contact the research team via email, and we subsequently scheduled baseline testing.

Once they agreed to join the study, intervention participants completed quantitative and qualitative assessments before the intervention. To do so, we scheduled participants for an online interview after they completed the online questionnaires. We sent a reminder of the appointment to each person one day prior to testing. They completed the follow-up online questionnaires immediately after completing the final training session. They were then scheduled for follow-up online interviews one to two weeks later. We compensated participants for completing the entire program and the testing with a participation certificate.

We recruited control group participants through referrals from existing participants, who were asked to recommend at least one woman like themselves in age and study level. Additionally, as stated before, we approached potential participants who could not join the intervention due to scheduling conflicts. We compensated the control group participants who completed the quantitative testing with €30.

Qualtrics supported all the online questionnaires and provided feedback on the results of both the intervention and control groups after they completed them. The interval between the pre- and follow-up assessments was approximately 22 weeks for both groups.

We recruited mentors through the researchers' professional contacts and social networks such as LinkedIn. We asked mentors to send their curricula and participants to submit their professional aims to the research team. Once the mentors were recruited, their profiles were analyzed, focusing on their work experience and area of knowledge to ensure they possessed the necessary expertise to guide their future mentees effectively. Mentors were informed that their primary role was to support and attend to their mentees' needs by adhering to the PETRAS Mentorship Program guidelines. This preparation ensured mentors were well-equipped to provide valuable insights and guidance throughout the mentoring process.

The matching process was designed to create strong, productive relationships between mentors and mentees. During the second training session, students were asked to submit a professional goal they aimed to achieve. These goals and the mentees' areas of study were used to match them with mentors with relevant expertise or professional experience. This personalized approach ensured that each mentee was paired with a mentor who could provide targeted support and guidance, maximizing the potential for a mutually beneficial mentoring relationship. Before starting PETRAS, a kick-off meeting was held with the mentors and the mentees.

The institutional research ethics board of the university responsible for the research approved all the study material and procedures, and all the participants provided written, informed consent before their baseline testing session.

The PETRAS intervention

The PETRAS intervention pilot program consists of 50 h of training and three mentorship sessions for young women. The PETRAS was developed based on two previous pilot programs conducted by the research team. The first one (Machin & Cifre, 2020) was a 35-hour women's empowerment program based on the PERMA model of well-being (Seligman, 2011) designed to increase women's well-being through increasing their awareness of the structural elements of their gender identity and how it influences their leadership style. In this way, the program searched for the development of organizational and leadership skills that move beyond traditionally masculine stereotypes, favoring leadership roles that combine agentic and communal qualities. The second one (Laguna-Sánchez et al., 2021; Segovia-Pérez et al., 2019) was a 32-hour leadership program for high-potential university female students designed to increase students' leadership skills based on Open Innovation. These two different sections of the program are consistent with the two major areas of business knowledge and personal development described previously, which serve to cover relevant topics and general content on leadership from a critical gender perspective that incorporates not only individual but also structural and relational/social elements (Gartzia, 2021; Laguna-Sánchez et al., 2021).

The final 50-hour training program took place over ten weeks (five weeks in November–December 2023 and five weeks in February–March 2024, with a break due to the Christmas holidays and exams period). It consisted of 5-hour weekly sessions led by five trained university professors. Contrary to the previous experience (Selzer et al., 2017; Brue & Brue, 2016), which involved fewer hours and less time, this structure and long-term duration provided the opportunity to build closer ties between participants. It was intentionally designed to increase participants' awareness of the influence of gender on their leadership identity, on the one hand, and to increase their overall leadership skills and self-efficacy, on the other hand. This training program was based on experiential and transformative learning principles (Kolb & Kolb, 2005) and was adapted during the sessions to the different sociodemographic (i.e., culture, age) and study backgrounds of participants. These principles of transformative learning have already been successfully applied in recent women´s leadership programs (i.e., Herbst et al., 2024).

The training consisted of ten training units. The first one was the introductory session, which is the only session devoted entirely to making participants aware of the sex–gender system, including structural sexism in the Spanish socio-cultural context, and how it has affected and can affect them when making professional decisions (due to their incongruence between caregiving and professional/leadership roles) considering also participants' socio-demographic and studies background, as well as their working experience (usually related to their age). The following four sessions focused on the development of well-being based on the PERMA model, working on each of its elements (positive emotions, engagement, relationships, meaning, and accomplishments) adapted to the development of leadership identity. The last five sessions addressed developing specific leadership skills (leadership style and techniques; communicating adequately; negotiating efficiently; personal branding, social media and networking; and design thinking for developing personal and professional projects). The content of these sessions was like that of the third edition of the Laguna-Sánchez et al. (2021) program. In the last nine sessions, gender issues were mainstreamed transversally across all the sessions. Of the 10 sessions, 4 were led by a person of Latin American origin, while the remaining ones were led by Spanish teachers. All the material about the sessions is collected in the "PETRAS teaching handbook" available in open access both in the institutional repository and the PETRAS digital platform.

Overall, the ten training units covered both the areas of personal development and broader knowledge about business processes and leadership, which have been suggested to be important from a critical gender perspective in our Spanish context (Gartzia, 2021; Laguna-Sánchez et al., 2021). In this regard, previous Spanish WLDPs have focused on developing leadership skills and management knowledge but failed to raise awareness of the structural gender biases existing in the Spanish working contexts, the lack of role models, the development of less stereotypically masculine leadership skills, and critical process of self-evaluation and empowerment to perceive themselves as potential leaders (Gartzia, 2021; Laguna-Sánchez et al., 2021). In the PETRAS intervention pilot program some modules served to improve personal development, including identifying one's values and strengths, creating a personal brand and managing social networks, whereas other modules served to help these young women better understand the gender system and organizational structures, covering areas such as gender stereotypes at work, leadership styles and prototypes in organizations. The development of self-efficacy in relation to leadership was implicit in most sessions, drawing on Bandura's (1997) sources of self-efficacy, activities such as mastering experiences, reproducing vicarious experiences, improving social persuasion, and understanding physiological and emotional states were incorporated to strengthen participants' beliefs in their leadership abilities. In particular, we included a "well-being pill" activity in each session to increase positive emotional states as a source of self-efficacy (Bandura, 1997). For a full description of the PETRAS training session content and activities, please refer to Appendix 2.

After a joint kick-off meeting, the mentorship program consisted of three meetings (primarily online). We provided the mentors with a brief manual with basic information about mentoring and the aim of this mentorship in the PETRAS program. After that, mentors and mentees were free to agree on each session's schedule and content, which was personalized to each mentee's development stage. The general recommendations we provided suggested the following session content: Session 1 focused on building the relationship (by discussing the mentors' expertise, exploring the mentees' background, and establishing a mechanism or strategy for communication). Session 2 centered on the exchange of information, where the mentee's goals for the mentorship were defined, and the mentor was encouraged to teach the mentee to regularly review her goals. Session 3 focused on the formal conclusion of the mentoring relationship and future planning, where the mentor was encouraged to work with the mentee to define the types of support she might need in the future and to foster reflection on the progress made toward goal achievement and on the mentoring relationship itself. Mentors also use self-efficacy sources during their sessions (Cassanelli, 2024).

The whole PETRAS was supported on a dedicated, interactive online digital platform tailored to the program. It was used to communicate (teachers, participants, mentors) and to support training and mentoring materials.

Study measures

Quantitative measures

Each outcome was measured for the intervention and control groups at baseline and follow-up. We used, adapted, and validated measures that best captured each of these central constructs.

Leader identity We assessed leader identity using four items used by Lanaj et al. (2021). We back-translated the items into Spanish. Example items include "I see myself as a leader" and "Being a leader is very important to my sense of self." Internal consistency for the pre- and postintervention scale scores was good (Cronbach's α ranging from 0.91 to 0.90).

Leader self-efficacy We adapted the Judge et al. (1998) generalized self-efficacy scale (Spanish version by Pujol-Cols 2019) to leadership positions. Examples of items are "I am confident I would achieve the leadership position that I deserve" and "I would be capable of coping with most of my problems as a leader." Internal consistency for the pre- and postintervention scale scores was good (α ranging from 0.91 to 0.93).

Self-perceived leadership skills One of the main concerns of the program's *organisers* organizers was to learn the degree to which the intervention participants felt that their leadership skills had developed. The seven-item scale was based on the scale previously validated by Segovia-Pérez et al. (2019). In accordance with Bandura's (1997, 2006) recommendations, each item was prefaced with the stem "I am confident in my ability to…". Examples of items are "… negotiate effectively under the win–win premise" and "… design my own personal and professional project". The internal consistency for the pre- and postintervention scale scores was good (Cronbach's α ranging from 0.86 to 0.88). We performed a Pearson correlation between the pre and post-intervention overall scores of this scale and the pre and post-intervention self-efficacy items overall scores of the Compound PsyCap Scale (CPC-12; Lorenz et al., 2016) validated by Platania and Paolillo (2022). The results show that Self-perceived leadership skills (SPLS) pre-intervention and post-intervention scores correlate positively and

significantly with self-efficacy pre-intervention scores (0.85, $p < 0.01$; 0.78, $p < 0.01$, respectively) and post-intervention scores (SPLS pre-intervention 0.71, $p < 0.01$; SPLS post-intervention 0.65, $p < 0.01$). Please refer to Appendix 3 for a full description of the scale items.

All these measures used a Likert-type response scale ranging from 1 (*strongly disagree*) to 6 (*strongly agree*).

Qualitative measures

We used semi structured interviews to explore preintervention (T1) participants' perceptions of leadership in general and leadership performed by women in particular. We also asked about aspects that make a person become a leader and if they consider themselves leaders (leader identity) now or in the future. In the postintervention period (T2), we focused on changes in leader identity, perceived leadership skills, and self-efficacy. All the data were recorded and transcribed verbatim. The intervention participants' T1 interviews lasted between 41 and 83 min ($M = 59$ min), and the T2 interviews lasted between 17 and 73 min ($M = 41$ min). We anonymized them by allocating the letter "P" (participants) and a consecutive number according to the order in which the interviews were conducted.

Data analysis

Data preparation and quantitative data analysis

The quantitative dataset consisted of responses collected via an online survey platform (Qualtrics) from 41 young women at Time 1 (22 in the intervention group and 21 in the control group) and 38 at Time 2 (18 in the intervention group and 20 in the control group). Data were gathered in November 2023 (Time 1) and March 2024 (Time 2).

Data Cleaning. Incomplete responses (i.e., those with more than 20% missing data) were excluded to ensure data reliability. Only participants who completed the questionnaire at both time points were retained in the final sample. Participants in the intervention group who did not meet the attendance criterion of 80% of the sessions were also removed. These procedures resulted in a final sample of 38 valid cases (18 in the intervention group and 20 in the control group).

Missing Data. There were no items with less than 5% missing values because all the questions were mandatory. Participants could not advance in the questionnaire without answering each question.

Variable Transformation. All items were measured on a 1-to-6 Likert scale. No reverse-coded items were included. Composite scores were computed by averaging the items corresponding to each construct.

Assumption Checks. Prior to conducting parametric analyses, assumptions of normality were assessed. Because most of them did not due to the small sample size, we chose to use non-parametric statistics that do not assume normality of the data.

All procedures with the dataset and the quantitative data analyses were conducted using IBM SPSS version 29.0.1.1. We ran frequentist parametric and nonparametric two-sample tests, as well as Bayesian tests, due to their combined benefits. Frequentist two-sample tests, such as the t-test and the Wilcoxon Signed-Rank Test, allow the rejection of the null hypothesis using p-values. These values highlight the probability of finding a difference under the null hypothesis (Kelter, 2021). Both tests are adequate for small samples and with nonparametric distributions (Kelter, 2021). Because Bayesian two-sample test inference considers unknown parameters as useful, in contrast to frequentist inference (Kelter, 2021), we chose to run a Bayesian test to address this limitation of the frequentist tests. We conducted a paired sample t test to explore the before-and-after training differences in the outcome variables. Additionally, we performed a Bayesian t-test to provide a more nuanced measure of the variables, allowing for a detailed understanding of parameter uncertainty and more flexible confidence intervals. Because of the small sample size, we carried out a nonparametric analysis. First, we ran the Kolmogorov–Smirnov test to determine if the scores had a normal distribution. Because most of them did not, we chose to run the Wilcoxon signed-rank test for matched samples ($p < 0.05$).

Qualitative data analysis

We analyzed the interviews by performing a directed content analysis to identify which factors influenced leadership identity development. We guided the content analysis by the dimensions of the interview variables (i.e., beliefs about their leadership identity and self-efficacy, sources that promoted leadership self-efficacy, and expectations about the PETRAS).

The content analysis was conducted by two researchers, one of whom conducted the interviews. Thus, the first coding phase was led by the researcher who had conducted the interviews as having a closer connection to the data and, therefore, more able to recognize hidden meanings that are not always apparent following the transcription process. The content analysis sought to identify the beliefs and concepts about leadership, how participants perceived themselves as leaders if they considered having the abilities to be a leader, and the sources of leadership self-efficacy. The content was categorized and coded according to these themes.

Table 1 Correlations of intervention group T1 and T2 (N= 18)

	1	2	3	4
1. Age	-	− 0.09	− 0.21	0.44
2. Leader identity	0.30	-	0.60**	0.58*
3. Leader self-efficacy	0.24	0.49*	-	0.50*
4. Self-perceived leadership skills	0.14	0.58*	0.79**	-

Note 1: Time 1, below diagonal; time 2, above diagonal

Note 2: *p< 0.05, **p< 0.01

To ensure intercoder reliability, the coders independently coded a subset of the data and, when finished, held a meeting to verify whether they agreed on the coding. When they did not agree, the coders discussed the differences in the criteria and, through consensus, decided on the final coding criteria. Considering the new criteria, they coded the subset of data and repeated the process. Once they agreed on every coding, the remaining data was coded according to the final coding scheme.

Results

Table 1 shows the Pearson correlations between the sociodemographic and outcome variables in the intervention group at time 1 and time 2. Table 2 shows the means and standard deviations.

Table 1 highlights significant relationships involving the research questions listed in the introduction, particularly among leader identity, self-efficacy, and self-perceived leadership skills (research question 1). Age has no relationship with the rest of the variables. Among the outcome variables, as expected, there is a moderate to high positive correlation between self-perceived leadership skills, leader self-efficacy, and leader identity at both T1 and T2, pointing to the relevant role of leadership self-efficacy and perceived leadership skills as relevant precursors of leadership identity formation.

Table 3 Changes (postintervention score minus preintervention score) in the intervention and control groups

	Control group		Intervention group	
	z	*p*	z	*p*
Leader identity	− 0.773	0.439	-2.594	0.009
Leader self-efficacy	-1.609	0.108	-3.554	0.000
Self-perceived leadership skills	− 0.120	0.905	-3.226	0.001

In the following, we present the mixed method results in response to our research question.

Table 2 shows the mean scores and score difference summaries across the domains at baseline and at follow-up by group. When comparing the pre- and postintervention scores (related to research question 2), there were significant differences in the variables of leadership identity (p value <0.001) and leadership self-efficacy (p value =0.020) and between the control (leadership identity time 2 mean: 3.70; leadership self-efficacy time 2 mean: 4.40) and the intervention groups (leadership identity time 2 mean: 4.83; leadership self-efficacy time 2 mean: 5.19). No significant differences were observed between the control (time 2 mean: 4.50) and intervention groups (time 2 mean: 5.05) in the variable self-perceived leadership skills after the intervention (z 1.685, p value 0.093).

Table 3 shows the differences within the intervention group between the pre- and postintervention scores. The intervention group mean differences are significant (leader identity: p value ≤0.010; leader self-efficacy: p value ≤0.001; self-perceived leadership skills: p value ≤0.001). No significant differences are observed within the control group mean scores when comparing pre- and postintervention scores (leader identity: p value ≥0.05; leader self-efficacy: p value ≥0.05; self-perceived leadership skills: p value ≥0.05). The results answer the research question positively: participating in PETRAS increased participants' leadership identity.

Table 2 Comparison of outcome variables by condition

	Control		Intervention			
	M (SD)		M (SD)		z	*p value*
Leader identity						
Time 1	4.14	(1.05)	3.57	(1.15)		
Time 2	3.70	(1.25)	4.83	(0.77)		
Interaction (Group X Time)					-3.352	< 0.001
Leader self-efficacy						
Time 1	4.12	(1.17)	4.39	(1.79)		
Time 2	4.40	(1.22)	5.19	(0.62)		
Interaction (Group X Time)					-2.344	0.020
Self-perceived leadership skills						
Time 1	3.94	(1.00)	4.31	(0.83)		
Time 2	4.50	(0.99)	5.05	(0.56)		
Interaction (Group X Time)					-1.685	0.093

The results of the Bayesian t-test show the differences between the mean scores of pre and post-intervention scores of the intervention and control groups (see Table 4). For the intervention group, the Bayes Factor (BF) indicate that the mean differences are significant (leader identity: BF 0.14; leader self-efficacy: BF 0.05; self-perceived leadership skills: BF < 0.01). Contrarily, the Bayes Factor (BF) indicate no significant differences within the control group mean scores between pre and post-intervention scores (leader identity: BF 3.88; leader self-efficacy: BF 5.84; self-perceived leadership skills: BF 1.58). These results also answer the research question positively.

Participating in PETRAS increases leader identity and self-efficacy as well as self-perceived leadership skills. The following paragraphs explain the factors that facilitated this throughout the interviews.

Before the intervention, the intervention group participants perceived themselves as able to lead. Their motivation to participate in the intervention was to increase their self-confidence about being a leader and exerting formal leadership roles (e.g., being a supervisor at work). At the time of the intervention, few of them had worked in formal leadership or supervisory roles, and those who had some experience in leadership were students' representatives and baseline supervisors, except one who was a middle-level supervisor.

The social identity of those participants with no experience as formal leaders was distal to the leadership identity. Leadership in the terms they were familiar with was distant from their own identity. At the beginning of the intervention, the participants' preconceptions about leadership were the primary influence on not seeing themselves as leaders because of their reference to traditional leadership models, characterized by autocracy, which focus on results and competition. The participants did not identify themselves with the expected leadership behaviors of these leadership styles, pointing to the potential relevance of leadership skills in the process of leadership identity formation. The perceived mismatch between what was expected of a leader and their behaviors and preferences caused them to doubt their ability to lead. They believed that they did not fit the profile of the stereotypical leader they were familiar with.

> *'If I were a leader, I think it would be a bit more difficult for me to lead because I tend to put myself in people's shoes too much, and I have to be a bit more rational, perhaps'.* -Participant 3.

Connected to research question 1 about connections between self-efficacy, perceived leadership skills and identity formation, participants in leadership roles were hesitant to validate themselves as leaders because they felt that their leadership had many areas for improvement. These participants doubted whether they could exercise leadership on a larger scale, did not feel prepared, or lacked the self-confidence required to take on such responsibility.

> *'[…] yes, it is true that I feel I have the potential to lead. And yes, it is true that, right now, I am leading a group. But I have always felt like I was missing something else […]. I am very good at being flexible, supporting the group, being more present […] I need to improve being a bit more directive […] It is a bit difficult for me to be a bit tough in that sense'.* - Participant 8.

After the intervention, the participants increased their self-efficacy beliefs and leadership identities. Among the elements that supported them in changing were the opportunity to reflect on themselves, become aware of their personal strengths and values, and gain the knowledge to design a personal and professional development project and a plan to achieve it.

> *'I did not think (before the intervention) I had leadership attitudes at all, and now I do; and no, that is not because I have more aptitudes now. It is because I think that I have the same attitudes, but I have recognized that they can be useful (to lead).* - Participant 21.

Learning about character strengths (Peterson & Seligman, 2004) and reflecting on their values changed the participants' perspective on themselves and their potential. Knowing that character strengths and positive values are the basis of responsible and transformational leadership increased their confidence in relation to exercising leadership positions in the present or in the future. Additionally, these strengths are developed through conscious actions, nurturing the idea that leadership can be learned and developed.

Table 4 Bayes T- test results for the intervention and control groups

	Control group			Intervention group		
	M -diff	BF	95% CI	M -diff	BF	95% CI
Leader identity	0.13	3.88	[LB -0.17, UB 0.42]	0.69	0.14	[LB 0.19, UB 1.20]
Leader self-efficacy	0.01	5.84	[LB -0.28, UB 0.30]	1.07	0.05	[LB 0.41, UB 1.73]
Self-perceived leadership skills	0.19	1.58	[LB -0.06, UB 0.43]	1.10	< 0.01	[LB 0.61, UB 1.59]

M -diff mean difference, *BF* bayes factor, *95% CI* 95% credible interval, *LB* lower bound, *UB* upper bound

'*I remember things from the classes about values, which values are important to me and how I can lead from there. That it (leadership) makes sense. […] I can also be a leader with characteristics that are not (stereotypically) feminine, but characteristics that I feel closer to me'*. – Participant 10.

At the beginning of the intervention, the participants were asked to define an objective they wanted to achieve in their careers. This objective was a starting point for the mentoring program and for practicing project development techniques. The participants had to include their strengths and values as leverage points to attain their objectives. In this sense, learning an innovation strategy to develop their personal project (i.e., design thinking) was crucial for the participants.

Knowing that having doubts about a project or idea and consulting other people to clarify them is a strength, not a weakness, was a turning point for the intervention participants. The knowledge acquired through the design thinking approach supported the transversal perspective of leadership as a developmental process prompted during the intervention. The participants realized that leadership can be learned and fostered. Therefore, assuming that they were leadership learners helped them project themselves as leaders.

"[…] as I said before that (becoming a leader), it is something planned, that it is not something that comes out of you […]. I already know my skills, and I can structure them and create a plan that allows me to do it. And that has made me feel more capable (to lead)'. – Participant 9.

During the intervention, the participants were informed about the types of leadership, and emphasis was placed on transformational leadership, one of the leadership styles most practized by women (Eagly et al., 2012). The findings that transformational leadership is one of the most beneficial leadership styles for employees and organizations validated the participants' interest in caring about people while achieving objectives. Relating to RQ2, knowing about different leadership styles prompted the participants to assume a leadership role. They also realized that to achieve it, they must have an active role in preparing themselves and searching for career-developing opportunities.

'[…] the part (of the intervention) that has helped me the most to reaffirm myself has been the one on female leadership, […] where I have been able to say ok, I do have a positive leadership style that is linked to how I am'. – Participant 1.

'[…] we also have to do our homework in the sense of knowing how to sell ourselves, knowing how to find those opportunities and not wait for the opportunities to come to us, but to go, to look for them, to go for it.' – Participant 14.

Relying on a support network built by peers, teachers, and mentors was very influential in developing their leadership self-efficacy and identity.

'I think the mentoring helped me reframe my projects or objectives that were proposed abstractly. What we (the participant's mentor and her) did was to say well, I want this, I have this time for this, and these are the things that I have to do. So that was a supremely positive aspect (of the intervention)'. – Participant 13.

This support network was also perceived as a source of vicarious learning, as the participants identified role models to follow to achieve their goals within the PETRAS community (peers, teachers and mentors).

'Having contact with women […] knowing that they had my same fears and doubts, […]. So, to be able to share with them was incredible for me. Having them on LinkedIn and seeing what they do inspires me. […] I said in the first interview that I wanted to surround myself with people looking for the same thing as me, and PETRAS gave me that'. – Participant 16.

Discussion

Overall, the pilot study results are promising, indicating that a women-only-leadership-based intervention can effectively enhance leadership identity and self-efficacy in young women. Contrary to the criticism regarding interventions exclusively dedicated to women, our results, coinciding with other previous Women Leadership Development Programs (WLDP) (Brue & Brue, 2016; Selzer et al., 2017; Sayers-Brown et al., 2024), support the effectiveness of directing training exclusively to women, providing them with a safe environment and inner changes. A significant time–by–condition interaction indicates that participants in the intervention group improved key factors related to leadership by the end of the program. Specifically, while findings suggest no overall change concerning self-perceived leadership skills considering time–by–condition interactions, differences in improved leadership identity and self-efficacy were evident in the intervention group within and between groups.

Preliminary examination of the baseline scores revealed that the intervention group began with higher self-perceived

leadership skills and self-efficacy but with lower leader identity than did the control group. This could be one of the reasons why it was so complicated to obtain voluntary participation in the PETRAS, as young women might feel that they did not need a program such as this one because they already felt able to lead. However, they did not identify themselves as leaders. In fact, this leader identity decreased significantly at time 2 in the control group but increased by more than one point in the intervention group, suggesting that the whole program (training and mentoring) had achieved its purpose.

The findings of our study, which employed mixed methods research demonstrate the potential to improve leader identity in young women but also identify the core factors contributing to this improvement. Initially, correlations indicated (related to RQ1), that all measured outcome variables (leader identity, self-efficacy, and self-perceived skills) were closely and positively related both pre- and postintervention, which was further confirmed in the qualitative section, highlighting the importance of addressing these factors concurrently. These findings suggest that leadership self-efficacy can play a pivotal role in shaping leadership identity formation. Participants with higher levels of self-efficacy also demonstrated greater confidence in their leadership abilities, which in turn facilitated their identification as leaders. This relationship was particularly evident in how individuals with strong self-efficacy engaged more proactively in the program, viewed challenges as opportunities for growth, and reflected on their potential to develop their leadership identity. These results align with existing literature suggesting that self-efficacy serves as a motivational force driving behaviors and attitudes necessary for identity construction (e.g., Haber-Curran & Sulpizio, 2017). By highlighting this connection, our study underscores the importance of fostering leadership self-efficacy as a mechanism to enhance leadership identity formation, particularly in contexts where individuals may lack confidence in their leadership potential.

Quantitative analyses related to our RQ2 of how the leadership intervention can play a role in contributing to these young women´s leader identities, further analyses within the intervention group compared with the control group revealed significant improvements in leader identity and self-efficacy. Qualitative analyses of personal interviews enriched these quantitative findings, revealing key factors that support these changes. These factors include a shift in participants' understanding of expected leadership behaviors and styles, particularly transformational leadership, and an increased awareness of personal strengths and values aiding in designing personal development projects. Additionally, the realization that leadership skills can be learned and where seeking and addressing doubts with others is seen as a strength are important factors. The presence of social support from diverse peers, teachers, and mentors provided a reflective and supportive environment for their growth. With respect to this result, vicarious learning seemed to be the most self-efficacy source used by the participants. Role models significantly determine leadership expectations on leaders' role aspirants (Gatzia et al., 2021). Parallel previous WLDP (Brue & Brue, 2016; Selzer et al., 2017) demonstrated positive results of role models through mentoring and as a catalyst for relational support and role knowledge, confirming leadership development as a social learning process and networking acquisition.

Importantly, the program seems to have reduced the mismatch and perceived incongruity between women's self-perception and the traditional leader prototype (Eagly et al., 2012). These young women initially did not view themselves as potential leaders, which is consistent with women's general view of themselves and others as particularly communal (Gartzia et al., 2021). Through the program, however, they seem to have learned to disassociate leadership roles from purely agentic traits. Empowered by this knowledge, the participants improved their general leadership identity and self-efficacy, possibly understanding that effective leadership does not necessarily require solely being agentic. These women in our program seem to have embraced more genuinely their authentic selves and recognized the value they can bring as leaders to their organizations.

This shift in perception may empower them to take on leadership roles with greater confidence and effectiveness, ultimately promoting a more inclusive and diverse leadership model within their future companies.

In summary, our findings corroborate the existing literature, which posits that self-efficacy is a crucial motivational factor in shaping behaviors and attitudes essential for identity construction (Haber-Curran & Sulpizio, 2017). By emphasizing this relationship, our study highlights the significance of nurturing leadership self-efficacy to bolster leadership identity formation, especially in environments where individuals may doubt their leadership capabilities. Furthermore, consistent with previous WLDP studies (Brue & Brue, 2016; Selzer et al., 2017), our results affirm the positive impact of role models through mentoring, serving as a catalyst for relational support and role knowledge, thereby reinforcing leadership development as a social learning process and networking acquisition. Finally, our program appears to have mitigated the discrepancy and perceived incongruity between women's self-perception and the conventional leader prototype (Eagly et al., 2012). As expected, considering the novelty of the program design, no previous studies have found similar results. Initially, these young women did not perceive themselves as potential leaders, aligning with the general communal self-view among

women (Gartzia et al., 2021). However, the program taught them to decouple leadership roles from exclusively agentic traits, fostering a more inclusive understanding of leadership. We state that leadership program interventions' design (and evaluation) must be gender-aware to be empowering and transformational.

Limitations and future studies

Although the study showed some promising results, several notable limitations are worth considering. First, as this was a pilot study, the small sample size limited our ability to conduct advanced statistical analyses, such as structural equation modelling, which should be explored in future research. Despite the sample and study design being comparable to those in previous research on Young Women's Leadership Development Programs (YWLDPs) (e.g., Ericksen, 2009; Selzer et al., 2017), some exceptions exist, such as Deutsch et al. (2023), which included 161 participants. Future studies would benefit from adopting methodologies used in other leadership program research, incorporating larger and more diverse samples or more controlled experimental designs (e.g., Rosch & Stephens, 2017). In this regard, even though having participants with diverse sociodemographic and studies backgrounds allows for the generalization of the results (Grahe et al., 2020), future research directions include replicating the program in different institutions (such as the universities involved in this study) and expanding its implementation to other European universities, adapting the program to the different sociocultural contexts, to increase its external validity. Additionally, extending data collection to a third time point (T3) would enhance the robustness of the analyses conducted.

Second, we relied on pre-test-post-test data without intermediate time points, which may not fully capture the progression of change in participants' leadership identity and self-efficacy. Future research employing advanced statistical techniques, such as growth curve modelling, could provide a more detailed measurement of change over time. By including additional time points between the pretest and post-test, future studies can better understand the dynamics of leadership development and gain a more nuanced understanding of the intervention's impact.

Third, while the measurement scales used showed high internal consistency, future research could benefit from incorporating more comprehensive and validated measures of leadership identity and self-efficacy.

Fourth, we used a convenience sampling frame, including women who volunteered to participate in the program, with a control group that did not show their interest in participating. This leaves open the possibility of response biases and confounding. In line with previous literature recommendations (e.g., Ely et al., 2012; Haber-Curran & Sulpizio, 2017), randomized assignment (randomized controlled trial, RCT) could be implemented to enhance the quality of the experimental study. Thus, future research using an experimental design should randomly assign women who volunteer to participate into either the intervention or control group. This random assignment could include a simple random assignment, where each participant has an equal chance of being assigned to the control or experimental group, or stratified random assignment, which ensures that specific subgroups (e.g., by age, area of studies, etc.) are equally represented in both groups. The control group would be placed on a waiting list for the next edition of the program, as originally intended.

Practical implications and recommendations

The findings of this study offer several practical implications, particularly for policymakers, organizational leaders, and educational program designers seeking to foster female leadership.

Together, our findings show that it is important to design programs using a holistic methodology in which educational settings, organizations and institutions aiming to foster leadership identity formation among young women should prioritize initiatives that enhance leadership self-efficacy and reinforcement of their genuine leadership skills. This recommendation is supported by our results, which showed significant improvements in leader identity, self-efficacy, and perceived leadership skills, along with qualitative evidence of shifts in leadership perceptions, alignment with transformational styles, and greater self-awareness and belief in the learnability of leadership. This can be achieved through targeted development programs, such as leadership training, mentorship, and role-shadowing opportunities, that build confidence in leadership abilities. Because communion and caring represent stereotypically feminine critical skills in organizations, particularly for leaders (Gartzia, 2024), developmental programs focused on strengthening young women´s skills in these domains can clearly connect them to leadership self-efficacy and identities. This would not only benefit these individual women but also enhance organizational functioning by fostering leadership and organizational values that value interpersonal and communal strengths.

Given the potential for positive effects on leader identity and self-efficacy for young women transitioning into the labor market, the PETRAS program can be delivered as a cocurricular program offered to final year (undergrad, master's, doctorate) university students. In this way, universities must incorporate these courses not only in an extracurricular way but also in their degree plans, whose impact would

be more significant if they reached all student profiles. Their suitability can even be considered at pre-university ages, as this impact on self-efficacy can serve as a catalyst for feeling capable of leading and pursuing masculinized careers, such as degrees in STEM fields. The incorporation of leadership in STEM careers is especially relevant, not only because their sectors are very masculinized, but also because society needs to incorporate the vision of women in the digital transformation we face. The effect would be double: on the one hand, women would be incorporated into sectors where the work of the future is, and on the other, the perspective would be changed to help other women in their essential digitalization.

Additionally, creating a culture both in educational (such as universities) settings and in organizations that encourages students/employees to take on leadership roles in low-risk environments can help reinforce self-efficacy through experiential learning. Providing regular, constructive feedback and recognizing leadership contributions are also critical in strengthening individuals' belief in their capabilities. Universities and organizations should ensure teachers and managers are trained to support these efforts by actively mentoring team members and modelling behaviors that promote resilience and reflective practices. By investing in these strategies, universities and organizations can cultivate a pipeline of leaders who not only excel in their roles but also possess a strong, resilient leadership identity. They also highlight the importance of delivering this content from a gender perspective in its design, implementation, and evaluation to facilitate the development of the leader identity within the professional identity of the participating women. In this sense, UN Women (2021) urges collaboration with diverse women's and civil society organizations for an inclusive and participatory approach.

Also, this program assists future success in integrating the skills acquired. It enables participants to establish a broad professional network with their colleagues, professionals, and program team, providing both a sense of security and the opportunity to create mutual support networks independently of their sociodemographic background and their studies. Therefore, it is essential that these programs establish mechanisms to ensure the creation and sustainability of these professional networks among all participants, as well as their connection with their original professional networks. This will reinforce long-term support systems, foster career development, and enhance opportunities for collaboration beyond the program itself.

Additionally, PETRAS, as a novelty, confirm the effectiveness of the integration of management skills training and the deconstruction of gender leader stereotypes and self-identity, i.e., to the best of our knowledge, this is the first intervention study to target leadership identity in young women while considering not only leadership skill development but also personal growth and empowerment as women. Previous programs either focus on the personal dimension and self-efficacy, self-esteem, etc., or on business leadership skills and management tools. Our results encourage future WLDP consider both, in a comprehensive and related way, aware that both are necessary to achieve improved self-esteem/self-efficacy and confidence in their capabilities and leader identity. Also, previous programs (Brue & Brue, 2016; Selzer et al., 2017) which were developed within higher education institutions have had a more strategic vision based on equity business policies and cultural change to improve organizations from the human resource perspective. In comparison, our program was born within the framework of pure research, based on the previous experience of two programs in the university environment. After an in-depth analysis of the strengths and weaknesses of these two programs, we generated PETRAS with a comprehensive evaluation system to search for future improvements. Compared with previous experience (Brue & Brue, 2016; Selzer et al., 2017) we aimed to offer solid evidence about a holistic WLDP with positive results that future practitioners and program developers can apply to mitigate gender discrimination and the psychological constraints these young women face pursuing leadership roles. Consequently, these transformational leaders will be better able to generate changes not only at the structural level in their organizations but also have an impact with their open and equitable vision in other social spheres.

Also, programs should be developed using active methodologies, with a focus on organizational innovation as Brue and Brue (2016) previously suggested. Based on previous programs (i.e., Laguna-Sánchez et al., 2021), PETRAS also reveals the potential of using an Open Innovation methodology compared to other previous programs (Brue & Brue, 2016; Selzer et al., 2017) because it considers the opinions of all the stakeholders involved. This should consider the selection processes for both participants and faculty. The key role of faculty as agents of transformation is not only through their teachings but also through their own diverse experiences, which add significant value and deeply impact the students. Using these role models illustrated attainable success (Brue & Brue, 2016; Selzer et al., 2017). Furthermore, student diversity in terms of profiles and/or sociodemographics and studies backgrounds, while being aligned in their life stages, will be a cornerstone in creating an atmosphere of trust that facilitates the achievement of objectives. Also, it is essential to incorporate mentoring programs to provide professional and personal support for participants (Laguna-Sánchez et al., 2021). Nevertheless, Brue and Brue (2016) provide us with a reflection on the future implementation of PETRAS in organizations or the future program

development, considering the importance of women's mentorship relationships with senior leaders who sponsor female juniors, and not only mentorship, sharing their stories, imparting their wisdom and guide them.

It is essential to consider the participants not as a homogeneous group of 'just young women' but in their full diversity. Their intersectionality (including factors such as age, education, and cultural background) should be acknowledged, along with their individual psychological components, such as their motivation to engage in the program. This perspective aligns with the need to evaluate and consider multiple identities within psychological sciences, particularly from socioecological and cross-cultural perspectives (Causadías et al., 2023). Such an approach enables a more tailored adaptation of the sessions and a better matching process with mentors. Also, the diverse sociodemographic backgrounds and studies/working experience of everybody participating in the program (teachers and mentors) should be considered (Fish, 2023). Additionally, contextual factors, such as the predominance of small and medium-sized enterprises (SMEs) in the region, should be taken into account to facilitate a smoother transition into the labor market.

Finally, it is essential to provide the developed materials as open-access resources to ensure accessibility for minority groups and individuals with limited financial means. This approach encourages a greater diversity of voices in both scientific and applied settings, fostering collaboration and facilitating program replication (Grahe et al., 2020).

Summing up, the program promotes conscious and transformative leadership capable of changing social realities in two ways. Programs such as PETRAS help promote female leadership, increasing the chances of reducing the gender gap in senior management positions, which ultimately means incorporating women's vision in decision-making. In this line, it is essential to be aware of the gender biases that the incorporation of AI in human resources management is causing in the labor market. To minimize these negative effects, all initiatives aimed at incorporating gender equality policies are essential (Vásquez-Pérez, 2024). This issue is one of the pillars pointed out by UN Women (2022) to guarantee a more diverse and fair society, which implies increasing the presence of women at all decision-making levels in institutions and political processes. On the other hand, women who follow the program can become mobilizing agents, ensuring that diverse women's voices are heard, and that diversity is fully present in the organization and allows for a transformation of the organizational culture itself. This conscious, responsible and transformative leadership leads us to cooperate with men, trying to mitigate the growing discourse of positive discrimination and the impact on men so that the social climate within companies is improved, but also, since these reflect society, in society. Additionally, reducing gender inequality in leadership not only fosters organizational justice and innovation, but also has measurable economic benefits. According to the fifth edition of the Closingap report (2025), analyzing the index in terms of economic impact, it is observed that the cost of inequalities between women and men has an adverse effect of 255,000 million euros for Spain's economy, the equivalent of 17.1% of the Gross Domestic Product (GDP) in 2023. These data highlight the economic imperative of implementing policies and programs that promote women's leadership and participation in decision-making roles.

Gender differences are socially constructed and are the root of structural segregation, masculine culture, and institutional and sectorial impediments to women's progression to leadership positions (Segovia-Pérez et al., 2019). Nevertheless, achieving change in this gendered structure requires an organizational commitment through practices and policies and a clear defense of the progress of underrepresented groups also considering the sociocultural context and backgrounds. Gender equality can be achieved from the base within organizations if leaders commit to this goal. The current program promoted conscious and transformative leadership that should facilitate inclusive progress and thus have an impact not only on gender equity but also on other disadvantaged groups (e.g. race, age). Since diversity science centers on the construction of difference, Plaut (2010) encouraged exploring dimensions beyond traditional categories like race and ethnicity. However, gender remains underrepresented within this framework. This study seeks to address this gap, aiming to reduce gender discrimination and enhance equity in workplace settings, promoting social justice and change by applying these research findings to advocate for policies and practices that foster greater fairness and inclusion in workplaces, education, and leadership.

Conclusion

Diversity science can be enriched by incorporating the gender perspective in action. The intentionally designed PETRAS intervention has demonstrated a positive impact on leadership identity and self-efficacy in young women

transitioning into the labor market, equipping them to navigate structural gender discrimination. PETRAS is the first intervention study to address leadership identity in young women, going beyond leadership skill development to foster personal growth and empowerment as women. The program includes both training and mentoring in a women-only setting and has shown significant changes in all three assessed outcome variables. However, only two of them (leadership identity and self-efficacy) exhibited a group × time interaction, as evidenced by both qualitative and quantitative analyses. Importantly, PETRAS has been enriched by the diversity of all those involved—participants, mentors, and teachers—embracing differences in sociocultural background, age, and fields of study. These findings contribute to leadership theory and practice from a gender-sensitive perspective, exemplifying diversity science in action. Additionally, the study offers practical recommendations for implementing similar interventions in diverse settings and emphasizes the importance of further research that examines gender in intersection with other structural factors, such as sociocultural context, background, age, and field of study, to inform the development of future leadership programs. The practical implications of PETRAS are particularly relevant, providing actionable insights for policymakers, industry leaders, and educators. More than a leadership training initiative, PETRAS serves as a catalyst for social enrichment and professional networking—benefiting not only the participants but also generating value for their organizations. Beyond their academic relevance, these results have economic and policy implications, as improving leadership identity and self-efficacy in young women contributes to more inclusive labor markets, strengthens organizational leadership pipelines, and supports broader gender equality policies aligned with national and international equity agendas. Ultimately, PETRAS contributes to building a more just and inclusive society by promoting a transformational leadership style grounded in equity and empowerment.

Appendix 1

Table 5 Intervention and control group characteristics and demographics

	Total (N= 38)		Control (N= 20)		Intervention (N= 18)		t or X^2 (p value)
	n	%	*n*	%	*n*	%	
Age, M (SD)	29.55	(4.94)	28.9	(4.30)	30.28	(5.60)	− 0.85 8 (0.20)
Working situation							4.92 (0.18)
Only study	11	28.9	4	20.0	7	38.9	
Work and study	11	28.9	5	25.0	6	33.3	
Only work	13	34.3	10	50.0	3	16.7	
Unemployed	3	7.9	1	5.0	2	11.1	
Current studies							6.88 (0.14)
Degree	8	21.0	3	15.0	5	27.8	
Master	8	21.0	4	20.0	4	22.2	
Doctorate	3	7.9	0	0.00	3	16.7	
Studying for civil service exams	2	5.3	2	10.0	0	0.00	
Not studying	17	44.8	11	55.0	6	33.3	

Appendix 2

Table 6 Training session content (5-hour session) and example of recommended activities

Session	Example of exercise
	Introductory session
2. Gender Awareness	- Identification of Barriers. Each participant identifies the barriers that they or other women they know have faced in developing their careers and accessing leadership positions. Then, they indicate the resources (personal, psychological, social, familial) they have relied on to overcome these obstacles.
	Module 1: Building personal resources (based on the PERMA-Well-being model; Seligman,2011)
3. Positive emotions and relationships	- Watching and class discussion of the video *"How to Be Happy by Managing Positive Emotions"* by Marian Rojas. - Identifying the Relationship Network. Participants are asked to identify the people who make up their relationship network using different prompt questions (e.g., Who supports and helps you when you need it? To whom do you dedicate your time? With whom do you have fun? Who are the key people in your network that help you feel well? Who is at the center of your life?). They are then asked to write these names on a spiderweb drawing, placing the most important person at the center. This exercise is inspired by Margarita Tarragona (2014). *Tu mejor tú: Cómo la psicología positiva te enseña a subrayar las experiencias que fortalecen*. Alianza.
4. Engagement and flourishing	- Strengths Identification. Participants are asked to complete the VIA Character Strengths assessment (https://www.viacharacter.org/) to identify their own strengths. Then, they are encouraged to reflect on how they apply these strengths in different life roles (e.g., family, work/studies, social life, or other areas).
5. Achievement	- Identifying achievements. Participants draw a tree. On the foliage, they write their dreams (goals they aspire to achieve), and on the fruits, they write the goals they have already accomplished in any area of their lives
6. Meaning	- Identifying personal life purpose. Participants are encouraged to write down their life purpose as a starting point for aligning their goals with it. An example of a personal mission statement or life purpose is: *"My mission is to use my gifts of intelligence, charisma, and optimism to cultivate self-esteem and self-worth in women around the world"* (Source: https://superhabitos.com/ejemplos-de-mision-personal)
	Module 2: Building basic leadership skills
7. Professional project design	- Design Thinking with LEGO. Participants are encouraged to create their professional vision using LEGO pieces. For more information, see: https://davidgauntlett.com/wp-content/uploads/2013/04/LEGO_SERIOUS_PLAY_OpenSource_14mb.pdf
8. Communication skills	- Practical exercises of for voice projection
9. Leadership skills	- Leadership self-assessment through the MLQ (Multifactorial Leadership Questionnaire) by Bass & Avolio (1990).
10. Negotiation skills	- Watching and class discussion of the video "How to negotiate to win in 6 steps" https://www.youtube.com/watch?v=TwlAU7aGsBg15
11. Personal branding	- Creating your own professional profile in LinkedIn, supported by the teacher.

Note 1: Most exercises are done primary in an individual way, then shared by couples, and finally they share the main conclusions by the "big group"

Note 2: All exercises can be found in open access in the "PETRAS Teaching handbook" at http://hdl.handle.net/10234/704573

Appendix 3. Self-perceived leadership scale

Self-created from PETRAS skills development sessions.
Response Scale:

- The scale ranged from 1 to 6: Totally disagree = 1; Strongly disagree = 2; Somewhat disagree = 3; Somewhat agree = 4; Strongly agree = 5; Totally agree = 6.

Items:

1. I am confident in my ability to speak publicly correctly in front of a group of people.
2. I am confident in my ability to communicate assertively with my work team.
3. I am confident in my ability to negotiate effectively under the win–win premise.
4. I am confident in my ability to identify my strengths and weaknesses.
5. I am confident in my ability to create a personal brand that identifies me as a professional.
6. I am confident in my ability to lead a group of people with an effective style adapted to my way of feeling about life.
7. I am confident in my ability to design my own personal and professional projects.

Acknowledgements We would like to thank Plonick for supporting the project promoting sample collection by publicizing the PETRAS program through social networks. In addition, a special thank you to Dr. Mercedes Segarra and Dr. Alma Rodríguez for helping to lead the PETRAS training intervention. Also, Dr. M. Carmen Delacalle-Durán for her support in designing the mentoring program. Finally, we want to thank all the volunteered mentors who supported the mentoring intervention.

Funding Open Access funding provided thanks to the CRUE-CSIC agreement with Springer Nature. Open Access funding provided thanks to the CRUE-CSIC agreement with Springer Nature. This study received financial support for the research and the publication of this article from Generalitat Valenciana, Spain (grant number This study received financial support for the research and the publication of this article from Generalitat Valenciana, Spain (grant number CIAICO/2021/136)).

Data availability The datasets analysed during the current study are available in the institutional repository http://hdl.handle.net/10234/696813. Supplemental material for this article such as the "PETRAS teaching handbook" is available online at https://doi.org/10.6035/CIAICO.CG.2024.

Code availability Not applicable.

Declarations

Ethics approval This study was performed in accordance with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of the responsible university (14/07/2023; No. CEISH/62/2023).

Consent to participate Informed consent was obtained from all individual participants included in the study.

Conflict of interest The authors declare no potential conflicts of interest regarding the research, authorship, and/or publication of this article.

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