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Gendered Motivations to Pursue Male-Dominated STEM Careers Among Spanish Young People: A Qualitative Study

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Abstract

The present study examined gender differences in the motivations leading young people to pursue highly male-dominated STEM [\[AQ1\]](#) degrees and careers. Seventeen young people, either enrolled in university studies or working in the private STEM sector, were interviewed. Drawing on the factors influencing teaching–choice theory, the results suggest certain similarities and differences between male and female participants. Male participants' intrinsic values associated the decision to follow STEM studies with specific objects that had attracted them since childhood, while women's interests revolved around the techniques and processes associated with their specific STEM field. Whereas women emphasized the extent to which their career decisions were based on teachers' encouragement, men emphasized the role of family tradition and mass media. Social utility values associated with the STEM field were important for women, whereas men stressed attainment of personal values. There were no gender differences in the task return–related values associated with choosing an STEM career.

Keywords

gender differences, expectancies, motivations, STEM, values

Women's share of the STEM fields varies across disciplines (Eccles, 2013 [\[AQ2\]](#); Sáinz & Eccles, 2012). In Spain, for the academic year 2015–2016, women represented a significant percentage of enrollments in many scientific disciplines, such as mathematics, chemistry, or biology, accounting for 38%, 52.67%, and 61.82%, respectively, of student enrollments in these university studies (MECD, 2017). [\[AQ3\]](#) Above all, women outnumbered men in disciplines related to the provision of health care, such as medicine or pharmacy, representing, respectively, 65.8% and 69.58% of total enrollments in these studies. However, the numbers dropped when it came to physical science, a discipline in which

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women represented only 25.62% of university enrollments. With regard to engineering, women were especially underrepresented in computer science, electronics and automatics, and electricity and energy—representing 17%, 11.83%, and 17.39%, respectively, of enrollments in these disciplines. This underrepresentation of women in various STEM fields is not exclusive to Spain, as it can also be observed in other Western countries (Eccles, 2015). In these countries, although women are highly represented in biomedicine, they too are underrepresented in engineering and hard sciences (Jerrim & Schoon, 2014).

The study of young people's gendered motivations in choosing studies and careers with a special focus on STEM has been the focus of research during the last 40 years (i.e., Eccles, 2009; Sáinz & Eccles, 2012; Wang & Degol, 2015 [AQ4]). However, there is a lack of research on what drives the motivations of men and women who have already selected highly masculine STEM studies and careers such as engineering or physical science. To what extent are the motivations of men and women already in highly male-dominated STEM fields similar or dissimilar? The present study aims to fill in these research gaps.

Most of the research conducted about young people's gendered motivations to pursue STEM careers and studies has been based on surveys (Wang & Degol, 2013). There is therefore a dearth of qualitative studies examining these issues. In the research presented here and in order to explore this topic in the context of Spain, a qualitative approach consisting of semistructured interviews with young people already following STEM careers has been carried out. In this regard, the present research provides new insight into the study of young people's motivations in choosing STEM studies and careers traditionally dominated by men. Interestingly, to meet this objective, the present research took its inspiration from the theoretical model describing young people's motivations for choosing teaching—a highly female-dominated field—as a career choice: factors influencing teaching (FIT)-choice. In Spain—like in other international contexts—STEM careers like engineering have been traditionally associated by young people with prestige, difficulty, employment, and money (López-Sáez, Puertas, & Sáinz, 2011; Sáinz, Meneses, López, & Fàbregues, 2016). However, boys and students planning to pursue male-dominated STEM studies seem to attach higher extrinsic value to these studies than girls and people interested in pursuing other studies (Sáinz & Müller, 2018). This therefore means that Spanish boys develop a higher interest in choosing these STEM careers (López-Sáez et al., 2011; Sáinz & Müller, 2018). Furthermore, existing masculine stereotypes associated with highly male-dominated STEM occupations discourage Spanish girls from choosing these career pathways, given that they do not identify with that prototypical masculine image (Sáinz et al., 2016).

Motivational Beliefs and the Pursuit of a STEM Career

The theoretical background used in this study to explain why young people choose STEM studies and careers has been inspired by the FIT-Choice Scale, developed by Watt and Richardson (2007). This framework provides a comprehensive model on why people choose a teaching career. For this purpose, this theory focuses on three key elements (self, value, and tasks) of the expectancy value theory (EVT)—one of the most prominent motivational theoretical frameworks mainly developed to explain gender differences in achievement and career choices—and includes antecedent-phase socialization and previous experience perception items identified by the model (Watt & Richardson, 2007).

According to EVT, the choice of university studies is most directly influenced psychologically by ability, perceptions of competence (expectations for success), and the task value attached to the different available options (Eccles, 2015; Wigfield & Eccles, 2002 [AQ5]). Individuals will therefore choose those studies they believe they can master and that to them are of value to them (Eccles, 2013 [AQ6]). That is, values and ability beliefs (expectancy for success) are the most important predictors of academic choices and behaviors. In addition, subjective task values consist of the following components

(Eccles, 2009): interest value (enjoyment or liking), utility value (how useful the task is in fulfilling personal goals), attainment value (the value attached to the task that is congruent with personal and collective identities), and costs (the social, economic, and psychological costs of participating in a particular task).

This FIT-choice theory identifies the following key elements in order to analyze the reasons guiding young people's decision to choose teaching as a career path (Watt & Richardson, 2007): self-perceptions of ability, intrinsic value, fallback career, personal utility value (comprises aspects related to the attainment of personal goals such as job security, time for family, and job transferability), social utility value (the attainment of social-oriented goals, such as shaping the future of children/adolescents, enhancing social equity, making a social contribution, or working with children/adolescents), prior teaching experiences, social influences (referring to the influence of other people), social dissuasion, beliefs and decision factors, task demand (in reference to expertise and high demand), and task return (comprising social status and salary).

This theoretical background will provide the present study with a solid point of departure from which to disentangle gender differences among young people's decisions to pursue STEM careers. In this regard, it is worth noting that, whereas teaching (especially in primary school) is a highly female-dominated career path, STEM fields such as engineering and physical science are male dominated. For this reason, it seems reasonable to use this theoretical paradigm to analyze the similar and divergent motivations leading young people to choose highly male-dominated STEM careers. To the authors' knowledge, this theoretical framework has been exclusively used to analyze people's motivations to pursue teaching. Interestingly, it has been used in the understanding of STEM teachers' motives for choosing teaching (Watt, Richardson, & Pietsch, 2009). We therefore expect that many of the reasons driving young people to pursue these highly male-dominated STEM careers will be similar to the ones steering teachers' choices. Moreover, we can also expect that men and women participating in this study will allude to comparable but also dissimilar reasons for having chosen these highly male-dominated STEM career paths. A qualitative deductive approach informed by the FIT-choice theory is thereby used in this study to examine the following eight motives for pursuing STEM careers: self-perceptions of ability, intrinsic value, fallback career, personal utility value, social utility value, prior experiences, social influences, and task return.

Gender Differences in the Pursuit of STEM Careers

There is a complex array of factors explaining why women opt for some STEM disciplines and opt out of others (Eccles, 2015). According to EVT, boys and girls choose different academic and career paths. Achievement-related behaviors such as education and career choice are related most directly to expectations for success and the value attached to the various options perceived as being available. Individual characteristics and experiences associated with STEM-related activities shape the development of self-efficacy, interests, task values, and long-term life goals, which in turn influence education and career choices in STEM and non-STEM fields (Jacobs, Davis-Kean, Bleeker, Eccles, & Malanchuk, 2005). Therefore, it is likely that gender differences in STEM field selection are associated with gendered differences in motivational beliefs (e.g., self-efficacy, interests, and task value). This theory also links individual differences in motivational beliefs to experiences in school, peer, and family contexts. Eccles and her colleagues suggest that teachers, peers, and parents are in a position to create opportunities for students to engage in a variety of STEM- and non-STEM-related activities through educational experiences, special programs, and so on (Eccles, 2015; Wang, 2012). These experiences, in turn, provide children or adolescents with information about their competence and emotional memories of various activities.

Gender differences in occupational preferences are also important predictors of female underrepresentation in STEM careers (Wang & Degol, 2015). Many studies indicate that women and men

demonstrate different work preferences and occupational aspirations, which are already visible and formed in adolescence (Diekman, Brown, Johnston, & Clark, 2010; Eccles, 2009). Women prefer occupations that allow them to interact with people, whereas men prefer occupations that involve work with objects, machines, and tools (Eccles, Barber, & Josefowicz, 1999).

Role congruity theory proposes that, in part, STEM careers are not appealing to women because they are not perceived as affording typically feminine communal goals, such as helping people (Diekman & Steinberg, 2013). Highly masculine STEM careers like engineering or physical science are generally associated with affording the agentic goals related to power, success, and individualism that are attractive to men. These STEM careers are generally not perceived as being helpful to others or as having a positive social impact, and this is seen as an obstacle to attracting women to these careers (Diekman et al., 2010). Based on this theory, the greater representation of women in certain STEM fields, such as those which are biology related or chemistry, could be attributed to the fact that these occupations are perceived to be more likely to afford communal goals than other STEM fields.

Gender differences in vocational preferences also seem to be related to whether the interest is in people or things (Graziano, Habashi, Evangelou, & Ngambeki, 2012). STEM occupations with a larger proportion of women are those that are perceived as being more people oriented (Su, Rounds, & Armstrong, 2009), whereas those with a larger proportion of men are those that are perceived as being thing oriented. A recent research study conducted in the United States combining both people and thing orientation and role congruity theory (Yang & Barth, 2015) showed that STEM fields that have a greater representation of women attract students who are relatively less thing oriented and more people oriented.

Despite this people/thing orientation possibly being an important factor shaping men's and women's academic and career choices, there may be other motivational beliefs (such as the influence of other significant people, intrinsic values, social utility values, and so on) driving young people to want to enter highly male-dominated STEM fields. To determine this, the context of teaching as a career choice (Watt & Richardson, 2007) has been an important reference framework in interpreting the results of the present qualitative study, which is aimed at understanding young people's (university students and young professionals in STEM fields) motivations for choosing a highly male-dominated STEM field. Teaching is congruent with feminine roles and it is therefore expected that people enrolled in teaching score high in social utility values, such as working with children, or making social contribution. A study with teachers in STEM subjects inspired by the FIT-choice theory concluded that female teachers were more motivated to work with adolescents than their male counterparts, and across STEM disciplines, women rated the demands of teaching (i.e., expertise) higher than men (Watt et al., 2009).

The study research questions are therefore as follows: (Research Question 1) Did male participants differ from female participants in their motivations to choose a highly male-dominated STEM field? (Research Question 2) Did male and female participants report having been influenced by the same role models and similar social influences? (Research Question 3) Did they express their self-perception of abilities in the same terms? (Research Question 4) Did they mention the same values as an explanation for having selected male-dominated STEM fields? and (Research Question 5) Did they attribute the same task return opportunities to these STEM fields?

Method

Study Design

This study employed a qualitative descriptive design (Sandelowski, 2000[AQ7]) to develop an in-depth, accurate, and detailed understanding of young people's motivations for pursuing male-dominated STEM careers, expressed in their own words. This design was selected because it involved

low-inference interpretations, which allowed us to stay close to the data, understand the meaning that participants attributed to their thoughts and beliefs, minimize research biases, and obtain straightforward answers to our research questions. As argued by Kahlke (2014), qualitative description is particularly relevant when, as in the current study, the research questions do not fit within traditional and clearly delineated qualitative approaches (e.g., ethnography, phenomenology, grounded theory, or case study). Furthermore, the use of qualitative description was consistent with our primary interest to describe and understand the subjective nature of the motivations expressed by the participants.

Sample

Purposive sampling was used to select eight STEM undergraduate university students and nine STEM professionals. To be eligible for the study, students had to be at least in their second year of the STEM bachelor's degree. Professionals had to be employed in the private sector, be working in a STEM field, and have a minimum of 1 year's and a maximum of 5 years' work experience in this field. Within both groups, variation was sought for gender and type of bachelor's degree. In comparison to students enrolled in male-dominated STEM university degrees, the participation of junior career participants could contribute to provide a fuller picture of the motives associated with the pursuit of those STEM careers.

Participant identification involved a number of formal and informal strategies, including: (a) asking friends, relatives, and acquaintances if they, or someone in their social network, knew of any potential participants; (b) contacting students' associations, university professors, and private firms from the STEM field, and (c) snowballing from initial contacts. This process was followed until data saturation was reached on the basis that new data did not generate additional insights. Saturation was assessed by the principal investigator by reading the verbatim transcripts of the interviews, and as a result, nine male participants and eight female participants were recruited. These numbers are consistent with sample size recommendations suggested in the literature on qualitative sampling (Guest, Bunce, & Johnson, 2006[AQ8]; Kuzel, 1999). Before scheduling the interview, all participants were screened individually via telephone and/or e-mail to ensure that they met the eligibility criteria.

Full characteristics of the study sample are displayed in Table 1. Participants were living in the metropolitan areas of Barcelona (eight students and three professionals) and Madrid (six professionals). In regard to gender representation, 37.5% and 55% of the students and professionals, respectively, were female. The mean age of participants was 22.1 ($SD = 1.3$) for students and 28.2 ($SD = 3.3$) for professionals. Students were enrolled in degree courses in physical sciences ($n = 3$), computing engineering ($n = 2$), telecommunications engineering ($n = 2$), and physics engineering ($n = 1$), whereas professionals had completed degrees in industrial engineering ($n = 3$), physical sciences ($n = 2$), telecommunications engineering ($n = 2$), aeronautical engineering ($n = 1$), and mining engineering ($n = 1$).

Data Collection

Semistructured interviews were carried out by the research team from April to September 2016. All the interviews were conducted in Spanish and took place in locations selected by the participants, such as university campuses, workplaces, or coffee shops. Each participant was interviewed once. The interviews ranged from 40 min to 1½hr. Each interview ended when the researcher felt that all the topics had been covered. When needed, follow-up prompts were used to encourage the interviewee fully expand his or her thoughts on the question discussed. No time or other interview setting constraints were experienced.

Before starting the interview, and after describing the main objectives of the study, each participant provided informed consent and authorization to make an audio recording of the interview. The 17

Table 1. Characteristics of the 17 Study Participants.

ID	Type	Gender	Age	Place of Residence	Bachelor Degree	Years Since Degree Completion	Total Years of Working Experience
P1	Student	Woman	22	Barcelona	Telecommunications engineering	—	—
P2	Student	Woman	23	Barcelona	Telecommunications engineering	—	—
P3	Student	Man	21	Barcelona	Physics engineering	—	—
P4	Student	Man	21	Barcelona	Computing engineering	—	—
P5	Student	Man	25	Barcelona	Computing engineering	—	—
P6	Student	Man	22	Barcelona	Physical sciences	—	—
P7	Student	Woman	22	Barcelona	Physical sciences	—	—
P8	Student	Man	21	Barcelona	Physical sciences	—	—
P9	Professional	Woman	27	Madrid	Industrial engineering	4	4
P10	Professional	Woman	27	Madrid	Telecommunications engineering	3	2
P11	Professional	Man	25	Madrid	Mining engineering	3	3
P12	Professional	Man	25	Madrid	Aeronautical engineering	4	3
P13	Professional	Man	29	Madrid	Industrial engineering	2	3
P14	Professional	Woman	27	Barcelona	Industrial engineering	4	4
P15	Professional	Woman	28	Madrid	Telecommunications engineering	5	4
P16	Professional	Woman	36	Barcelona	Physical sciences	12	4
P17	Professional	Man	30	Barcelona	Physical sciences	5	4

interviews were transcribed verbatim by a professional transcriber. The interview guide, which was developed based on the key topics of the literature review and the research questions, included three sets of questions, addressing why participants had decided to pursue their STEM degree, how they would describe the prototypical image of a STEM professional (i.e., physical and psychological traits, type of work done), and what the key barriers to and facilitators of women's access to their STEM sector were. Each set of questions was given the same importance and allocated time within the interview. Only the findings related to the reasons for pursuing a STEM degree are presented.

Data Analysis

Interview transcripts were imported in QSR NVivo 11, qualitative data analysis software that allowed data to be managed, coded, and analyzed using qualitative content analysis (Schreier, 2012). This method was particularly suitable because it allowed us to focus and analyze in a systematic and flexible way only those categories of interest in the interview data set. Qualitative content analysis involved three steps. In the first step, an initial version of the coding frame was developed based on Watt and Richardson's (2007) FIT-choice framework. In the second step, the coding frame was tested by two coders using 30% of the interview data set. NVivo's coding comparison was used to contrast both codings and to discuss the units of coding, which were assigned different codes.

The coding comparison allowed us to ensure that both coders had similar interpretations of the codes and to evaluate the consistency and validity of the coding frame. When disagreement between coders occurred, divergences were discussed and when no agreement was reached, a third member of the team was brought in. No intercoder reliability score was used as after several rounds of discussions,

agreement was reached on both the meaning of the codes and the segmentation of data in coding units. Such agreement was assessed by reviewing each code of the coding scheme to ensure similar understanding and standardized application of these in the data. As a result of the pilot coding test, a few changes were made, such as removing irrelevant codes and merging similar ones. The third and final step, the main analysis phase, involved applying the coding frame to all interviews. Once all the data set was coded, NVivo's matrix coding query was performed to compare interviewees' responses in relation to their attributes.

Results

Intrinsic Value

A considerable number of the interviewees ($n = 12$) mentioned a high intrinsic value as a clear motivation for pursuing their university studies. In other words, they reported having chosen those studies because they liked them. Both male and female participants reported having encountered difficulties when deciding on which studies to pursue. However, for some men ($n = 2$), their motivation was related to childhood interests such as computers or explosives. That is, during childhood, these participants developed an intense attraction to the STEM studies they finally selected.

When I was a child I used to watch cartoons where inventions and inventors making machines were showcased and, like that, I was drawn to them: I wanted to become an inventor. There were also movies, more related to computing, where computers or programs were showcased and I told myself: I want to make these things. (Participant 4, man)

Interestingly, this kind of early motivation was not explicitly mentioned by women. In this sense, women did not identify any specific hobby or activity when commenting on the reasons that had inspired them to enroll in the university STEM courses they finally chose.

I was attracted by the fact that you could encompass so many fields of knowledge that you did not have to choose any particular field. I had no particular vocation, I had no specific hobby like sailing or something similar. (Participant 7, woman)

Furthermore, some male participants ($n = 4$) reported having a high level of interest in specific objects (such as structures, airplanes, or helicopters) and practical issues (like "the building of machines"). However, women ($n = 8$) reported having more general and applied interests in issues like science, math, health, machinery, or structures of scientific reasoning. In this regard, a female telecommunications student stated to have chosen engineering because of her preference for "stuff containing a mathematical process, that departs from any idea that can always be resolved" (Participant 2, woman).

As an exception, two male physics students also expressed an interest in pure science, or in the deepest part of mathematics that contained a less philosophical approach to physics, such as Newton's laws, as a main motivation for entering this particular STEM field.

At the beginning, I was attracted by the most philosophical part of physical science, in terms of space and time, quantum mechanics, things like that. And then, once at university, above all I developed an interest in the deepest part of math, not as much philosophically, but rather Newton's laws . . . (Participant 8, man)

In line with the FIT-choice theory, these results suggest that intrinsic values played a major role in explaining participants' motivations to pursue a STEM career.

Social Influences

In relation to social influences, there were relevant gender differences regarding how participants described the important role that some family members and teachers had played in the final decision they made. In general, women ($n = 7$) acknowledged the influence of some significant individuals. The support and suggestions provided by a high school teacher were especially relevant for some of the female participants ($n = 5$).

Well, when I was in ESO [AQ9] [obligatory secondary education in the Spanish education system] I had a male teacher who introduced me to that passion for science, because to tell you the truth I was going to go for Arts. (Participant 1, woman)

However, although some male participants referred to family members and acquaintances already working in the STEM field they finally selected, they were rarely identified as an influence. In relation to the influence of the presence of family members in the STEM field, few male ($n = 2$) or female participants ($n = 2$) acknowledged the important role that relatives had played in their career-related decisions.

With regard to concrete role models, again some important gender differences were detected. While for women, high school teachers ($n = 5$) were their main role models, male participants identified certain male family members or acquaintances working in STEM fields ($n = 4$) as their role models.

My uncle is my most immediate reference. He is a civil engineer. He has been always focused on this job. (Participant 11, man)

In addition, when female participants referred to the influence of family members ($n = 3$), they mentioned people who mentored them or engaged them in technical tasks. In general terms, with the exception of one female participant whose cousin was the first woman in the family to choose a technological career, female participants lacked a specific role model to follow.

In terms of the influence of mass media, some men referred to the main characters of books, cartoons, or movies who were male scientists and acted as role models for them when they were children or teenagers ($n = 3$). Interestingly, two male physical scientists explicitly referred to the work published by two influential physical scientists: Stephen Hawking and Richard Feynman. In contrast, women did not mention having any specific role model from the mass media, with the exception of one female participant who referred broadly to the influence of science fiction movies without specifically mentioning one.

There are lots of famous characters. I don't know, but the truth is that I have not paid particular attention to any of them, or to any person to follow his or her paths. (Participant 7, woman)

These findings support the important role that for the FIT-choice theory, the motives associated with socialization constructs play in young people's career choices. When narrating the social influences that motivated their study choices, some women ($n = 5$) recognized that they had to cope with certain negative gender stereotypes due to their counter-stereotypical academic and career preferences. However, and in line with expectations, male participants did not mention having faced any negative gender stereotype associated with their study choices in STEM.

Self-Perceptions of Ability

When talking about their decisions to pursue a highly male-dominated STEM field and corroborating the theoretical background, allusions to self-perceptions of ability were very frequent in both male

($n = 4$) and female ($n = 5$) participants. All of them reported that they excelled in STEM subject areas such as math, physical science, technology, or technical drawing when they were in high school.

I have always been very good at math, physical science, and technology [. . .] I did not hesitate about enrolling in the technological high school because I was very good at those subjects. (Participant 14, woman)

In addition, noteworthy gender differences were encountered. For some women ($n = 3$), their parents' and other significant people's gender stereotypes were an important factor conditioning their perceptions. Consequently, at some point in their academic and professional career, they admitted having called into question their own STEM abilities.

[My parents] thought that I was good at the arts and that science could be challenging, but that I would be able to pass it. At this point, it was me who doubted it. (Participant 1, woman)

Contrarily, men reported having a high degree of self-confidence both in relation to their perception of their ability and their ability to manage potential challenges associated with the STEM field they had already selected.

Previous Positive Experiences

Contrary to expectations, few interviewees indicated that having positive past experiences involving the chosen field was a major reason for selecting that particular STEM career. Only one female professional engineer referred to having had previous experiences at home with her father fixing electrical appliances (like the TV set) during her childhood. These experiences in early childhood were seen as positive and shaped her interest in mechanical and electronic devices.

My father has helped me a lot. He, for instance, is very handy at everything. I always asked him. When the TV set broke, my father opened it and I used to tell him, "Hey, show me how to do it." (Participant 15, woman)

A few participants (two men and two women) positively mentioned their participation in "open house days" or in student associations, but those who did failed to acknowledge such participation as being a decisive experience in their final career choices.

And then when they took us to the open house days, that was very beautiful. You have access to the labs, but the life of a physical scientist does not 100% take place in a lab. (Participant 17, man)

Given the lack of cases and the notable variety of participant discourses in this regard, no gender similarities or differences can be highlighted in relation to this motive.

Social Utility Value

Relevant gender differences were observed with regard to this subject matter. Some men ($n = 2$) referred to the possibility of creating, inventing, and controlling the environment as an important reason for having chosen the specific STEM discipline they were engaged in. Contrarily, some women ($n = 3$) talked about social utility values (such as improving the life of people) as the main motivation for having decided to pursue a STEM degree. Some of these female participants ($n = 3$) acknowledged that they missed the "human side" of the STEM studies or jobs they were engaged in. In this regard, they reported that they aspired to make contributions that would build a better world, help people

through research on diseases or the development of health applications, or by working with people from other places and “living things.”

I like dealing with an electronic board that a single person may use or a specific application that helps people. (Participant 1, woman)

An important motivation among women was their work’s potential applicability to concrete social problems (mainly focused on health or environmental issues). Interestingly, while health issues featured as a main source of motivation for some women ($n = 3$), for men, health was never the principal objective associated with their work in the STEM field.

I always imagined being able to work developing algorithms in order to better detect an arrhythmia in someone using a pacemaker, or in the event of health problems. (Participant 10, woman)

In addition to this, contrary to some male participants, women did not put much emphasis on other applications (like security systems for banks or the automotive industry) associated with the specific STEM field. Similar to assumptions made by the theoretical background, social utility value was an important motive mentioned by the participants.

Personal Utility Value

Very few interviewees alluded to this kind of motivation ($n = 6$), mostly women ($n = 5$). They generally appreciated, as a personal utility value, that the selected STEM studies would prepare them not only to be rigorous “mathematically” and “practically” speaking but also to become self-sufficient professionals, capable of learning fast and of solving problems autonomously.

I had two options: math and physical science. I did not like the theoretical part of math. I was looking for something practical, mathematical and rigorous [...]. (Participant 17, male)

You learn to fend for yourself. So, this attracted me the most. I loved that, many times, they left us alone to fend for ourselves (...), [to learn] how to be autonomous. (Participant 9, woman)

In addition, it should be noted that three of the female engineers interviewed recognized that it was not until they had attained a certain degree of professional experience that teamwork played a major role in the development of any professional project.

I had always imagined [...] that we would have to develop and design a system that does this and that. Well, how would you do it? Then, you think of it and create it, [...] even develop it. Ideally, I had thought of it like that. Now I realize that it’s a bit more complex. Each person has their own space, and who designs something is not the same as who builds it or tests it. (Participant 15, woman)

Contrary to expectations, motivation related to personal utility values was not mentioned by all participants enrolled in these highly masculine settings.

Task Return Opportunities

The vast majority of the interviewees (eight men and eight women) mentioned aspects related to task return opportunities (i.e., social status or salary). For some of them (three men and four women), when choosing the male-dominated STEM careers finally selected, the decision was associated with good professional gateways, future opportunities, or high wages.

With regard to future prospects and considering the economic crisis we were in at the time, I saw that any engineering or technology aspects were a clear example of a future through which I could make a living [...] If this would help me get a job at some point in the future, I'd do it. Not because I liked it. (Participant 5, man)

In comparison to other degrees in the field of humanities (such as history), the task return opportunities of these STEM disciplines were perceived to be much higher.

[...] I have some friends who studied History and cannot find a job. I also wonder why they are studying history if they know that the professional gateways are going to be scarce. I rule out something that has no professional gateways, even though I really like it. Right now in my profession, I am doing this; if I see that doing this I cannot get ahead, then I will change directions [...]. (Participant 9, woman)

Aligned with assumptions by the theoretical framework, participants commented on motives associated with task values opportunities.

“Fallback” Career

Contrary to theoretical assumptions, no cases mentioned this kind of reason as a main driver for their career choices in STEM. This could be an indicator of the extent to which these STEM careers were chosen taking into consideration not only the benefits (good professional opportunities) but also the costs (time and dedication) associated with them. Apparently, all participants seemed to have taken up STEM careers with the conviction that they were in the direction in which they wanted to develop their talents and skills.

Discussion

The present study tackles a pertinent issue, namely, gender differences in motivations to pursue highly male-dominated STEM careers such as engineering, computer science, or physical science. The low presence of women in these highly male-dominated studies and occupations appears to be a major concern of both scholars and policy makers (Diekman & Steinberg, 2013; Wang & Degol, 2013). As research points out, women's interest in STEM careers is incongruent with existing feminine gender roles and the associated communal goals (Diekman et al., 2010; Eccles, 2015). The FIT-choice theoretical background, which draws from the expectancy value theory of achievement-related motivation, has guided the analysis of the present research and the justification of its main results. This model seems to be a useful strategy for analyzing not only young people's motivations for pursuing a teaching career (Watt & Richardson, 2007) but also for studying young people's motivations for pursuing careers in highly male-dominated STEM fields.

Regarding Research Question 1 (Do male and female participants differ in their motivations to choose a highly male-dominated STEM field?), we have also observed outstanding gender differences in the motives that male and female participants attest to having influenced their career choices in some of the highly male-dominated STEM studies and careers they were already involved in. This is one of the main contributions of the present research. In this regard, one of its strengths has to do with this intergender comparison of young people's motives to pursue male-dominated STEM careers.

All participants associated their study choices with a high intrinsic value, such as their preference for or enjoyment of STEM subject areas (i.e., physical science or math) when they were in junior high and high school (Eccles, 2005 [AQ10]; Watt & Richardson, 2007). However, whereas male students tended to justify their choices by alluding to a strong attraction to the field since childhood, female participants did not attribute their being drawn to STEM to childhood preferences. This gender difference is likely associated with how congruent STEM careers are with masculine roles (Diekman et al.,

2010). Following this line of argumentation, for men, developing an attraction to male-dominated STEM careers in childhood is congruent with their masculine gender roles.

Furthermore, regarding Research Question 2 (Did male and female participants report having been influenced by the same role models and similar social influences?), the social forces guiding male and female participants' choices seem to be different. Whereas female participants acknowledged the influential role played by their teachers in the final decisions they made, male participants identified cartoons, outstanding personalities in the field, or family tradition as sources of inspiration for their ultimate STEM choices. Moreover, and in line with expectations, most female participants recognized that they lacked specific role models in these male-dominated fields, particularly, feminine role models. In fact, some of the female participants stated that, as the selected STEM fields were incongruent with feminine gender roles (Diekman et al., 2010), they had to face discriminating comments that on occasions led them to question their own abilities.

Likewise and with regard to Research Question 3 (Did male and female participants express their self-perception of abilities in the same terms?), male and female participants seem to differ in the way they transmit their abilities in the different STEM fields they are engaged in. Men tend to highlight their abilities in STEM fields, whereas women tend to be less consistent in recognizing their abilities in these fields. This finding confirms the results of several studies suggesting that young women are more clearly to underestimate their abilities in STEM fields such as math or physical science, while men are likely to overestimate them (Sáinz & Eccles, 2012; Wang & Degol, 2013). This could be a result of how the socialization process in the family or school context shapes the way men and women evaluate their own abilities and talents in these STEM fields (Eccles, 2009, 2015).

Few participants mentioned aspects related to positive previous experiences when talking about their ultimate study choices. This is one of the motives least mentioned by the participants in the interviews. Only a few participants (mostly male) had positive previous experiences in STEM fields throughout their life course that inspired their ultimate study choices in these fields. Despite not having these previous experiences, the participants were interested in following this professional path. This finding calls into question the role that previous experiences may have in guiding young people's (above all, women's) motivations to choose highly male-dominated STEM fields.

Regarding Research Question 4. (Did male and female participants mention the same values as an explanation for having selected male-dominated STEM fields?), we have observed that gender preferences regarding working with people versus objects play a crucial role in the underrepresentation of women in highly male-dominated STEM fields such as engineering or physical science (Graziano et al., 2012; Su et al., 2009). However, in line with expectations, most female participants alluded to the social utility value attached to the selected STEM field (Eccles, 2015). They did choose a highly masculine STEM career, but they expressed a strong people orientation (Diekman et al., 2010). That is, female participants commented on how the development of technological tasks could involve an improvement in people's health or way of life and that this was one of the main motives for their STEM choices. On the other hand, male participants did not mention this social utility value.

Furthermore, although all participants highlighted the personal utility value associated with choosing these studies and occupations (and more specifically the transferability of skills associated with the different STEM fields), more men than women talked about these issues. However, some of the female participants also talked about the important role that teamwork played in these fields. It is precisely the negative stereotype about the lack of interaction with other people associated with STEM disciplines that deters young women from entering these fields (Sáinz et al., 2016).

Generally speaking and with reference to Research Question 5 (Did male and female participants attribute the same task return opportunities to these highly male-dominated STEM fields?), male and female participants did not differ much in terms of the task return opportunities (access to the labor market, salary, future, and professional gateways) associated with the pursuit of the respective STEM careers they had already selected. Both genders highlighted the importance that the good professional

outlooks associated with the specific STEM fields finally chosen played in their decision to enroll in these studies. This finding confirms the results of other studies in Spain, where it is believed that engineering and other highly masculine disciplines are associated with good job opportunities (López-Sáez et al., 2011). This has been especially true during the years of the recession, given that in Spain most technologically oriented jobs (except those associated with real state) have suffered less from the cuts and other negative effects associated with the economic crash.

Contrary to expectations, no fallback career-related motives were mentioned by any of the participants. It is noteworthy to highlight that, whereas it is an important motive raised by literature on teachers' motivations for pursuing the profession (Watt & Richardson, 2007), it was not explicitly mentioned by people enrolled in these highly masculine STEM careers. This may suggest that people enrolled in highly male-dominated STEM careers seem to be highly motivated to enter and persevere in this STEM field. This could also be associated with the difficulty linked to these careers, which leads participants to enter the field, not to try their luck but to develop their skills. However, this aspect requires further research.

Limitations, Future Research, and Ideas for Intervention

Two limitations associated with qualitative research should be stressed. First, the study sample was small and may not be representative of the motivations of all the young STEM students and professionals in Spain. Given that differences in cultural and educational values may lead to different motivations to pursue a STEM career, the findings are not generalizable to the general population. Second, it is not possible to determine the true frequency of theme endorsement by the participants. The motivations for choosing a STEM career were derived from open-ended interview questions and not from a predefined list of motivations. Therefore, the fact that a certain motivation was not spontaneously mentioned in the interview does not necessarily mean that this motivation was not shared by the participant. Future studies may benefit from other methodological approaches (i.e., a survey) looking at gender differences in the reasons leading young people to pursue work in highly male-dominated STEM fields.

Since most women in STEM fields are not thing oriented and consequently not interested in "thing" jobs (Graziano et al., 2012), emphasizing the people dimension of STEM careers alone may not be enough to encourage women's participation in STEM. That is, interventions should also highlight the potentialities of both the thing and people dimensions of STEM careers in order to attract more women in STEM. It is therefore expected that women interested in the things dimension are most likely to go into male-dominated STEM fields (Wang & Degol, 2015). Underlining the social dimension of STEM fields may be beneficial to reaching a goal of gender equity across STEM fields.

Given that gender differences in interests are fairly stable during children's development (Wang & Degol, 2013), any intervention carried out early on in education will be important in changing male and female students' views of the different STEM career paths.

Furthermore, as social influences were also identified as a relevant source of motivation to pursue highly male-dominated STEM careers, actions addressing how high school teachers and career advisors could encourage young women to enroll in these STEM studies could also be beneficial. For instance, career advisors and secondary teachers should receive training on how to encourage that students make realistic decisions on the choice of studies and occupations far from the influence of gender roles and stereotypes. Moreover, career advisors can be encouraged to conduct practical interventions targeting families to guide their children's decisions accordingly to their talents instead of to their parental expectations. In addition, these interventions can incorporate STEM professionals (some of them women) who may inspire young women to make study choices in these fields.

Participants enrolled in university studies seemed to have a more idealistic view of the decisions they made than young professionals already in the profession. University students' lack of job experience causes them to have a limited view of the STEM field they have already selected. Based on this

finding, it would be beneficial to design interventions targeting university students in which young STEM professionals (including women) introduce them to the different applications and utilities associated with these particular STEM jobs.

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