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Gender Stereotypes and Attitudes Towards Information and Communication Technology Professionals in a Sample of Spanish Secondary Students

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Abstract

This study examined Spanish young people's gender-stereotyped beliefs and attitudes about people working in the field of information and communications technology (ICT). For this purpose, their positive, negative, and neutral perceptions of the associated characteristics of these workers were also analyzed. Likewise, the use of masculine, feminine, or neutral expressions to describe these professionals was explored. The existence of gender differences in these aspects was also investigated. 900 students from Catalonia (51 % girls) enrolled in the last course of junior secondary education (mean of age=15 years old; S.D.=1.73) participated in a survey with close and open-ended questions. Content analysis of responses to an open-ended question indicated that the boys and girls held several stereotypical beliefs about ICT professionals (a highly male-dominated field), but they also reported counter-stereotypical beliefs about them. As expected, these stereotypical beliefs described a masculine portrayal of ICT workers. Contrary to expectations, most of the students' portrayals of people working in ICT were either positive or neutral, not negative. Likewise and opposite to predictions, young males did not show more positive attitudes towards ICT professionals than girls. In fact, both girls and boys evaluated more positively than negatively the different descriptive aspects associated with ICT professionals. In support of expectations, most boys and girls referred to masculine role models working in ICT. No gender differences were observed in the type of characteristics associated with ICT professionals. However, young females were more likely to offer feminine references about professions where ICT is the tool rather than the object of their work. The theoretical and practical implications of these findings within the context of Spain are discussed.

Keywords

Attitudes, Gender Roles, ICT Stereotypes . Underrepresentation

Introduction

Gender differences in choice of studies emerge in adolescence when Spanish (López-Sáez et al. 2011; Sáinz and Eccles 2012) and US (Eccles 2007) secondary students begin to orient their academic trajectory through their selection of subjects before transitioning to high

school. North American research suggests that these career-related decisions are frequently based on inaccurate information about the available subjects and occupations (Eccles 2007). Thus, secondary school years are of interest for the study of stereotypical portraits of occupations, as US students do not consider many of the potential options because they do not believe that these choices will fit well with existing gender roles or other social role schemas (Eccles 2007). These stereotypical portraits of US men and women are "acquired partly through experience and work as guidelines for social interaction, even when objectively wrong" (White and White 2006, p. 259). Moreover, late primary schoolchildren and adolescents in the US presumably use these standards when contemplating future career choices (Eccles et al. 1999; Eccles 2007).

Most of the existing literature of the last 30 years tackling young people's gender stereotypical beliefs about occupations has been conducted in North America (Cejka and Eagly 1999; Eccles 1994; Levy et al. 2000; among other authors). But a recent study conducted in Spain using an Implicit Association Test (IAT) also shows that secondary students have stereotyped beliefs regarding engineering and medical professions (López-Sáez et al. 2011). Male and female participants appraised more positively female university students enrolled in medicine than those enrolled in engineering, provided these participants perceived that medicine was congruent with feminine roles (i.e. provision of care). In Spain, women represent approximately 50 % of the workforce in the medical profession and about 70%of the resident physicians (DiarioMédico [Medical News] 2014). On the contrary, engineering was perceived as incongruent with such feminine gender roles and for this reason they appraised negatively female students enrolled in engineering. This research line is still a topic of interest in the US (Barker and Aspray 2006; Eccles 2007) and Spain (López-Sáez et al. 2011), due to women being underrepresented in technological fields in these two countries. The field of Information and communications technology (ICT) is an example of this underrepresentation.

Both North American (Bair and Marcus 2007; Barker and Aspray 2006; Goode et al. 2006) and Spanish (Castaño 2011; Sáinz and López-Sáez 2010) research illustrates that ICT education and labor market are particularly male-dominated and very much gender-typed. In Spain, the rate of female university enrollments in computing is decreasing (around 17 %), in contrast to the moderate participation of women in telecommunications engineering (26 %) (Instituto de la Mujer [Women's Institute] 2012). Likewise, there is a dearth of women who opt for technological university degrees (representing 27 % of the enrollments). This low enrollment is particularly striking if we take into consideration the high participation of females in non-technological university degrees related to health (72 %), social sciences (62 %), or humanities (61 %). However, provided the good rates of employment associated with the provision of ICT products and services in Spain (Castaño 2011; Statistical Office] 2014), which is linked to ICT's current role in information society (Castaño 2011), it is necessary to analyze Spanish young people's portrayals of those working in ICT. Likewise, given the multiple applications of ICT to real world situations in Spain (Castaño 2011; Sáinz 2007), it is also crucial that Spanish boys and girls learn to consider ICT as a future career option, in which to develop their respective talents.

In line with research carried out in the US "the picture of gender stereotypes one obtains may differ if people generate their own list of traits, as opposed to responding to the one provided by the researcher" (Rudman and Glick 2010, p. 89). The present study aims thereby at analyzing masculine stereotypical portrayals of ICT professionals in a sample of Spanish secondary students, by means of a content analysis of open-ended question responses. It also examines students' appraisals of these portrayals, as well as the extent to which girls report more negative than positive or neutral appraisals than boys do about people working in ICT. Equally, it attempts to look at secondary students' expressions of gender regarding the portrayals associatedwith ICT professionals and the extent to which boys and girls report more masculine than feminine and neutral references related to these professionals. Studies from other countries can benefit from the findings of the present research, as some aspects under analysis may be applicable to other contexts and to other professional settings (i.e. female-dominated like nursing in the US, Cejka and Eagly 1999). In addition, the present research combines the study of the content of young people's gender stereotypes about people working in ICT with their attitudes and gender references associated with ICT professionals. Knowing more about this can provide inspiration for interventions oriented to challenge these stereotypes and their prescriptive role.

Gender Roles and Stereotypical Beliefs about ICT

Young US people tend to choose a career that is reflective of their personality (Holland 1985). That is, they gather knowledge about the prototypical characteristics (i.e., physical appearance or other personality traits) of the typical person in a given job. This self-to-prototype matching paradigm confirms that the stronger the overlap between the person's self-image and the prototypical working person –for instance in the business professions in the US (Moss and Frieze 1993)–, the more likely this person will choose that profession. In connection with this idea, young US females perceive fewer similarities than young males between themselves and the prototypical male computer scientist (Cheryan et al. 2013). That is, young US females do not identify with computer scientist role models who fit the aforementioned stereotypes (Cheryan et al. 2012). Likewise, US research also concludes that technology-related fields lack of feminine role models, which discourages women from enrolling in technological occupations (Bandura 1999; Eccles 2007).

According to US research based on social role theory, women are thought to behave in a manner that can be described as communal (friendly, unselfish, concerned about others, and expressive). In contrast,men are thought to behave in an independent, masterful, assertive, and instrumentally competent manner, which is described as agentic (Eagly 2001; Eagly et al. 2000). These gender stereotypes have multidimensional structures in the US (Deaux and Lewis 1984) because they encompass traits, role behaviors, occupations, and physical appearance, including "beliefs about individuals' physical characteristics, cognitive abilities, typical roles, specific skills, and emotional dispositions" (Eagly 2001, p. 1072). That is, the person's physical appearance, personal traits, gender role behaviors, and occupations are in the list of characteristics frequently used by US people to make inferences about men and women (Deaux and Lewis 1984; Eagly 2001). Inferences about one component (i.e. a man described by masculine physical characteristics) can affect inferences made about the

other components (i.e. being in possession of masculine traits and occupy masculine roles), and people will attempt to maintain consistency among the different components (Deaux and Lewis 1984).

In line with these theoretical ideas, a recent study confirms that US college students' stereotypes of computer scientists appear to assume this is a masculine field and include multiple masculine-related characteristics (Cheryan et al. 2013). These professionals were portrayed as very intelligent (smart or nerdy), technology-oriented, focused on computers, lacking social skills, or in possession of unattractive physical features, such as pale, wearing glasses, or thin. Such stereotypes in the US can be perceived as incongruent with the female gender role (Cheryan et al. 2013; Cejka and Eagly 1999; Eagly 2001) andmay reinforce rather than challenge traditional stereotypes about US people working in this particular field (Rudman and Glick 2010). Assuming that secondary students also associate the ICT field with men and those with male characteristics, they should report more masculine than feminine characteristics when describing people working in the ICT field (Hypothesis 1.1).

In light of the importance that US young people give to personal characteristics when describing computer scientists' masculine qualities (Cheryan et al. 2013), the categories 'physical appearance', 'intellectual aptitudes', and 'social skills' were included in the present research to analyze secondary students' portrayals of ICT professionals. That is, having an unappealing physical appearance, being in possession of certain 'technical' intellectual capacities, or lacking social skills are masculine traits frequently used to describe men and women working in the ICT field (Cheryan et al. 2013). In addition, the categories 'social position', 'role models', and 'ICT occupations' were incorporated in the present research to respectively describe gender role behaviors and concrete occupations that secondary students associate with ICT professionals. With regard to the 'social position' category, its relevance revolves around the high status and well paying stereotype associated in the US (Eagly 2001; Rudman and Glick 2010) and Spain (López-Sáez et al. 2011) withmale-dominated jobs, such as engineering and other technology-related occupations. More concretely, Spanish young people tend to associate technological careers with good work opportunities and money (López-Sáez et al. 2011; Sáinz 2007).

Similarly, the category 'role models' was also included in the analysis to make reference to concrete examples of people that boys and girls associated with ICT professionals. These role models (i.e., male and female blood or distant relatives, friends, or Bill Gates) seemed to match their prototypical male-related image associated with these professionals. As adherence to gender roles is socially stressed during adolescence in the US (Eccles 1994; 2007), US young people prefer to pay more attention to same-gender rather than to other gender models (Bussey and Bandura 1999; Lockwood 2006).

Finally and with regard to ICT occupations, two types of occupations were identified to account for ICT workers, as suggested by US (Zarrett and Malanchuk 2005) and Spanish (Castaño 2011, p. 89) research: 'professions oriented to the design and development of ICT services' (hard IT jobs, such as computer scientists or network engineers) and 'professions using ICT as a tool' (soft IT jobs, such as journalists or secretarial workers). Furthermore, US

(Zarrett and Malanchuk 2005) and Spanish (Sáinz 2007) literature also indicates that secondary students tend to ascribemore strongly masculine characteristics to hard rather than to soft IT jobs. In addition, women in Spain (Castaño 2011; Sáinz 2007) and the US (Zarrett and Malanchuk 2005) tend to concentrate in professions using ICT as a tool rather than in professions oriented to the design and development of ICT services (more congruent than the former with male gender roles). Thereby, considering the remarkable presence of female workers in jobs using ICTas a tool (soft ICT jobs) that could act as archetypes of people working in these jobs (especially for young females) and the lower ascription of masculine characteristics to these jobs than to hard ICT jobs, girls in the present study are expected to provide more references than boys about people in occupations using ICT as a tool (Hypothesis 1.2).

Gendered Attitudes towards ICT Professionals

Attitudes and stereotypical portrayals of ICT are very much interconnected. Besides several neutral qualities, US research suggests that the stereotype towards a target group can include several traits that are clearly positive and some other traits that are clearly negative (Greenwald and Banaji 1995). In support of this assumption, research in the US illustrates the endorsement of negative (i.e. lack of social skills or unattractive physical appearance) and positive (i.e. high intellectual abilities) attitudes towards IT professionals (Zarrett and Malanchuk 2005; Goode et al. 2006). That is, the nerd and antisocial stereotype of IT workers may lead some young people to negatively evaluate these professionals; whereas, the stereotypical portrayal of ITworkers in possession of high intellectual capacities may also lead some young people to positively evaluate these professionals. However, research in the US has consistently highlighted that ICT is frequently viewed by secondary and college students in the US as solitary, unappealing, and full of geeky and nerdy men (Goode et al. 2006; Margolis and Fisher 2002). Furthermore, most popular USmedia channels seem to transmit and reinforce this unappealing stereotype of people who work with computers (Bair and Marcus 2007; Barker and Aspray 2006; Cheryan et al. 2013). But how do Spanish boys and girls express their attitudes towards the portrayal of ICT professionals? Research Question 2.1 was therefore formulated in order to further investigate whether Spanish adolescents see the ICT field as more negative than positive and neutral, as U.S. do. Three categories (positive, negative, and neutral) were included in the analysis of students' portraits of ICT professionals.

Likewise, another line of research in the US (Meszaros et al. 2007) and Spain (Sáinz and López-Sáez 2010) shows that whereas young males have more positive attitudes towards the different facets of the ICT profession, young females have more positive attitudes towards ICT professionals' social skills. Given US (Eccles 2007) and Spanish (Sáinz 2007) young females' interest in people-oriented occupations (congruent with feminine roles), it is therefore probable that these girls believe that these workers work in interaction with other people and are not as antisocial and weird as people think. In reality, professional practice in the US requires computer analysts to have excellent communication skills, playing an intermediary role between end users and stakeholders (Bair andMarcus 2007). Curiously, and despite showing more positive attitudes towards these workers' social skills, these

Spanish (Sáinz and López-Sáez 2010) young females develop less interest than young males in pursuing computer-related studies. In this regard, US research (Barker and Aspray 2006; Margolis and Fisher 2002; Cheryan et al. 2013) concludes that many young females do not choose these studies because they do not identify with the prototypical masculine nerd stereotype frequently associated with these professionals. Contrary to their female counterparts, US male students identify with many prototypical masculine characteristics associated with these professionals (Cheryan et al. 2013; Margolis and Fisher 2002), even with the negative ones (such as their unattractive physical appearance or antisocial behavior). Thus, provided young males' tendency to show more positive attitudes towards ICT in the US (Meszaros et al. 2007) and Spain (Sáinz and López-Sáez 2010) than their female counterparts, it is expected that boys will express more positive than negative or neutral attitudes towards the characteristics associated with ICT professionals than their female counterparts (Hypothesis 2.2).

Language Related Gender Marks and Stereotypical Portraits of Technology and Technological Occupations

In contrast to the semantic use of gender, the grammatical meaning of gender and how it is associated with occupations in languages different from English (such as Spanish, Catalan, or French) is underdeveloped. As reported by research carried out in the US, language is the mechanism through which humans perceive the world and think about space, time, colors, and objects (Boroditsky et al. 2003). It plays an important role in social cognition (Boroditsky et al. 2003), representing the way people in the US think about men and women (Hellinger and Bußmann 2003). For instance, when asked to classify names or pictures of objects as masculine or feminine, English and Spanish speakers in the US and Spain tend to judge natural objects as more feminine and tools as more masculine. Surprisingly, English speakers make consistent judgments about the genders of objects, despite the lack of grammatical gender in English (Sera et al. 1994).

Speakers of a language with grammatical gender like Spanish need to refer to an object as masculine or feminine. This may lead them to selectively consider that object's masculine or feminine qualities, thus making those qualities more salient. For instance, while in Spanish the word 'sun' is masculine, 'el sol', in German it is feminine, 'die Sonne'. The grammatical gender shapes the meanings that German and Spanish speakers give to words and how they describe them Boroditsky et al. (2003). In this regard, native German from Germany and native Spanish speakers from Mexico rated a set of nouns on the dimension of potency, which according to cross-cultural research carried out in the US is highly associated with masculinity (Konishi 1993). Both groups of speakers judged the nouns that were grammatically masculine in their native language to be more potent than nouns that were grammatically feminine.

Together with other languages, the masculine form in Spanish functions as the so-called 'unmarked' form, both in the singular and plural. For instance, when referring to people working in occupations, in Spain it is common to use the masculine singular 'un informático' (a computer scientist) or the plural form 'informáticos' (computer scientists) to refer to both

genders. These terms are subject to gender bias and reflect the underrepresentation of women in technologyrelated positions and occupations. “However, for jobs that are traditionally, and still today, performed by women (such as nursing), the masculine term ‘enfermeros’ does not automatically function as generic, nor does the feminine ‘enfermera’. For this reason, the term ‘personal de enfermería’ (staff of the infirmary) is employed”, as research on the assymetrical representation of men and women in Spanish language illustrates (Nissen 2003, p. 274). In support of research conducted in Germany, these findings are associated with social gender, “which has to do with stereotypical assumptions about what are the appropriate social roles for women and men, including expectations about who will be a typical member of the class of, say, surgeon, or nurse. Deviations from such assumptions will often require overt formal markings, as in English female surgeon or male nurse” (Hellinger and Bußmann 2003, p. 11).

Thus, for the research reported above, the use of grammatical gender in Spanish was considered a useful subject of analysis with regard to gender stereotypical portrayals of ICT professionals. For this reason, an analysis of how young Spanish people refer to gender in the expression of the different characteristics associated with ICT professionals was carried out. As ICT professionals are frequently depicted in masculine terms by US (Cheryan et al. 2013; Goode et al. 2006; Margolis and Fisher 2002) and Spanish young people (Sáinz 2007) and the use of grammatical gender in Spanish to refer to people working in this male-dominated field (Nissen 2003), it is therefore expected that the characteristics associated with these professionals will contain more expressions formulated in masculine and neutral than in feminine terms (Hypothesis 3.1). Equally, assuming the salience of masculine qualities of the ICT field in the US (Cejka and Eagly 1999; Cheryan et al. 2013; Goode et al. 2006; Margolis and Fisher 2002) and Spain (Sáinz 2007; Castaño 2011), are there gender differences in the secondary students' use of masculine, feminine, or neutral expressions to describe the characteristics associated with ICT professionals? Thus, Research Question 3.2 was formulated in order to analyze the existence of these gender differences.

To conclude, the hypotheses and research questions were formulated as follows:

First set of Hypotheses. Students’ portrayals about ICT professionals will contain characteristics more aligned with male rather than female gender roles.

> Hypothesis 1.1. Secondary students should report more masculine than feminine characteristics when describing people working in the ICT field.
>
> Hypothesis 1.2. Girls are expected to provide more references than boys about people in occupations using ICT as a tool (less congruent than hard ICT jobs with male gender roles).

Second set of Hypotheses and Research Questions. Students’ portrayals of ICT professionals will contain more negative than positive or neutral appraisals.

Research Question 2.1. Do Spanish adolescents see the ICT field as more negative than positive and neutral, as U.S. do?

Hypothesis 2.2. Boys will report more positive rather than negative and neutral attitudes towards the characteristics associated with ICT professionals than their female counterparts.

Third set of Hypotheses and Research Questions. The characteristics associated with ICT professionals will contain more masculine than feminine or neutral references.

Hypothesis 3.1. The characteristics associated with ICT professionals will contain more expressions formulated in masculine rather than in feminine or neutral terms (Hypothesis 3.1).

Research Question 3.2. Are there gender differences in secondary students' use ofmasculine, feminine, or neutral expressions to describe the characteristics they associate with ICT professionals?

Method

Sample

The sampling was conducted by randomly selecting schools throughout Catalonia (an autonomous region in the North of Spain). Originally, more than 30 schools were targeted but only 10 agreed to participate. All students enrolled in their final year of junior secondary education at these 10 public secondary schools, located in different areas of Catalonia were targeted. The recruitment procedure was partly done with the help of secondary school teachers and asking school principals to participate in a 2-year longitudinal study aimed at analyzing secondary school students' ICT attitudes and motivations to pursue ICT studies. The survey was available both in Catalan and Spanish, but in most schools the research team administered the survey in Spanish. The response rate for all targeted participants was approximately 90 %. Some of the targeted students could not participate in the present study because they were sick or not in class during data collection. Therefore, 900 students attending 10 schools in urban (58 %) and rural (42 %) areas of Catalonia took part in this study. Sixty-five percent of the participants belonged to middle-class households. On average, approximately 75 students per school completed the survey. Eighty-one percent were of Catalan or Spanish origin, and the remainder came from other European (2.2 %) or non-European contexts (16.8 %), such as Latin America or Morocco. The mean age of the sample was 15 years, with a standard deviation of 1.73 years. Approximately 51 % of the participants were females (see Table 1 for the distribution of girls and boys according to socio demographic data). No gender differences were observed in the distribution of the sample.

Data Collection

The questionnaires were administered in classrooms and data were collected on students' use of computers, attitudes towards ICT, and views of future academic and occupational aspirations. Prior to the study, informed consent was obtained from the students' parents and education authorities. Similar to Zarrett and Malanchuk's (2005) preliminary study of high school students' attitudes towards ICT professionals, the following open-ended question was included in the questionnaire: What type of person comes to mind when you think about someone working in ICT? (¿Qué tipo de persona te viene a la cabeza cuando piensas en alguien que trabaja con las TIC?).

Participants were asked to write their answers in the space provided under each question. Response rates reached 77.3 %. A study conducted previously in Spain with junior and senior secondary students proved the adequacy of using this openended question to examine young people's gendered portraits of computing professionals (Sáinz 2007).

Content Analysis

To identify the presence of stereotypes and attitudes in a sample of secondary students using a gender-based approach, a content analysis of responses to the open-ended question was conducted.

Two independent coders familiar with research on gender stereotypes were trained to participate in the content analysis. The training was carried out in three sessions. The first session was held before the development of the coding scheme and aimed at generating a common understanding of the main conceptual framework of the study, as well as developing the necessary abilities to perform inductive coding. The second and third training sessions were conducted during the inter-reliability pilot study with the main purpose of ensuring that both coders consistently applied the coding scheme onto a subsample of 90 responses. By means of a checklist, they were trained to identify the presence or absence of the characteristics associated with the responses to our survey question (type of content). Similarly, they had to identify whether the references about ICT professionals involved positive, negative, or neutral appraisals (attitudes), and whether they were masculine, feminine, or neutral (gender marks). During both sessions, ambiguities and discrepancies were identified and discussed. Changes in the coding scheme were made accordingly.

Content of the coding scheme and data analysis. The coding scheme used in this study took the form of a checklist composed of three areas of information regarding student responses: (a) the type of content; (b) the students' attitudes towards ICT; and (c) the gender marks observed through the text (Table 2).

For the type of content, most of the categories were generated in light of Deaux and Lewis' (1984) theory on the multidimensional structure of gender stereotypes and Eagly's (2001) social role theory. This deductive process of category generation also included discussions between members of the research team. Students' responses to our survey question were therefore coded using seven dichotomous categories. In each response, the presence of the

feature represented by each category was coded as 1 and its absence was coded as 0. For instance, responses such as 'mi hermano' (my brother), 'bajo con gafas' (short man wearing glasses), 'gente inteligente' (bright person), 'una persona friqui, aislada socialmente' (freak, socially isolated person), or 'un empresario con dinero' (an entrepreneur with money) were respectively coded under the categories 'role models', 'physical appearance', 'intellectual aptitudes', 'social skills', or 'social position'. Similarly, 'informáticos' (computer scientists) and 'gente normal que trabaja con ordenadores' (ordinary people who work with computers) were respectively coded under the categories 'professions oriented to the design and development of ICT services' and 'professions using ICT as a tool' (Castaño 2011; Zarrett and Malanchuk 2005).

For the students' attitudes towards ICT professionals, and in line with the literature review (Bair and Marcus 2007; Greenwald and Banaji 1995; Goode et al. 2006; Margolis and Fisher 2002; Meszaros et al. 2007; Sáinz and López- Sáez 2010; Zarrett and Malanchuk 2005), responses were coded as 'positive,' 'negative', or 'neutral'. Examples of students' attitudes towards someone working in ICT were: 'personas inteligentes, con buen futuro laboral y salario' (intelligent people with good job prospects and income) (positive, represented 31 %: 216 out of 696), 'personas que se pasan todo el día en frente de la pantalla del ordenador y no son muy sociables' (people who spend their day in front of a computer screen and are not very sociable) (negative, represented 6.9 %: 48 out of 696), and 'profesores' (teachers) (neutral, represented 62.1 %: 432 out of 696).

For the gender marks, responses were coded as masculine, feminine, or neutral, depending on the grammatical gender use identified in students' responses (Hellinger and Bußmann 2003; Konishi 1993; Nissen 2003). Examples of masculine, feminine, and neutral gender marks about people working in ICTwere: 'mi tío que es gay y muy moderno' (my uncle, who is gay and very modern); 'una profesora de universidad' (a female university professor); and 'una persona que lleva trajes caros y es muy inteligente' (a person who wears expensive suits and is very intelligent). Plural gender forms, such as 'ingenieros informáticos' (computer engineers) or 'periodistas' (journalists) were considered gender neutral and represented 14 % (45 out of 329) of this category. As for the use of masculine generics, we cannot assume that the person explicitly referred to males or to both generic categories. Hence, these references were also included within the 'gender neutral' category. Similarly, references to undefined singular nouns such as 'una persona que sabe de informática y tecnología' (a person who knows about computing and technology) or to undefined singular pronouns like 'alguién que trabaja programando ordenadores' (someone who works as a computer programmer) were also categorized as gender neutral and represented 83 % of these attributes (244 out of 329) included in this category.

References to adjectives without any preceding noun and semantically neutral in Spanish, such as 'friqui' (freak) or 'inteligente' (intelligent) were also considered gender neutral. These references represented 13 % (40 out of 329) of this category. However, expressions preceded by grammatically masculine forms or connotations were categorized as masculine. This was the case for singular masculine nouns like 'ingeniero' (computer engineer); masculine adjectives such as 'empollón' (male grind); and masculine nouns preceded by

undefined masculine pronouns and adjectives such as 'un informático' (a computer scientist) or 'algún informático' (some computer scientist). The feminine singular nouns were considered feminine, as was the case for 'secretaria' (female secretary) or 'enfermera' (female nurse).

Reliability of the coding scheme. Before coding began, a pilot study to assess the reliability of the coding scheme was undertaken. Krippendorff's alpha was computed to determine inter-coder agreement, given the ordinal nature of gender marks (masculine, feminine, and neutral) and attitudes towards ICT (positive, negative, and neutral). As opposed to Cohen's kappa, Krippendorf's alpha offers the opportunity to calculate inter-coder reliability from a single framework, enabling the comparison of ordinal and nominal data (the content of the survey question in our study) with a single index, alpha (Neuendorf 2011). For this purpose, the KALPHA macro in SPSS version 18.0 was used. As was the case in the present study, this macro makes it possible to compute Krippendorff's alpha reliability estimate for subjective judgments made at any level of measurement, including nominal and ordinal data (Hayes and Krippendorff 2007).

In the first phase of the pilot study, two coders independently coded a random subsample of 90 responses (10 % of the full sample). This exercise resulted in a low alpha coefficient in some categories. These categories were refined through discussion with the research team, and an improved version of the coding scheme was agreed upon by consensus. In the second phase, the revised coding scheme was tested with a different subsample of 90 responses. Once the coding process was finalized, the alpha values were computed for all the categories. Mean alpha coefficients reached 0.87. Additionally, reliability coefficients for each category are shown in Table 2. These coefficients made it possible for the final version of the coding scheme to be applied to all responses by one coder.

Results

How do Young People Express their Portrayals and Attitudes towards ICT Professionals? Is there any Gender Difference in the Expression of these Meanings?

First, the participants mentioned different personal attributes of people working in ICT (see Table 3). Most of these personal attributes were related to their intellectual aptitudes (30.6 %), such as intelligence and creativity, or their physical appearance (10.9%), such as looking untidy orwearing glasses, their social skills (10.1 %), such as being a `freak' or a socially isolated character, or their social position (3.3 %), such as wearing a suit and tie, or being wealthy. Secondly, most of the participants (31.9 %) alluded to several role models (for instance, family members, peers, friends, teachers, or even successful people working in ICT, such as Bill Gates). According to predictions regarding secondary students' propensity to report more masculine than feminine characteristics when describing ICT workers (Hypothesis 1.1), most of the reported personal attributes and rolemodels were aligned with masculine gender roles. Similarly and in congruence with this tendency to provide masculine features about these professionals (Hypothesis 1.1), 28.2 % of the responses also

referred to professionals involved in the design and development of ICT (computer scientists and telecommunications engineers) in contrast to lower level occupations where ICT is the tool rather than the object of the work (18 %), such as office and clerical professionals. Concerning gender disparities and in support of the expected predisposition of girls to provide more references than boys about people in occupations using ICT as a tool (Hypothesis 1.2), chi-square analyses proved that more young females than males mentioned occupations where ICT is frequently used as a tool rather than the object of their work $X2(1,696)=8.237$, $p<.001$.

Concerning participants' attitudes towards ICT professionals (Table 4), it was observed that, in general and contrary to the assumption revolving around students' inclination to perceive more negative than positive and neutral characteristics associated with ICT professionals (Research Question 2.1), chi-square tests illustrated that more neutral attitudes were associated with the person working in ICT. Likewise, no gender differences were extracted with regard to attitudes towards ICT professionals $X2(2, 696)=1.797$, $p>.05$. This last finding does not support predictions regarding boys reporting more positive attitudes than girls towards ICT professionals (Hypothesis 2.2).

In connection with the person working in ICT (see Table 5), it is worth noting that according to chi-square analyses all references entailed positive attitudes towards the personal attributes of ICT professionals: their intellectual aptitudes $X2(2,213)=392.688$, $p<.001$, physical appearance $X2(2,76)=44.189$, $p<.001$ or social skills $X2(2,70)=157.647$, $p<.001$. In contrast, most of the participants reported neutral attitudes towards role models $X2(2,222)=139.180$, $p<.001$. Likewise, the references to professionals working in the design and development of ICT $X2(2,196)=117.255$, $p<.001$ were neutral and hardly ever negative. These findings do not support our expectations because participants did not report more negative than positive/neutral attitudes towards the characteristics associated with ICT professionals (Research question 2.1). Similarly, and contrary to predictions regarding boys' predisposition to report more positive than negative and neutral appraisals of the characteristics associated with ICT professionals, chi-square analyses illustrated that young males did not report more positive attitudes towards ICT professionals' social skills $X2(2,70)=157.647$, $p<.001$ and role models $X2(2,222)=139.180$, $p<.001$ than their female counterparts (Hypothesis 2.2). In addition, young females were more likely to appraise in neutral than in positive or negative terms the professions oriented to the design and development of ICT services $X2(2,101)=50.553$, $p<.001$. Against predictions (Hypothesis 2.2), not only young males but also young females were more likely to evaluate positively than negatively ICT professionals' physical appearance $X2boys(2,41)= 28.976$, $p<.001$; $X2girls(2,35)=15.958$, $p<.001$ and intellectual aptitudes $X2boys(2,106) = 201.762$, $p < .001$; $X2girls(2,107)=190.959$, $p<.001$. Interestingly, young males were more likely than young females to report negative appraisals of ICT professionals' physical appearance $X2(2,76)= 44.189$, $p<.001$.

How do Young People Refer to Gender in their Expression of their Meanings associated with ICT Professionals? Is there any Gender Difference?

With regards to the gender references associated with the global aspects linked to ICT professionals (Table 6), chisquare analyses proved that most of the responses associated the person working in ICT with being masculine (47.3 %) or were neutral (46.1 %). This result does support our expectations regarding the lack of feminine references associated with ICT professionals (Hypothesis 3.1). Equally, no gender differences were observed in the assessment of these aspects $X2(2,696)=5.041$, $p>.05$ (Research Question 3.2).

Similarly, with respect to gender references in the characteristics associated with the type of person working in ICT (see Table 7), chi-square tests showed that young males and females displayed the same pattern of gender references in all of the response categories. In this regard, in both groups the intellectual aptitudes and social skills associated with the person working in ICT were considered gender 'neutral' by most of the participants. Alternatively, and in line with our expectations, the categories that referred to role models $X2boys(2,222)=60.734$, $p<.001$; $X2girls(2,222)=81.213$, $p<.001$ and to professionals that design and develop ICT $X2boys(2,196)=36.583$, $p<.001$; $X2girls(2,196)=27.592$, $p<.001$ were regarded in masculine terms by both groups. However, some feminine role models were reported, but only by young females. Interestingly, although both groups regarded professions using ICT as a tool in masculine terms, young females were more likely than young males to regard these professions in neutral terms. These findings supported our expectations concerning the association of more masculine than feminine references about ICT professionals (Hypothesis 3.1). But they did not confirm the existence of gender differences in the gender marking references regarding the type of characteristics associated with the ICT professional (Research Question 3.2).

Discussion

The present study aimed to analyze young people's gendered portrayals of ICT professionals and contributes to the literature regarding the social construction of masculinity and femininity in technological occupations, providing a novel approach to secondary students' gendered portraits of ICT professionals, in the context of Spain. In this sense, the combined study of attitudinal responses and gender markings associated with these gendered portrayals is one of the assets of the present research. Although Spanish secondary students are technologically competent, they have gender stereotypical portraits of who produces and uses certain ICT tools and services (Sáinz 2007). In congruence with research carried out in the US (Eccles 2007), some of these portrayals are based on ICT workers' physical appearance and some characteristics of personality, which could be partly associatedwith their lack of information about their future job prospects with regard to ICT. Similarly, several of these stereotypical portrayals (such as their unappealing physical appearance or their lack of interpersonal skills) are also associated with the highly maledominated component of ICT in the Spanish (Castaño 2011; Sáinz and López-Sáez 2010) and US (Cheryan et al. 2013; Goode et al. 2006; Margolis and Fisher 2002; Meszaros et al. 2007; Zarrett and Malanchuk 2005) contexts. In this regard and in support of UK (Abbiss 2008) and US research (Rudman and Glick 2010), this research illustrates a social phenomenon associated with the historical production and reproduction of power and status in technological fields in Spain, as well as with masculine forms of ICT occupations.

The lack of interest shown by women in technological studies and occupations –such as ICT– has several important theoretical and practical implications. As most of the prestigious and managerial jobs in the US (Eagly 2001; Cejka and Eagly 1999) and Spain (López-Sáez et al. 2011) are related to technology, this field continues to be a male-dominated setting where women tend to occupy positions entailing less status and power. Thus, Spanish women will be more likely to occupy traditional feminine ICT jobs and play a secondary role in the design and production of ICT tools and services (Sáinz and Eccles 2012). Consequently, the stereotype that US (Barker and Aspray 2006) and Spanish (Sáinz and Eccles 2012) women lack technological competence will be reinforced and women will run the risk of being 'stigmatized' as users and not competent producers of ICT tools and services.

Gender Roles and Stereotypical Portrayals of ICT Professionals

Congruent with social role theory and studies carried out in the US (Eagly 2001; Eagly et al. 2000; Rudman and Glick 2010), these perceptions of ICT professionals evidence the differential roles that men and women play in this particular male-dominated arena in Spain. Thus, most of the power and status-related roles in technological occupations are associated with masculine characteristics (i.e., those references regarding ICT professionals' social position or physical appearance), which condition men's and women's actions and decisions before and after entering these fields. In line with the multidimensional perspective of gender stereotypes, and in support of social role theory in North American contexts, our participants held stereotypical beliefs about the professionals involved in ICT (Deaux and Lewis 1984; Eagly 2001; Cejka and Eagly 1999; Cheryan et al. 2013). These stereotypical portrayals depicted the preponderance of male gender roles in the ICT field. As in other studies carried out in the US (Cheryan et al. 2013; Holland 1985; Moss and Frieze 1993) and Spain (Sáinz 2007), these portrayals comprise a set of different physical and personality attributes aligned with the prototypical image of the person working in this profession. In support of US research based on self-to-prototype matching theory, it might be expected that the more young people identify with this prototypical image of ICT professionals, the more they will consider ICT as a future option (Cheryan et al. 2012; Holland 1985; Moss and Frieze 1993). Interestingly, research conducted in the US shows that female role models in Science, Technology, Engineering, and Mathematics (STEM) fields seem to provide beneficial effects for young women highly identified with STEM by protecting them against the negative effects of gender stereotypes (Lockwood 2006; Cheryan et al. 2012).

Alternatively, the most accessible image of the ICT professional was associated with someone participants knew well and were close to. For this reason, some of the students reported the names of several close family members, friends, or teachers and even Bill Gates, a well-known person in the field. These participants bear in mind an ideal concrete person working in the field (Holland 1985). This finding also supports US studies demonstrating the importance of role models in shaping young people's career aspirations (Bussey and Bandura 1999; Cheryan et al. 2012; Eccles 2007; Lockwood 2006). US young people take the most accessible and same gender role models when deciding what to do in

their near future (Bussey and Bandura 1999; Lockwood 2006). Nonetheless, it is worth mentioning that few of the reported role models were women, especially among young males. This general tendency to refer to male role models in maledominated professions in North America is not exclusive to the ICT field (Bussey and Bandura 1999; Cejka and Eagly 1999; Margolis and Fisher 2002). However, our findings suggest that young Spanish males seem to be less gender aware than their female counterparts with regard to diversity in ICT (Castaño 2011; Margolis and Fisher 2002). This could be an interesting aspect for consideration in planning for future interventions in Spain. Young males and females should be involved in different activities aimed at raising gender-awareness, with regard to traditional gendertyped occupations, and at offering strategies to fight against gender portrayals of these professionals and occupations.

Similarly, it is also worth highlighting that a substantial number of students had access to specific professions when thinking about someone working in ICT. For this reason, they identified professionals involved in the design and development of ICT while, in contrast, they also mentioned professionals who use ICT as a tool for performing tasks as part of their jobs, rather than as the object of their work. These findings corroborate research conducted in Spain (Castaño 2011) and the US (Zarrett and Malanchuk 2005). In addition, more girls than boys tended to refer to professionals who use ICT as a tool for performing tasks as part of their jobs. In support of Spanish (Castaño 2011) and North American (Zarrett and Malanchuk 2005) research, this may be a result of the higher presence of female role models in soft than in hard IT professions. In line with US research, this result also confirms that gender matching of career role models in maledominated occupations is especially important for women (Lockwood 2006).

Attitudes Towards People Working in ICT

Most of the participants showed neutral or positive attitudes towards the different attributes associated with people working in ICT. Although some of the responses related to ICT involved a negative image of people working in the field, a considerable number of responses entailed a positive image of these professionals. This finding confirms US research about regarding the unfavorable and favorable attitudes towards people target of stereotypes (Greenwald and Banaji 1995). Contrary to expectations and to other research carried out in North American contexts, where several characteristics of IT professionals were negatively evaluated (Margolis and Fisher 2002; Zarrett and Malanchuk 2005), both young males and females evaluated the descriptive aspects related to ICT professionals, such as their physical appearance, social skills, and intellectual aptitudes, more positively than negatively. This result may be attributed to the fact that participants do not perceive ICT to be restricted to computer scientists or other technical professionals, but to be a transversal career path in which Spanish men and women can use and develop different digital competences (Castaño 2011). Furthermore, it is interesting to note that boys do not report higher positive attitudes towards the different characteristics associated with ICT professionals than their female counterparts.

These views of the field will play a key role in shaping young people's future ICT-related aspirations, as US (Cheryan et al. 2013; Zarrett and Malanchuk 2005) and Spanish (Sáinz and Eccles 2012) research has demonstrated. Nevertheless, the image of the field is not as negative as other research carried out in the US has claimed (Margolis and Fisher 2002; Goode et al. 2006). This finding could be culturally grounded, given the informational and communicational connotations of the term ICT in Spain. This explains why our participants do not exclusively focus on 'hard' technological characteristics of this field. For this reason, further crosscultural research is needed in order to gain insight into the way female and male secondary students in different countries (western and non-western) perceive the different facets of ICT.

Gender Marking References and ICT Professionals

The grammatical and semantic use of the Spanish language reveals the dearth of feminine references related to ICT professionals, particularly with regard to their physical appearance, social skills, intellectual aptitudes, or social position. This finding supports North American research and suggests that these personal traits associated with these workers are not congruent with femininity and with the female gender role (Cheryan et al. 2013; Cejka and Eagly 1999; Eagly 2001). Interestingly and contrary to expectations, this lack of feminine references can be also appreciated in the reported soft ICT jobs (such as media or clerical jobs) where Spanish women are not necessarily underrepresented (Castaño 2011).

In addition, while the categories related to ICT professionals' intellectual aptitudes or social skills were mostly appraised by male and female participants as gender neutral, the categories related to particular role models and to professionals that design and develop ICT were full of masculine references. On the one hand, that ICT professionals' intellectual aptitudes or social skills are perceived as gender neutral suggests that despite many young males may identify with the prototypical ICT worker (as US research shows, Goode et al. 2006; Cheryan et al. 2013; Margolis and Fisher 2002), some participants believe that being in possession of high intellectual aptitudes and lacking interpersonal skills are characteristics shared by both male and female ICT workers. Actually and in support of North American research, it is probable that some young females may identify with the prototypical nerd ICT worker and consider ICT as a future career option (Cheryan et al. 2012).

On the other hand, the findings regarding the prevalence of masculine references about role models working in the ICT field and professionals that design and develop ICT seem to support the masculine portrayal of ICT observed in US research (Bair and Marcus 2007; Goode et al. 2006; Margolis and Fisher 2002). It also reinforces the social distribution of gender roles in ICT, as research conducted in the US (Cejka and Eagly 1999; Eagly et al. 2000) and Germany (Hellinger and Bußmann 2003) shows. These findings are also in line with a study carried out in the US context where most of the interviewees pictured a male person when thinking about someone working in ICT (Goode et al. 2006). According to Goode et al. (2006), the image of people who work in ICT comes largely from US popular culture. These gender stereotypes might therefore become prescriptive and help to maintain the existing

gender roles and hierarchy in such a maledominated field as ICT, as postulated by US research focused on social role theory (Cejka and Eagly 1999; Eagly et al. 2000). Finally, no gender differences were observed in the type of gender expressions secondary students related to ICT professionals. Both males and females coincided in associating more masculine than feminine and neutral expressions with role models and professionals that design and develop ICT, whereas they also assigned gender neutral expressions to ICT professionals' intellectual aptitudes and social skills.

Some Guidelines for Intervention and Future Research

As young people in Spain seem to suffer from a lack of information about both the labor market and the content of several occupations, they tend to have stereotypical views of occupations and the tasks associated with them. Thus, more interventions should target and challenge these stereotypical occupational beliefs, providing young Spanish people who have not chosen any particular academic track with more real role models of ICT professionals. In support of research carried out in the US, this strategy may counteract the influence of these stereotypical portraits (Bair andMarcus 2007). It would also help achieve gender equality opportunities in young Spanish people's decisions to pursue studies and occupations.

Simultaneously, as many occupation-related choices are made in secondary education, secondary school teachers, careers advisors, and parents should receive further training in the possible occupational gateways and opportunities that young people might encounter in the near future. The design of such a training plan in Spain should be gender-grounded and should target young males, who in light of US research seem to hold more stereotypical beliefs about the role that women play in highlymale-dominated areas (Cejka and Eagly 1999), such as ICT. Similarly, policy makers in Spain should provide adolescents with more female role models in the field of ICT, such as Ada Lovelace, a British analyst, metaphysician, and founder of scientific computing. In support of US research (Cheryan et al. 2012; Lockwood 2006), these female role models may have beneficial effects for girls already highly identified with ICT.

As a final remark, it is worth mentioning that the findings of this study are limited to a particular framework of categories, resulting in the loss of important information that is not represented by them. This limitation is, however, not unique to our study and has been reported in US literature (Pope et al. 2007). This type of methodology helps expand our knowledge of the explicit content of gender stereotypes. Still, the application of other implicit measures could complement the picture of the gendered portraits of such a male-dominated field. Similarly, another limitation of the present study is associated with the low value in the cells for some categories. Some predictions could not therefore be tested.

Another limitation of this research could be associated with the use of some masculine generics in participants' responses as equivalent to gender neutral. Nevertheless, we used these masculine generics generally and not in reference to men. Psycholinguistic research in Germany shows that masculine generics only trigger male-only associations and inferences,

rather than gender balanced associations in recipients' cognitions (Gygax and Gabriel 2011). The use that some secondary students make of masculine generics suggests therefore the importance of teachers, school advisors, principals, and parents being gender sensitive when making reference to occupations, referring indistinctively to 'ingenieras' and 'ingenieros' (female and male engineers) instead of using the masculine generic 'ingenieros'.

Given that Spanish/Catalan languages have grammatical gender, one can think that the results of the present research cannot be replicated in other contexts, where grammatical gender is not applicable to occupations. This is particularly problematic in the case of characteristics associated with ICT professionals, because of the expressions used by students to describe them. However, some occupational titles in English also have grammatical gender (e.g., policemen, firemen). For this reason, the present research could be replicated in English-speaking contexts, as US children tend to think that the aforementioned occupations are reserved for men (Liben et al. 2002).

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References

Abbiss, J. (2008). Rethinking the "problem" of gender and IT schooling: Discourses in literature. Gender and Education, 20, 153–165. doi: 10.1080/09540250701805839.

Bair, B., & Marcus, M. (2007).Women's interest in information technology: The fun factor. In C. J. Burger, E. G., Creamer, & P. S. Meszaros (Eds.), Reconfiguring the firewall: Recruiting women to information technology across cultures and continents (pp. 161– 175).Wellesley, MA: A K Peters, Ltd.

Barker, L. J., & Aspray, W. (2006). The state of research on girls and IT. In J. M. Cohoon & W. Aspray (Eds.), Women and information technology: Research on underrepresentation (pp. 3–54). Cambridge, MA: The MIT Press.

Bandura, A. (1999). Self-efficacy in changing societies. London: Cambridge University Press.

Boroditsky, L., Schmidt, L. & Phillips, W. (2003). Sex, syntax, and semantics. In D. Gentner & S. Goldin-Meadow (Eds.), Language in mind: Advances in the study of language and cognition (pp. 61–79). Boston, MA: Massachusetts Institute of Technology.

Bussey, K., & Bandura, A. (1999). Social cognitive theory of gender development and differentiation. Psychological Review, 106, 676– 713. doi:10.1037/0033295X.4.676.

Castaño, C. (Ed.). (2011). Género y TIC. Presencia, posición y políticas. [Gender and ICT. Presence, position, and politics]. Barcelona: Editorial UOC.

Cejka, M. A., & Eagly, A. H. (1999). Gender-stereotypic images of occupations correspond to the sex segregation of employment. Personality and Social Psychology Bulletin, 25, 413–423. doi:10. 1177/0146167299025004002.

Cheryan, S., Drury, J., & Vichayapai, M. (2012). Enduring influence of stereotypical computer science role models on women's academic aspirations. Psychology of Women Quarterly, 37, 72–79. doi:10. 1177/0361684312459328.

Cheryan, S., Play, V. C., Handron, C., & Hudson, L. (2013). The stereotypical computer scientist: gendered media representations as a barrier to inclusion for women. Sex Roles, 69, 58–71. doi:10.1007/ s11199-013-0296-x.

Deaux, K., & Lewis, L. L. (1984). Structure of gender stereotypes: Interrelations among components and gender level. Journal of Personality and Social Psychology, 46, 991–1004. doi:10.1037/ 0022-3514.46.5.991.

Diario Médico [Medical News] (2014). Colegiación médica. Las mujeres escasean en lascúpulas. [Medical collegiates. Women are scarce on the top]. Retrieved from http://www.diariomedico.com/2014/04/28/ area-profesional/sanidad/mujeres-escasean-cupulas

Eagly, A. H. (2001). Social role theory of sex differences and similarities. In J. Worell (Ed.), Encyclopedia of women and gender (pp. 1069– 1079). San Diego, CA: Academic.

Eagly, A. H.,Wood,W., & Diekman, A. (2000). Social role theory of sex differences and similarities: A current appraisal. In T. Eckes&H.M. Trautner (Eds.), The developmental social psychology of gender (pp. 123–174). Mahsawah, NJ: Erlbaum.

Eccles, J. S. (1994). Understanding women's educational and occupational choices. Applying the Eccles et al. model of achievementrelated choices. Psychology of Women Quarterly, 18, 585–609. doi: 10.1111/j.1471-6402.1994.tb01049.x.

Eccles, J. S. (2007). Where are all the women? Gender differences in participation in physical science and engineering. In J. S. Ceci &W. M. Williams (Eds.), Why aren't more women in science? Top researchers debate evidence (pp. 119–210). Washington: American Psychological Association.

Eccles, J. S., Barber, B., & Jozefowicz, D. (1999). Linking gender to educational, occupational and recreational choices: Applying the Eccles et al. model of achievement-related choices. In W. B. Swann, J. H. Langlois, & L. A. Gilbert (Eds.), Sexism and stereotypes in modern society (pp. 153–191). Washington: American Psychological Association.

Goode, J., Estrella, R., & Margolis, J. (2006). Lost in translation: Gender and high school computer science. In J. M. Cohoon & W. Aspray (Eds.), Women and information technology: Research on underrepresentation (pp. 89–114). Cambridge,MA: TheMIT Press.

Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. Psychological Review, 102, 4–27. doi:10.1037//0033-295x.102.1.4.

Gygax, P., & Gabriel, U. (2011). Gender representation in language: More than meets the eye. In R. Mishra & N. Srinivasan (Eds.). Language and cognition: State of the art (pp.72-92). Münich: Lincom AP.

Hayes, A. F., & Krippendorff, K. (2007). Answering the call for a standard reliability measure for coding data. Communication Methods and Measures, 1, 77–89. doi:10.1080/19312450709336664.

Hellinger, M. & Bußmann, H. (2003). The linguistic representation of women and men. In M. Hellinger& H. Bußmann, (Eds.) Gender across languages: The linguistic representation of women and men. (Vol. 2, pp. 1–26). Amsterdam: John Benjamin's Publishing Company.

Holland, J. L. (1985). Making vocational choices. A theory of personalities and workenvironments. Englewood Cliffs, NJ: Prentice Hall.

INE [Spanish Statistical Office] (2014). Indicadores Sector TIC [Indicators ICT Sector]. Retrieved from http://www.ine.es/jaxi/ menu.do?type=pcaxis&path=%2Ft14%2Fp197%2Fe01&file= inebase&L=0.

Instituto de la Mujer [Women's Institute] (2012). Statistics. Retrieved from http://www.inmujer.gob.es/ss/Satellite?c=Page&cid= 1264005678200&language=cas_ES&pagename=InstitutoMujer% 2FPage%2FIMUJ_Estadísticas.

Konishi, T. (1993). The semantics of grammatical gender. A crosscultural study. Journal of Psycholinguistic Research, 22, 519–534. doi:10.1007/BF01068252.

Levy, G. D., Sadovsky, A., & Troseth, G. L. (2000). Aspects of young children's perceptions of gender-typed occupations. Sex Roles, 42, 993–1005. doi:10.1023/A:100784516910.

Liben, L. S., Bigler, R. S., & Krogh, H. R. (2002). Language at work: Children's gendered interpretations of occupational titles. Child Development, 73, 810–828. doi:10.1111/1467-8624.00440.

Lockwood, P. (2006). "Someone like me can be successful": Do college students need same gender role models? Psychology of Women Quarterly, 30, 36–46. doi:10.1111/j.1471- 6402.2006.00260.x.

López-Sáez,M., Puertas, S., & Sáinz, M. (2011).Why don't girls choose technological studies? Adolescents' stereotypes and attitudes towards studies related to medicine or engineering. Spanish Journal of Psychology, 14, 71–84. doi:10.5209/rev_SJOP2011.v14.n1.6.

Margolis, J., & Fisher, A. (2002). Unlocking the clubhouse: Women in computing. Cambridge, MA: MIT Press.

Meszaros, P. S., Lee, S., & Laughlin, A. (2007). Information processing and IT career interest/choice among high school students. In C.J. Burger, E.G. Creamer & Meszaros (Eds.), Reconfiguring the firewall. Recruiting women to information technology across cultures and continents (pp. 77–95). Massachusetts: A K Peters Limited.

Moss, M. K., & Frieze, I. H. (1993). Job preferences in the anticipatory socialization phase. A comparison of two matchingmodels. Journal of vocational behavior, 42, 282–297. doi:10.1006/jvbe.1993.1020.

Neuendorf, K. A. (2011). Content analysis - A methodological primer for gender research. Sex Roles, 64, 276–289. doi:10.1007/s11199-010- 9893-0.

Nissen, U. K. (2003). Gender in Spanish. Tradition and innovation. InM. Hellinger & H. Bußman (Eds.), Gender across languages: The linguistic representation of women and men (Vol. 2, pp. 251–279). Amsterdam: John Benjamin's Publishing Company.

Pope, C., Mays, N., & Popay, J. (2007). Synthesizing qualitative and quantitative health evidence: A guide to methods. Maidenhead: Open University Press.

Rudman, L. A., & Glick, P. (2010). Content and origins of gender stereotypes. In L. A. Rudman & P. Glick (Eds.), The social psychology of gender. How power and intimacy shape gender relations (pp. 81–104). New York: The Guilford Press.

Sáinz, M. (2007). Aspectos psicosociales de las diferencias de género en actitudes hacia las nuevas tecnologías en adolescentes. [Psychosocial aspects on gender differences in attitudes towards new technologies in adolescents] (Doctoral Dissertation) Retrieved from http://www.injuve.mtas.es/injuve/contenidos.item.actionid= 1423691052&menuId=400_352110.

Sáinz, M., & López-Sáez, M. (2010). Gender differences in computer attitudes and the choice of technology-related occupations in a sample of secondary students in Spain. Computers and Education, 54, 578–587. doi:10.1016/j.compedu.2009.09.007.

Sáinz, M., & Eccles, J. S. (2012). Self-concept of computer and math ability: Gender implications across time and within ICT studies. Journal of Vocational Behavior, 80, 486–499. doi:10.1016/j.jvb. 2011.08.005.

Sera,M., Berge, C.& del Castillo, J. (1994). Grammatical and conceptual forces in the attribution of gender by English and Spanish speakers. Cognitive Development, 9, 261–292. doi:10.1016/0885-2014(94) 90007-8.

White, M. J., & White, G. B. (2006). Implicit and explicit occupational gender stereotypes. Sex Roles, 55, 259–266. doi:10.1007/s11199- 006-9078-z.

Zarrett, N.R. & Malanchuk, O. (2005). Who is computing? Gender and race differences in young adults' decisions to pursue an Information Technology career. New directions for child and adolescent development, 110, 65–84. doi:10.1002/cd.150.

Sáinz, M., Meneses, J., López, B. S., & Fàbregues, S. (2016). Gender Stereotypes and Attitudes Towards Information and Communication Technology Professionals in a Sample of Spanish Secondary Students. Sex Roles, 74, 154–168. https://doi.org/10.1007/s11199-014-0424-2

Table 1. Socio-demographic distribution for boys and girls (counts and percentages)

Variables	Males	Females	X^2
School location			
Urban	256 (28 %)	269 (30 %)	(1, *N* = 900) = .107
Rural	187 (21 %)	188 (21 %)	
Total N	443	457	
Place of Origin			
Living in Catalonia	359 (40.2 %)	364 (40.8 %)	(2, *N* = 893) = .726
Born in other European countries	8 (0.9 %)	12 (1.3 %)	
Born outside Europe	74 (8.3 %)	76 (8.5 %)	
Total N	441	452	
SES			
High SES	47 (5.4 %)	34 (3.9 %)	(2, *N* = 865) = 3.241
Intermediate SES	269 (31 %)	294 (34 %)	
Low SES	104 (12 %)	117 (13.5 %)	
Total N	420	445	

Chi-square values for the comparison between males and females for all categorical row variables.

Table 2. Description of coding categories and reliability coefficients regarding people working in the ICT field

Area of information	Category	Description of the category	Alpha
A. Type of Content	1. Physical appearance	Physical attributes (i.e. height, body weight or skin tone), physical changes (i.e. aging or hair loss), clothing, or other personal attributes.	1.000
	2. Intellectual aptitudes	Professional or personal capabilities.	0.885
	3. Social skills	Social skills or psychological traits related to sociability.	0.731
	4. Social position	Prestige, social position, power, or financial success.	1.000
	5. Professions oriented to the design and development of ICT services	Computer science or engineering jobs.	0.697
	6. Professions using ICT as a tool	Other jobs that require an intensive use of ICT (i.e. architecture, public service, administrative assistance, graphic design, or media jobs).	0.913
	7. Role models	Blood or distant relatives, friends, teachers or famous people in the field (i.e. Bill Gates).	0.885
B. Attitudes towards ICT	Positive, negative, or neutral perceptions about ICT professionals.		0.898
C. Gender References	Use of a grammatical masculine, feminine or neutral gender form.		0.833

Given the ordinal nature of B and C, Krippendorff's alpha was computed to determine inter-coder agreement

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Table 3. Stereotypical beliefs about people working in ICT across gender

	Males	Females	$X^2(1)$
Physical appearance			
Yes	41 (12.2%)	35 (9.7%)	1.044
No	296 (87.8%)	324 (90.3%)	
Total N	337	359	
Intellectual aptitudes			
Yes	106 (31.5%)	107 (29.8%)	.223
No	231 (68.5%)	252 (70.2%)	
Total N	337	359	
Social skills			
Yes	32 (9.5%)	38 (10.6%)	.228
No	305 (90.5%)	321 (89.4%)	
Total N	337	359	
Social position			
Yes	13 (3.9%)	10 (2.8%)	.625
No	324 (96.1%)	349 (97.2%)	
Total N	337	359	
Professions oriented to the design and development of ICT services			
Yes	95 (28.2%)	101 (28.1%)	.000
No	242 (71.8%)	258 (71.9%)	
Total N	337	359	
Professions using ICT as a tool			
Yes	46 (13.6%)	79 (22.0%)	8.237***
No	291 (86.4%)	280 (78%)	
Total N	337	359	

	Males	**Females**	**$X^2(1)$**
Role models			
Yes	107 (31.8%)	115 (32.0%)	.006
No	230 (68.2%)	244 (68%)	
Total N	337	359	

Chi-square values for the comparison between males and females for all categorical row variables. The degrees of freedom are specified between brackets
***$p < .001$, **$p < .01$, *$p < .05$

Sáinz, M., Meneses, J., López, B. S., & Fàbregues, S. (2016). Gender Stereotypes and Attitudes Towards Information and Communication Technology Professionals in a Sample of Spanish Secondary Students. Sex Roles, 74, 154–168. https://doi.org/10.1007/s11199-014-0424-2

Table 4. Analysis of gender differences in the attitudes towards people working in the ICT field

	Males	**Females**	$X^2(2)$
Attitudes			
Negative	26 (7.7 %)	22 (6.1 %)	
Neutral	201 (59.6 %)	231 (64.3 %)	1.797
Positive	110 (32.6 %)	106 (29.5 %)	
Total N	337	359	

*** $p < .001$ ** $p < .01$ *$p < .05$. Chi-square values for the comparison between males and females. The degrees of freedom are specified between brackets

Sáinz, M., Meneses, J., López, B. S., & Fàbregues, S. (2016). Gender Stereotypes and Attitudes Towards Information and Communication Technology Professionals in a Sample of Spanish Secondary Students. Sex Roles, 74, 154–168. https://doi.org/10.1007/s11199-014-0424-2

Table 5. Attitudes towards people working in the ICT field across and within gender

	Males	Females	$X^2(2)$ Total	$X^2(2)$ Males	$X^2(2)$ Females
Physical Appearance					
Negative	10 (24.4 %)	5 (14.3 %)	44.189***	28.976***	15.958***
Neutral	11 (26.8 %)	12 (34.3 %)			
Positive	20 (48.8 %)	18 (51.4 %)			
Total	41	35			
Intellectual Aptitudes					
Negative	11 (10.4 %)	10 (9.3 %)	392.688***	201.762***	190.959***
Neutral	6 (5.7 %)	13 (12.1 %)			
Positive	89 (84.0 %)	84 (78.5 %)			
Total	106	107			
Social Skills					
Negative	13 (40.6 %)	14 (36.8 %)	157.647***	–	–
Neutral	3 (9.4 %)	4 (10.5 %)			
Positive	16 (50.0 %)	20 (52.6 %)			
Total	32	38			
Social position					
Negative	1 (7.7 %)	0 (0.0 %)	–	–	–
Neutral	1 (7.7 %)	1 (10.0 %)			
Positive	11 (84.6 %)	9 (90.0 %)			
Total	13	10			
Professions oriented to the design and development of ICT services					
Negative	1 (1.1 %)	5 (1.0 %)	117.255***	–	50.553***
Neutral	90 (94.7 %)	90 (93.1 %)			
Positive	4 (4.2 %)	6 (5.9 %)			

	Males	**Females**	$X^2(2)$ **Total**	$X^2(2)$ **Males**	$X^2(2)$ **Females**
Total	95	101			
Professions using ICT as a tool					
Negative	0 (0.0 %)	0 (0.0 %)	–	–	–
Neutral	42 (91.3 %)	77 (97.5 %)			
Positive	4 (8.7 %)	2 (2.5 %)			
Total	46	79			
Role Models					
Negative	1 (0.9 %)	4 (3.5 %)	139.180***	–	–
Neutral	104 (97.2 %)	104 (90.4 %)			
Positive	2 (1.9 %)	7 (6.1 %)			
Total	107	115			

*** $p < .001$ ** $p < .01$ *$p < .05$. --- Chi-square is not applicable, cells are lower than 5. Chi-square values for the comparison between ($X^2(2)$ Total) and within ($X^2(2)$ Males; $X^2(2)$ Females) males and females for all categorical row variables. The degrees of freedom are specified between brackets

Sáinz, M., Meneses, J., López, B. S., & Fàbregues, S. (2016). Gender Stereotypes and Attitudes Towards Information and Communication Technology Professionals in a Sample of Spanish Secondary Students. Sex Roles, 74, 154–168. https://doi.org/10.1007/s11199-014-0424-2

Table 6. Gender differences with regard to gender references associated with people working in the ICT field

	Males	**Females**	$X^2(2)$
Gender References			
Masculine	168 (49.9 %)	153 (42.6 %)	
Feminine	17 (5.0 %)	29 (8.1 %)	5.041
Neutral	152 (45.1 %)	177 (49.3 %)	
Total	337	359	

*** $p < .001$ ** $p < .01$ *$p < .05$. Chi-square value for the comparison between males and females. The degrees of freedom are specified between brackets

Sáinz, M., Meneses, J., López, B. S., & Fàbregues, S. (2016). Gender Stereotypes and Attitudes Towards Information and Communication Technology Professionals in a Sample of Spanish Secondary Students. Sex Roles, 74, 154–168. https://doi.org/10.1007/s11199-014-0424-2

Table 7. Gender references associated with people working in the ICT field across and within gender

	Males	Females	$X^2(2)$ Total	$X^2(2)$ Males	$X^2(2)$Females
Physical Appearance					
Masculine	19 (46.3 %)	17 (48.6 %)	–	–	–
Feminine	1 (2.4 %)	0 (0.0 %)			
Neutral	21 (51.2 %)	18 (51.4 %)			
Total	41	35			
Intellectual Aptitudes					
Masculine	22 (20.8 %)	17 (15.9 %)	–	–	–
Feminine	1 (0.9 %)	2 (1.9 %)			
Neutral	83 (78.3 %)	88 (82.2 %)			
Total	106	107			
Social Skills					
Masculine	7 (21.9 %)	12 (31.6 %)	–	–	–
Feminine	2 (6.3 %)	0 (0.0 %)			
Neutral	23 (71.9 %)	26 (68.4 %)			
Total	32	38			
Social position					
Masculine	7 (53.8 %)	2 (20.0 %)	–	–	–
Feminine	0 (0.0 %)	0 (0.0 %)			
Neutral	6 (46.2 %)	8 (80.0 %)			
Total	13	10			
Professions oriented to the design and development of ICT services					
Masculine	66 (69.5 %)	64 (63.4 %)	59.389***	36.583***	27.592***
Feminine	10 (10.5 %)	9 (8.9 %)			
Neutral	19 (20.0 %)	28 (27.7 %)			

	Males	Females	$X^2(2)$ Total	$X^2(2)$ Males	$X^2(2)$Females
Total	95	101			
Professions using ICT as a tool					
Masculine	25 (54.3 %)	35 (44.3 %)	.217	–	.126
Feminine	2 (4.3 %)	6 (7.6 %)			
Neutral	19 (41.3 %)	38 (48.1 %)			
Total	46	79			
Role Models					
Masculine	77 (72.0 %)	74 (64.3 %)	141.744***	60.734***	81.213***
Feminine	13 (12.1 %)	22 (19.1 %)			
Neutral	17 (15.9 %)	19 (16.5 %)			
Total	107	115			

*** $p < .001$ ** $p < .01$ *$p < .05$. --- Chi-square is not applicable, cells are lower than 5. Note: Chi-square values for the comparison between ($X^2(2)$ Total) and within ($X^2(2)$ Males; $X^2(2)$ Females) males and females for all categorical row variables. The degrees of freedom are specified between brackets