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EXPLORATION OF THE ACADEMIC DECISIONS OF HIGHLY ABLE STUDENTS

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Abstract

The choice of career for students with high ability (HA) is not without its difficulties. In STEM (Science, Technology, Engineering, Mathematics), women with HA do not choose such areas in the same proportion as men. We sought to understand how contextual factors influence the academic decisions of HA students. In this qualitative study, eight focus groups with students with HA and interests in STEM were conducted. The results show parents as role models; however, fathers' messages can be threatening for female students. Results also show that teachers inspire and provide clear guidance based on skills, rather than on real challenge, and that school activities allow direct experience of discipline, but produce little linkage to real areas of interest.

GENDER RELATIONS • HIGH ABILITY STUDENTS • STEM

EXPLORACIÓN DE LAS DECISIONES ACADÉMICAS EN ESTUDIANTES CON ALTA CAPACIDAD

Resumen

La elección de carrera en estudiantes con alta capacidad (AC) no está exenta de dificultades. En STEM (Science, Technology, Engineering, Mathematics) las mujeres con AC no eligen dichas áreas en la misma proporción que los hombres. Se buscó entender cómo los factores contextuales influyen en las decisiones académicas. Es un estudio cualitativo donde se realizaron ocho focus group de estudiantes con AC e intereses en STEM. Los resultados muestran a los padres como modelos; sin embargo, el mensaje paterno puede ser amenazante para las mujeres. Los profesores inspiran y entregan orientaciones claras basadas en las habilidades más que desde un desafío real. Las actividades escolares permiten una experiencia directa con la disciplina, pero producen poca vinculación con reales áreas de interés.

RELACIONES DE GÉNERO • ESTUDIANTES DE ALTA CAPACIDAD • STEM

EXPLORAÇÃO DE DECISÕES ACADÊMICAS EM ESTUDANTES DE ALTA CAPACIDADE

Resumo

A escolha da carreira de alunos superdotados não está livre de dificuldades. No tocante à STEM (Science, Technology, Engineering, Mathematics), as mulheres superdotadas não escolhem tais áreas na mesma proporção que os homens. Tentou-se entender de que maneira os fatores contextuais influenciam as decisões acadêmicas. Trata-se de um estudo qualitativo no qual foram realizados oito focus groups de alunos superdotados e com interesses em STEM. Os resultados mostram os pais como modelos; no entanto, a mensagem paterna pode ser ameaçadora para as mulheres. Os professores inspiram e transmitem orientações claras baseadas mais em habilidades que em um desafio real. As atividades escolares permitem uma experiência direta com a disciplina, porém produzem pouca ligação com áreas reais de interesse.

RELAÇÕES DE GÊNERO • ALUNOS COM ALTAS HABILIDADES • STEM

EXPLORATION DES DÉCISIONS ACADÉMIQUES CHEZ LES ÉTUDIANTS À HAUTE CAPACITÉ

Resumé

Le choix de la carrière des élèves à haut potentiel n'est pas libre de difficultés. En ce qui concerne STEM (Science, Technology, Engineering, Mathematics) les femmes à haut potentiel ne choisissent pas tels domaines dans la même proportion que les hommes. On a essayé de comprendre de quelle manière les facteurs du contexte influencent les décisions académiques. Il s'agit d'une étude qualitative pour laquelle on été réalisés huit focus groups d'élèves à haut potentiel intéressés à STEM. Les résultats montrent les parents comme modèle, pourtant le message paternel peut être menaçant pour les femmes. Les enseignants inspirent et transmettent des orientations claires basées plus dans des habilités que dans des défis réels. Les activités scolaires permettent une expérience directe avec la discipline, cependant elles produisent peu de liens avec les vrais domaines d'intérêt.

RELATIONS DE GENRE • ÉTUDIANTS HAUTEMENT CAPACITÉS • STEM

IN RECENT YEARS, GIVEN THE MINORITY REPRESENTATION OF WOMEN IN STEM CAREERS

(Science, Technology, Engineering and Mathematics), there has been a marked interest in learning about the processes that influence women's career choices or disciplinary areas of interest (MENDEZ; CRAWFORD, 2002). Science, Technology, Engineering, and Mathematics skills are a 21st century necessity at the technical and professional level (HUTCHINSON, 2013); given that a country's development depends on the contributions from all of its citizens, it is crucial that both men and women have the opportunity to develop their potential. In the case of women with High Ability (henceforth HA), this representation is particularly worrying; despite the fact that boys and girls have the same probability of being highly able (PETERSON, 2013), they do not enter STEM careers in equal proportions (STOET; GEARY, 2018) indicating that cognitive potential alone does not explain these differences.

The process by which this gap occurs begins and intensifies during the school period. During primary and secondary education, despite being equally competent in mathematics and science (HUTCHISON; LYONS; ANSARI, 2018; MILLER; HALPERN, 2014), women's attitudes towards these subjects are more negative, which has a significant impact on their academic achievements, later school-related decisions, and career choices (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT – OECD, 2015). In particular, adolescents with HA confront the processes of choosing areas of academic and professional development at a deeper level and with unique characteristics. This is due to their intellectual precocity, multiple areas of potential, and the expectations regarding their professional projections (JUNG, YOUNG, 2018; WATTERS; DIEZMANN, 2015). In science and mathematics at school, the interaction of these characteristics with motivational factors, self-concept, and self-efficacy play a critical role in understanding the development of career interests, as well as the abandonment of them, which is more frequently observed among women (BENÖLKEN, 2019; VU *et al.*, 2019).

Previous studies have shown the influence of relevant actors, such as parents and teachers, in the configuration of these intrapersonal factors. The constitution of biases in the way these actors identify, promote, and stimulate interest in science and mathematics among girls and adolescents with HA has been reported in northern hemisphere countries (BENÖLKEN, 2019; VU *et al.*, 2019). Thus, the development of interest in STEM areas for women may be negatively influenced by the overlap of stereotypes regarding gender, HA, and scientists (e.g., male, lonely, working indoors, etc.), as these students are socialised by parents and teachers, throughout their adolescence (MATHEIS *et al.*, 2019). However, these effects can be moderated precisely by the family and school (MURATORI; SMITH, 2015; TWEEDALE; KRONBORG, 2015; WATTERS, 2010).

The processes by which academic interests are developed, as well as the factors and influential actors, have been studied previously (MURATORI; SMITH, 2015; WATTERS, 2010; JUNG; YOUNG, 2018). However, this area of study among students with HA, in societies that are particularly traditional in their configuration of gender stereotypes, as is the case in Latin America (SCANTLEBURY; BAKER, 2007), has received little attention, and no studies have been found in the case of Chile. This research, therefore, sought to promote a better understanding of the phenomenon by investigating the gender differences between students with HA, particularly in the selection of specialised academic tracks and technical-vocational tracks during secondary education.

THEORETICAL FRAMEWORK

THE CONCEPT OF HIGH ABILITY

The concept of HA has been associated, since its inception, with the concept of intelligence (CONEJEROS-SOLAR; CÁCERES; RIVEROS, 2012); however, there is now a broader understanding that incorporates socio-cultural and developmental approaches, as well as non-cognitive attributes, in addition to high potential (KAUFMAN; STERNBERG, 2008). Students with HA constitute 10% of the population (GAGNÉ, 2015) and are characterized by having different learning characteristics from their peers of the same age, experience, and opportunity, which are expressed as skills such as greater speed, complexity, and depth (CONEJEROS-SOLAR *et al.*, 2018; HÉBERT, 2010; PFEIFFER, 2013). In educational contexts, HA can be defined as having the capacity to perform at a higher level in one or more domains, over peers with similar characteristics (NATIONAL ASSOCIATION FOR GIFTED CHILDREN – NAGC, 2020).

CAREER CHOICE OF STUDENTS WITH HIGH ABILITY

Over the years, it has been thought that students with HA have an easier time choosing a career, because their superior skills would allow them to follow any academic area of preference (CHEN; WONG, 2013). However, research has revealed that this is a complex phenomenon and that decision-making in this group is not simple or straightforward (KIM, 2013). To explain this process, reference is made to multipotentiality, a controversial concept in HA literature that refers to the presence of multiple superior abilities - this in turn can be linked to a phenomenon that has been called the “over-choice syndrome” (RYSIEW; SHORE; LEEB, 1999). This syndrome refers to hesitation in making choices when faced with many viable future career options and, in the case of HA, with outstanding skills in various areas.

Women with HA have been found to be more vulnerable during the decision-making process, which is affected, among other things, by gender socialisation and lower professional ambitions than their male peers (KERR; SODANO, 2003). Likewise, research suggests that career choices made by women with HA do not take into account their real intellectual potential, indicating possible difficulties in integrating their superior skills into this process; they may also be influenced by environmental expectations regarding intelligence and femininity (MAXWELL, 2007; OGURLU; KAYA; HIZLI, 2015).

PARENTS AS INFLUENTIAL FIGURES IN THE DEVELOPMENT OF INTERESTS

For students with HA, family relationships are critical, as parents are the first to identify characteristics associated with this condition in their sons and daughters, recognising them and therefore providing environments that enrich and enhance their superior cognitive characteristics (GOMEZ-ARIZAGA; TRUFFELLO; KRAUS, 2019; IVIE; CZUJJKO; STOWE, 2002). Likewise, it has been observed that for students with HA, the parental figure of the same sex can constitute a role model, in terms of both cognitive and socio-affective characteristics (HÉBERT, 2018). Similarly, fathers also tend to encourage early interests in both their daughters and sons, based on the observation of their superior cognitive characteristics or signs of precocity (COLEMAN, 2016; KINGSBURY; HEYLIGHEN, 2019).

Regarding parental influence on the career choice of students with HA, a preponderance of family influence over school influence for both genders, at all socio-economic levels has been found (STEENBERGEN-HU; OLSZEWSKI-KUBILIUS, 2017). Regarding the choice of STEM careers, some results highlight the maternal figure in this process (BAHAR; ADIGUZEL, 2016), particularly the fact that maternal figures are more positive about the options that her children have; they are also more available for their HA children, both physically and emotionally (LIU; McMAHON; WATSON, 2015). As for the father figure, it has been found that the father’s occupation has a greater influence on female students and less influence on males (VU *et al.*, 2019).

There are also cultural and socio-economic factors that affect the support provided by parents. From a socio-economic perspective, Leppel, Williams and Waldauer (2001) found that when the father came from an affluent background and/or had a well-paid profession, daughters were more likely to choose traditionally male careers. From a cultural perspective, in a qualitative study conducted in Korea, Lee and Sriraman (2012) found a significant decline in interest in STEM careers among teenage girls, despite their superior skills in mathematics. Analysing the role of fathers in this process, they found that both mothers and fathers did not promote and/or reinforce these choices. On the one hand, the father figure, while supporting the early development of mathematical skills, held views that scientific work was incompatible with the female role. Mothers, on the other hand, reinforced skills oriented towards humanistic disciplines. Similar results were found by Tirri and Kuusisto (2018) with eminent women in Finland, where the father figure held stereotypical perceptions of STEM careers, considering them a restricted field for women. The mother figure, on the other hand, was perceived as a general and constant support over time.

Within the studies that have been carried out in Latin America (Mexico), Farfán Marquez and Simón Ramos (2018), interviewed adolescents with HA in mathematics and found that parental figures, in general, despite having high expectations and actively promoting the development of their daughters' high abilities, held opinions linked to traditional roles and showed a gender bias towards typically male and female careers.

TEACHERS AND THEIR INFLUENCE ON THE DEVELOPMENT OF ACADEMIC INTERESTS

The development of academic interests and the process of career choice for students with HA is influenced by both intrapersonal factors such as cognitive ability, areas of interest and performance, as well as career-specific aspects of occupational prestige and gender roles (CHEN; WONG, 2013). How the personal and career dimensions interact with each other depends on socialisation processes, in which teachers are key actors.

The influence of teachers in exploring interests and career alternatives for students with HA is particularly relevant, and this interaction can be characterised both directly and indirectly. At a direct level, there is the intellectual stimulation that teachers encourage in students, especially through practical experiences that contribute to the consolidation and fostering of exploration routes and the development of their skills (MURATORI; SMITH, 2015). They can also provide specific information on careers and working environments. In this way, teachers help these students to understand and value their academic performance history and to project expectations for the future (GALLAGHER, 2019).

As for the indirect influence of teachers in the exploration of academic and professional interests, teachers emerge as influential actors who raise or remove subjective barriers associated with gender, class, occupational prestige, or career accessibility. The classroom educational experience and vocational reflection are central elements of this exploration. Teachers' influence can be observed when they provide opportunities and equal treatment to all of their students, allow students to explore, free of bias, or on the contrary, when they focus students on barriers related with certain options, which can move the student away from a career choice that was in their sights (MURATORI; SMITH, 2015).

Especially relevant to female students with HA, the literature highlights that teachers, whether male or female, can foster their interests and commitment in STEM areas by maintaining positive interpersonal relationships, presenting challenging content that enhances their skills, and becoming role models (MULLET; KETTLER; SABATINI, 2018). It has also been observed, in relation to the perceived social support for female students, that those teachers who offer opportunities in mathematics and science, who trust them more and recognise their performance in front of the class, strengthen their interest in this area (BUDAY; STAKE; PETERSON, 2012; TWEEDALE; KRONBORG, 2015).

EXPOSURE TO STEM ACTIVITIES AND ORIENTATION AND THE INFLUENCE OF THESE ON CAREER CHOICE

Regarding opportunities to access STEM-related learning experiences, evidence indicates that there is a positive effect between exposure to these activities and the subsequent completion of a degree in the field and later work-related achievements (STEENBERGEN-HU; OLSZEWSKI-KUBILIUS, 2017). Previous studies, such as Wai, Lubinski and Benbow (2010), lend support to this relationship, suggesting that access to STEM enrichment activities at the school level and purposeful career orientation can promote degree attainment and significant achievement in the area.

In a study by Bahar and Adiguzel (2016), which compared factors determining STEM career choice among US and Turkish high school students with HA, they found that academic fairs and competitions were highly valued by students in both countries. This research suggests that these types of activities, in which students with HA feel challenged, are opportunities that cannot be missed. Challenge is thus one of the main factors influencing the interests of these students in the STEM disciplines.

In terms of school experience, other factors that have been found to influence career choice are linked to an appropriate learning environment in the classroom. A study of 130 high school students with HA revealed a significant correlation between choice and environment, and also established a link between the latter and achievement motivation (OGUTU, 2019). Other studies also suggest that the learning environment inspires the academic goals that students adopt, and is therefore relevant to consider when addressing career orientation processes in this student population (GHERASIM; BUTNARU; IACOB, 2011).

CHILEAN EDUCATIONAL CONTEXT

In Chile, school education is structured in two levels: 1) basic or primary education, which covers the first eight years of schooling, and 2) secondary education, which corresponds to the last four years of schooling. Of these last four years, the first two (1st and 2nd year) are general education, in the last two (3rd and 4th year), however, different specialization tracks are offered, in addition to the common curriculum. The following options are available for specialised tracks: (a) Humanistic-Scientific tracks, academic paths, aimed at deepening knowledge in the humanities or sciences, (b) Technical-Vocational tracks, aimed at technical training for different economic and industrial sectors, and (c) the Artistic track, aimed at specialised training in different artistic areas (Law No. 20,370) (CHILE, 2009). At the end of their second year of secondary education, students must choose what track they will pursue for their third and fourth years of secondary education, depending on the options offered by their educational establishment.

While there is considerable literature on career choice for students with HA at the international level (CHEN; WONG, 2013; KIM, 2013; MAXWELL, 2007; OGURLU; KAYA; HIZLI, 2015), what happens with formal preparatory events, such as the choice of in-depth academic courses or technical-vocational specialities during secondary education, has not been studied. The purpose of this study was to examine how contextual factors, such as parental figures and the school environment, affect the decision-making process of female and male students during the last two years of secondary education as they choose from between the humanistic-scientific tracks or the technical-vocational tracks. We sought to answer the following research questions:

- How do parental figures influence the choice of specialised tracks in female and male secondary-level students with HA?
- What are the people and/or preparatory events at school level that affect decision making regarding specialised tracks in female and male secondary-level students with HA?

METHODOLOGY

PARTICIPANTS

The participants were part of a longitudinal three-year study; they were HA students, in their second year of secondary education, who had already decided or were about to decide on their specialised humanistic-scientific track or their technical-vocational track speciality for the last two years of schooling. The sample was comprised of HA students who are categorised in two groups: (a) students with HA who attend curriculum enrichment programmes and (b) students with HA who attend regular educational establishments. The sampling was conducted in two stages: 1) The Raven's Standard Progressive Matrices Test was applied to students from regular educational establishments to identify those with HA, using the 75th percentile as a cut-off point, as established in the Ministry of Education regulations (MINEDUC) (CHILE, 2010) (students attending curriculum enrichment programmes had been previously identified using the same instrument); 2) students with HA, both from programmes and from regular educational establishments, were tested with two instruments to measure attitudes towards science (TOSRA) (FRASER, 1981; NAVARRO *et al.*, 2016) and attitudes towards mathematics (TOMRA) (CHAPMAN, 2012). Only those students with favourable attitudes towards one or both subjects were selected to continue. A total of 61 students participated (HA and with favourable attitudes towards science and/or mathematics), 34 males and 27 females, which, for the purpose of analysis, were ordered in groups according to the characteristics of the institutions or programmes they attend (Table 1).

TABLE 1
PROFILE OF STUDENTS ACCORDING TO CHARACTERISTICS OF THE TYPE OF SCHOOL OR PROGRAMME

Profile	Male	Female	Total
Group 1 Students from the Valparaíso or Araucanía regions who, in addition to attending their regular schools, participate in a curricular enrichment programme for high ability students. They come mainly from municipal schools (90%).	10	10	20
Group 2 Students from Santiago who attend paid private schools and offer the Humanistic-Scientific tracks. These schools serve children from a high socioeconomic status group (SES), (i.e., mothers have, on average, 16 years of schooling, while fathers have 17, the average household income is \$1,792,707 pesos (\$2,500 USD) and the school has 1% of vulnerable children) (CHILE, 2012).	10	8	18
Group 3 Students from the Metropolitan Region who attend subsidised public schools that offer the Humanistic-Scientific tracks. These schools serve children with medium-high SES, (i.e., parents have, on average, 14 years of schooling, an average household income of \$698,960 pesos (\$980 USD) and 24% of a school's population are vulnerable children) (CHILE, 2012).	3	0	3
Group 4 Students from the Metropolitan Region who attend subsidised schools that offer the Technical-Vocational tracks and who are part of a Catholic foundation. These schools serve children with low SES, (i.e., parents have, on average, eight years of schooling, an average household income of \$151,349 pesos (\$210 USD) and 88% of the school's population are vulnerable children) (CHILE, 2012).	11	9	20
Total	34	27	61

Source: Own elaboration.

PROCEDURES AND DATA COLLECTION TECHNIQUES

Eight group interviews were conducted, three mixed and five single-sex, with an average of four to eight students participating. Single-sex interviews were used in those establishments where it was possible, in order to promote an atmosphere of trust and openness. Each student participated in a group interview, conducted in the same educational establishments or in the curricular enrichment programs.

An interview script was designed and piloted with students with HA of the same age as the participants, but who were not part of the sample. This allowed adjustments to be made regarding the application time, the clarity of the instructions, and the relevance of the activities included. The group interview protocol considered three moments: (a) students thought about those events or people who influenced the choice of specialised tracks and then they ordered those elements based on importance, (b) they gave a brief account of the chosen track and (c) they imagined themselves taking that specialised track, so as to consider their projections for this academic stage. The adjusted script, with the three sections mentioned, is presented in Table 2.

TABLE 2
GROUP INTERVIEW PROTOCOL

	Prompt	Guiding questions
Section 1	We would like to lead you to think about the process of choosing your specialised track in your school. To do this, we would like you to think about people, situations, events or activities that have influenced you in the last two years and write each one down on a piece of paper. Now we would like you to rank these people or activities, putting a 1 on the most influential, and continuing to the least influential.	What or who did you write down? Why did they influence you in this way? Can you give examples?
Section 2	Now that we have talked about the election processes, we would like you to tell us briefly what track you chose or plan to choose and explain what options there are at your school.	
Section 3	In the specialised track that I chose (or will choose) My performance will be... About these subjects (from the specialised track) I am concerned about... About these subjects (from the specialised track) I am enthusiastic... The specialised track I chose (or will choose) will help me to...	Why?

Source: Own elaboration.

DATA ANALYSIS

After the transcription of the group interviews, a qualitative content analysis was carried out, which sought to understand more deeply the meaning given by the students to the choice of specialised track. In this way, the analysis focused on moving beyond the explicit text pointing out the inferences that can be made from these narratives (DÍAZ, 2018). This analysis considered different stages to achieve the necessary density and saturation of the data obtained. Five expert researchers and three research assistants participated in this process:

- Stage 1: Open reading and initial coding of the data;
- Stage 2: Triangulation and codebook creation;
- Stage 3: Analysis of the interviews using the Atlas.ti 8 software;

- Stage 4: Triangulation between researchers and creation of themes and categories of analysis;
- Stage 5: Interpretation of results.

ETHICAL CONSIDERATIONS

The parents of the participating students gave their consent by authorising their children to take part in the study, while the students signed an informed assent. In these documents, parents and students were informed of the purpose and duration of the study, as well as the potential risks. It was also emphasised that participation was free and voluntary.

RESULTS

Inductive analysis led to the formation of two major emerging themes that account for the most relevant contextual factors in the process of choosing a specialised track (Humanistic or Scientific or from the Technical-Vocational tracks): parental figures and school context.

PARENTAL FIGURES

Referring to the type of support from their nuclear parental figures (i.e., mother and father) perceived by students with HA, it was found that both parents were perceived as providers of support and motivation, insofar as they encouraged their children to achieve in their studies, either in their specialised tracks or thinking ahead to higher education. However, there were nuances in how this support, from both parental figures, was perceived by male and female students.

Father

For participants of both sexes, the father was a role model, mainly through the profession/occupation that he practices. The area or discipline in which the father is involved allowed him to hold conversations with his children about what this type of work entails and to exert influence regarding academic decision-making, such as the choice of specialised track, providing performance parameters, such as obtaining a good score in the University Selection Test (PSU).

I see my dad as a role model and, I mean, I see everything he does, and I don't know if I would be able to do everything he does. That's why I'd like to get close to even a little bit of what he does, and not study the same as him, but have the same impact that he has. (Female, group 2, own translation)

My dad has told me a lot about studying engineering. So, he has talked to me a lot about issues in the field. And another reason why I chose the maths, history, and physics electives, is because... I'm still not quite sure what to study, but my dad always told me that, it doesn't matter what I do, as long as I have a good PSU score. (Male, group 3, own translation)

For both sexes, the father was also a figure who has engaged them in early and practical experiences related to STEM areas, either by sharing his hobbies or by early encouragement of his children's specific interests.

When I was little, he used to buy me things like electronics. Like, I mean, I have always liked to play video games or things like that, so he would buy them for me. And I would entertain myself with that. Sometimes he would teach me how to take it apart, or something like that. So, he kind of got me into what I want to be. (Female, group 4, own translation)

In terms of specific orientations towards a particular area, for women in private schools, the influence of the father was often perceived in a negative way, either as a pressure – and in some cases, an imposition – to follow certain careers associated with a better economic return, or to follow certain areas that, according to the father, would have a greater value or contribution to society, than others.

My dad didn't really like the idea of me choosing art. Um, he would prefer me to get into environmental systems because it's much more useful, which it really is...But he found it outrageous that I chose art over systems which is something that I could use more. In other words, whenever, let's say, I jokingly said, "I want to be such a thing", he would say, "no, you can't be that. You have to do something important". (Female, group 2, own translation)

In one case, the perceived pressure from the father provoked a negative disposition of the student towards the profession, accompanied by a “rebellious” attitude of not choosing what the father has dictated, but rather following other interests.

[my dad] told everyone that I was going to be a geologist. But about two years ago I said to myself, no, it's a burden; I'm not going to like it. Why follow what he wants me to do, and not something that I like? (Female, group 2, own translation)

For male students, on the other hand, although their fathers may be directive in their orientations, this was not experienced in a negative way, rather, it was perceived more as a support in their decision-making, whether for the choice of a specialised track or career.

Well, he was very supportive of me in my first year of high school. To continue with physics. In other words, he supported me so that I would do well. But he wouldn't want me to go into a career like his, mechanical engineering, because he didn't do very well. So, he supports me, but he prefers that I go into industrial engineering... I don't know what it's called, but it's engineering. (Male, group 3, own translation)

Mother

For the male participants, the mother, like the father, represented a role model, in particular mothers who had a profession linked to a STEM area.

[My mother] is a chemistry teacher at high school. And there she kind of sees everything about sustainability, about ecology, and how everything is in that area. And I kind of have to study something that has to do with that. I mean, I don't have any relatives who are like, at university, in engineering. I think my mother is the only one who has a degree in what I think is teaching. And that would be, I got into it because of that. (Male, group 3, own translation)

However, for the female participants, the mother played a guiding role, presenting different options, without necessarily assigning a value to them, but rather promoting reflection and analysis of them.

She just put me in situations, making me choose. But she helped me think about those situations, putting them on the table, so to speak. (Female, group 1, own translation)

It's not that she tells me "choose this", but that she gives me the information and structure of each thing, so that I can inform myself, and know which speciality I would like to choose and what would be useful to me later on, and all that. That's why I think she's an important factor in my decisions at the moment, because she doesn't tell me what to do, she advises me based on her life experiences. (Female, group 4, own translation)

In contrast to the pressure perceived by daughters from their fathers, female students, regardless of their socio-economic group, reported that the messages from their mothers encouraged them to base the decision regarding the choice of specialised tracks and careers on self-realisation rather than economic return.

It's just that my mum, basically, instead of telling me that this is more convenient for me, tells me to do what I like. (Female, group 4, own translation)

My mum tells me that I should do what makes me happy. But my dad doesn't. "You're going to starve to death. You won't be able to have a home". (Female, group 2, own translation)

SCHOOL/ACADEMIC CONTEXT

In the school context, regarding the category of support in the processes and guidance as students choose specialised tracks and the subsequent choice of discipline in higher education, there are three subcategories that express favourable and/or unfavourable aspects of this support: (a) teacher influence, (b) career guidance, and (c) extra-curricular activities.

Teacher influence

For the participants of both sexes, in the development of interests in science and mathematics, teachers can be seen as positive role models. These teachers were characterised by high motivation and love for the discipline they teach and instilled in students a passion for learning more about the subject.

Biology teachers always leave me with that intrigue about what else I can look for about some type of cell, or what happened to this disease, which affects every part of the body. (Female, group 1, own translation)

On the contrary, unstimulating teaching practices caused students to dislike the class, which may have led the students to distance themselves from the disciplinary area.

I don't know what I could do in relation to science, but I am entertained during science classes. I like it. I don't like physics so much, but I think it's the way they teach it. Because at times, it interests me, if I sit down to study alone, I'm interested. (Female, group 2, own translation)

The fact that teachers were actively concerned with encouraging students to reflect on "what's coming" was also seen as positive, transmitting high expectations about their potential after school. In the case of women, they particularly valued the fact that these teachers, through conversations, provided criteria to be considered when making decisions about their future plans. Teachers provided relevant guidance, taking into account students' marks or their difficulties or advantages in relation to certain skills:

And my teachers, also always told me “no, you are a better scientist than a humanist”. So, I began to believe that. So, I put humanities to one side, and now I’m doing very badly in humanities. (Female, group 2, own translation)

Career-orientation activities

Regarding career orientation, understood as the opportunities and options organised by educational institutions to guide and channel the interests and skills of their students, it was noted from the narratives that career orientation activities were focused primarily on providing information about the process of choosing between the academic specialised tracks or among the technical-vocational tracks, about the University Selection Test (PSU), and university degree programs, and not necessarily about exploring preferences, personal knowledge, and personal interests. These activities did not seem to contribute to a greater knowledge and personal growth for the student and hence did not meet the expectation in terms of providing “guidance”.

They gave us a sheet where we had to choose whether it was gastronomy, telecommunications, or electronics. And then a month passed, and they informed you of what each one consisted of, with talks about gastronomy, electronics, and those things. But after having put on the sheet what you wanted, without knowing anything. (Male, group 4, own translation)

They gave us a test, but they didn’t give us the results. (Male, group 1, own translation)

Among the most valued actions for both male and female students were those with an emphasis on providing an experience or the possibility of having access to different influential actors (teachers, other students studying a certain specialised track or university degree programme) that provided complementary information to the decision-making process. In career guidance, it is important to consider that it is a process, which should allow doubts to be clarified and requires a base of trust in the relationship with multiple actors.

[...] we visited universities. And, on these trips, we learned more about the careers that were available, they put you in classes for specific careers, and I think that helped a lot. It guided you much more in what options there were [...] in the end that’s what I’m going to do, so I want it to be something that I really like. (Female, group 2, own translation)

And sometimes other professionals also come, to explain to us how it has gone. Kids who have finished high school, and how they’ve done at university and everything. Then they explain and guide us. (Male, group 1, own translation)

When these elements were not present, uncertainty was expressed about the alternatives that existed and concern was manifested about the lack of guidance and information. This concern focused on the possibility of making a mistake or a wrong decision that would ultimately result in choosing an area that is not of interest.

I think that also because you can choose something because you think it will be good for you, but I think that if you are going to choose something that you like, it is good to be guided, so that you are not confused, and to be clear about what you want. So that you don’t make mistakes, and that you see how it can help you, if that’s what you like. (Female, group 1, own translation)

There was a talk, in which a guy had said that as he entered a university, he was going to study engineering, and he realised that he did not like mathematics. I'm kind of worried that something like that might happen to me, that I really don't like what I chose. (Male, group 2, own translation)

Extra-curricular activities

Refers to actions whose objective is not career-related but complementary to the educational activities offered by institutions or other educational bodies such as universities (science fairs, Olympiads, summer schools). These instances were observed to contribute favourably to orienting student decisions, given that these activities allowed them to visualise themselves and project themselves into specific professional training spaces on a cognitive and emotional level. They also helped students gain experience in areas of interest or affinity. These activities were particularly valued by students, and the voluntary decision to participate in them gave them greater significance in personal decision making.

[Science fair] It allows us to know our affinities more easily. For example, a person who wants to be a nurse, and goes to the fair, cannot faint if they see a cow liver. If they faint, they have less affinity with this career. (Male, group 1, own translation)

[...] university courses, because I have won scholarships, things like that. Um, so I was able to get to know the university atmosphere, the demands. And that's what I want, to be in that environment and go to university. (Female, group 4, own translation)

DISCUSSION

PARENTAL FIGURES

The support of parental figures, for students with HA, is of equal importance for both female and male students, supporting the idea that parents play a fundamental role when students are making academic decisions, such as the choice of specialised tracks and when planning future careers (STEENBERGEN-HU; OLSZEWSKI-KUBILIUS, 2017). This support emerges most strongly at the decision-making stage for students (i.e., secondary education); however, it was also evident that it emerges early, particularly with the father emerging as a figure who provides practical experiences associated with STEM that promote the development of early skills and interests (COLEMAN, 2016; KINGSBURY; HEYLIGHEN, 2019).

As for the father and mother figures, both are considered to be examples to follow, and perceived as *professional role models* for both male and female students, which is not necessarily consistent with findings on the predominance of the parental figure of the opposite sex (HÉBERT, 2018). However, when receiving comments or feedback on career-related issues, messages from mothers and fathers are interpreted differently depending on the gender of the student. On the one hand, it was found that female students, especially from high socioeconomic groups, respond negatively to the advice coming from the father figure, even displaying rebellious behaviour. In these cases, the father figure often suggested more “typically male” career options (LEPPEL; WILLIAMS; WALDAUER, 2001), but the way in which this was done seemed to push their daughters in the opposite direction, even leading to a rejection of STEM areas. This emerging finding may be related to an authoritarian parenting style, which could be detrimental in the socio-emotional

development of students with HA (GRANADO; CRUZ, 2010). In this way, high ability and high socioeconomic status may uniquely combine to establish a type of parental pressure that can negatively influence adolescents, especially girls (SHERMAN, 2016).

For daughters, the maternal influence is relevant in that it helps them explore academic options in a free and flexible way, presenting academic alternatives in possible scenarios and emphasising self-realisation rather than economic return. This is aligned with previous results that positively link the mother to academic decisions, showing support and openness and welcoming the different concerns of her children (LIU; McMAHON; WATSON, 2015; TIRRI; KUUSISTO, 2018).

The results showed that students did not perceive stereotyped views in their parents regarding specific specialised tracks or STEM-related careers, i.e., as being subordinate to one gender. This finding does not coincide with international research results, which have indicated that although fathers were permanent support figures, their messages about the nature of STEM careers and their compatibility with male and female roles were shown to be influenced by gender stereotypes (FARFÁN MARQUEZ; SIMÓN RAMOS, 2018; LEE; SRIRAMAN, 2012; TIRRI; KUUSISTO, 2018). This could be explained by the way these gender stereotypes are configured: on the one hand, explicit stereotypes are sensitive to social desirability (NOWICKI; LOPATA, 2017) and Chile is experiencing a growing feminist movement, led by Chilean female students (REYES-HOUSHOLDER; ROQUE, 2019); this could influence parents to be more cautious of their opinions in this new social context. However, at an implicit level, while these parents do not directly verbalize a bias between STEM and gender, this does not mean that it is not present.

SCHOOL/ACADEMIC INFLUENCE

Teachers

When it comes to positively influencing the development of interests in STEM or professional careers in the field, male and female teachers have similar opportunities to exercise their roles as positive role models and by not showing differences based on the student's gender. But also, through unengaging and non-interactive teaching practices, students may be discouraged from these fields. In Chile, few studies in the STEM area explore this relationship. In the area of mathematics, the pedagogical interactions between teachers and male and female students has been explored, finding that primary mathematics teachers asked boys more challenging questions and gave them more detailed feedback in comparison to girls (ESPINOZA; TAUT, 2016); this could clearly discourage female students from taking an interest in this area, given their greater need, relative to men, for confirmation of their decisions.

In relation to the previous point, the value that female students assigned to their teacher's counselling is acknowledged as a positive influence, which provides decision criteria for choosing areas of study or professions. This serves both to make options visible and to discard them, both of which are important processes during adolescence. In this way, teachers can have an important influence on their students, through their opinions, expectations, and criteria, for the explorations that students engage in when thinking of career planning (MILLER; CUMMINGS, 2009). A less favourable perspective appears when it is observed that teachers also offer criteria that drive students to discard preferences when these do not coincide with what the teacher perceives as the student's area of greatest ability or align with their previous marks. This may cause an early abandonment of preferred options, in favour of more accessible ones (MURATORI; SMITH, 2015). The disadvantage of this process is that it may push students towards areas that require less effort and not necessarily those where they report greater satisfaction. On the other hand, this seems to favour deterministic views about students' ability level, in line with Dweck's statement (2015), which may even discourage students who positively face intellectual challenges.

Career-related activities

Regarding the possibilities of exploring and exposing students to experiences in the area of STEM to help their decision-making processes, the career guidance initiatives carried out by schools are not reported as highly significant. These activities play an informative role at specific times and are not articulated as part of a process that effectively allows decisions to be made about future studies or career plans. The actions that stand out refer to those in which students can experience, live, and share with others who are immersed in certain fields of study and can relate their experience first-hand. In this sense, several studies point out the positive impact of exposure to various activities in the STEM area during their school years on future career choices in such areas (BAHAR; ADIGUZEL, 2016; STEENBERGEN-HU; OLSZEWSKI-KUBILIUS, 2017; WAI *et al.*, 2010), as well as the relevance of guided and purposeful academic processes (WAI *et al.*, 2010).

CONCLUSIONS AND IMPLICATIONS

The results obtained allowed for a more in-depth approach to the issue of the career choices of female students with HA and interests in STEM, not only identifying the actors in the context that most influence this process, but also the form that this influence can take. In this regard, parental support is critical for female and male students; however, for girls with HA, paternal influence can have negative nuances in terms of perceived pressure in favour of certain STEM areas. From the research, it would be relevant, for example, to consider for future studies, parenting styles and their link to academic decisions in this group of students. In practice, these findings raise the possible need for other socialising agents (e.g., extended family members) who can complement the career support provided in the family context, especially for girls.

At the school level, the teacher as a vocational guide and the type of experiences offered to students can create a turning point in career-related decision-making. In this way, a male or female teacher, who is inspiring in their area of discipline, but who also contributes in terms of decision-making criteria, is particularly valuable for female students. However, this guidance should not lead girls to discard skill-based options, but rather give preference to these, given the condition of HA.

The findings report a number of milestones, conversations, and practical experiences that should be modified to provide comprehensive and effective support to female students with HA who have an interest in STEM. Such interventions, aimed at specialised tracks and career choices, should consider a gender approach and incorporate high ability as a variable in this process. For example, it is relevant to consider how higher education institutions and schools promote and/or generate interest in STEM careers, demonstrating not only instrumental aspects, but also how such areas are intellectually challenging and contribute to the social sphere and the common good. In addition, when guiding female students with HA, the following considerations should be taken: (a) the condition of HA itself and (b) how the cognitive and socio-emotional characteristics of these students play a role in the discipline or career to be chosen, thus, proposing areas that allow them to choose options that move beyond what is “comfortable” or expected for their gender.

LIMITATIONS

Possible limitations to this study are (a) the type of sample, which refers exclusively to students' experiences with HA and (b) the group interview technique for collecting information instead of conducting individual interviews. According to the literature, the group interview allows for a limited number of questions, and participants may feel inhibited from addressing important issues, thus affecting the depth of information obtained (AUSSERER; KAUFMANN; RISSER, 2016). However, in a second stage of this longitudinal study, individual interviews were conducted to further complement the results obtained in the focal interviews.

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