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PROFESSIONAL INTERESTS IN ACADEMIC GIFTEDNESS AND REGULAR STUDENTS: THE INFLUENCE OF SEX, GRADE LEVEL, AND GROUP VARIABLES

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Abstract:
This study examined the professional interests of gifted students in comparison with those of non-gifted students. The effects of grade and sex variables were also examined. The academic giftedness group consisted of students in the 5th grade (n = 2,233), 9th grade (n = 3,373), and 11th grade (n = 3,515), 50.8% female, between the ages of 9 and 21 (M = 14.67; SD = 2.59). A control group (non-gifted) was selected as a random sample matched with school grades and sex. Based on Holland's model of professional interests, the sample completed the 18REST, a short interest measure. A multivariate analysis of variance revealed that group (p = 0,008), gender (p = 0,002) and grade (p = 0,001) were significant. Women generally showed a greater interest in social and artistic activities than men. A more realistic interest was presented by men. Social interest tends to be more common in both groups as a first choice, with SI -social investigative - being the most common code.

Keywords: Holland model; career choice; gender

1. Introduction

In the literature, gifted students' professional interests have been neglected for a long time (Jung, 2013; Kim *et al.*, 2012; Worrell *et al.*, 2012). This subject has not been adequately research in the literature (Burton, 2016; Chen & Wong, 2013), but this topic has gained more interest over the years (Yu & Jen, 2019). In the decades that followed, ample evidence has shown that gifted students, despite their high general intelligence and ability, also have a difficult time making career decisions, leading to career indecision (Jung, 2020).

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The term giftedness refers to individuals with above-average intellectual capabilities (Maxwell, 2007). The study will focus on academically gifted students, who are defined as those performing in the top 5% of their field in academics (Kim et al., 2012). According to recent studies, gifted students may demonstrate career development differently than their peers due to their wide range of interests (Akdoğna *et al.,* 2017; Jung, 2017). Several studies have indicated that career counseling can assist gifted students in reflecting on self, choices, beliefs, values, academic achievement, and personality traits (Yusof *et al.,* 2020). Research, however, did not explore this focus, despite the fact that gifted students often get confused about how their abilities and domain areas relate to career paths in the future (Kim, 2011).

Career theories have not been applied effectively to gifted student's concerns and needs (Smith & Wood, 2018). Some of these scenarios can be explained by the belief that gifted individuals do not require guidance or career planning (Delisle & Squires, 1989; Greene, 2006; Kurt, 2016). In this belief, gifted students will intuitively understand the career development process and will probably excel at anything they pursue (Maxwell, 2007), assuming their high-level abilities and interests will lead to professional success (Muratori & Smith, 2015). Reality indicates that, considering that giftedness can affect an individual's expectations and others' expectations related to their career decision-making process (Muratori & Smith, 2018), they require proactive career planning and counselours to provide specific intervention (Briddick *et al.,* 2024; Muratori & Smith, 2015).

These beliefs may lead gifted students to feel more stress, anxiety, fear, failure, and indecision regarding career decisions than non-gifted peers (Greene, 2006). As a result, gifted students often believe there is only one perfect career, leading them to make decisions based on social pressures (Maxwell, 2007). Those beliefs may hinder gifted students' career aspirations by influencing their perception of the types of careers available to them (Muratori & Smith, 2018).

Researchers have shown that a variety of factors can influence gifted students' career decisions (Ogurlu *et al.,* 2015). Among the factors that may affect their choice are their early interest in some areas, the multipotentiality that comes with a high-flat ability profile (Casey & Shore, 2000), pressure from their parents, teachers, or others (Çelik et al., 2023; Muratori & Smith, 2015), narrowmindedness, perfectionistic tendencies, gender stereotypes (Chen & Wong, 2013), capacity in a broad range of areas, family and societal pressures, high self-expectations, and aspirations (Jung, 2014, 2018), as well as being sensitive to others' expectations (Emmet & Minor, 1993).

Between them, especially two factors influence gifted students' professional choices: their interests in the profession and the effects of family or environment (Sahin & Yildirim, 2020). As a result, students may be compelled to choose careers that are financially stable, especially ambitious careers, in high demand or well-paying professions, abandoning their own interests and strengths (Keer & Sodano, 2003).

For gifted students, these characteristics make career selection more challenging (Fatimah & Salim, 2020), conflicted, and stressful (Jung, 2019), especially for minority groups such as rural gifted students (Seward & Gaesser, 2018) or gifted black girls

(Collins *et al.,* 2020; Ford *et al.,* 2018; Young et al., 2019). Thus, supporting gifted individuals' career development has proven essential (Wood *et al.,* 2018).

To investigate professional interest in gifted students, Keer and Sodano (2003) support the notion that vocational interest tests are adequate as the first instrument. This construct is an important predictor of occupational choice (Hoff *et al.,* 2024). Holland (1985) proposed one of the most used models in this field, the RIASEC model, a hexagonal system of vocational-interest themes, combining abilities, motivation, interests, and opportunity in personality types with six corresponding favorable environments (Rysiew *et al.,* 1999). Holland's typology career theory includes individual and environmental components (Holland, 1978). In this way, satisfaction will be achieved when the person chooses a career compatible with their personality and environment. According to Putranta *et al.* (2019), gifted students can obtain beneficial career choices when Holland's model is used.

This model, applied to gifted students, shows that some variables can influence these choices. For example, being gifted and gender can negatively affect gifted students' career development (Keer & Sodano, 2003; Vock *et al.,* 2013). Considering the RIASEC model, different results are found. Gifted students scored higher on investigative and artistic vocational interest than non-gifted students (Schmidt *et al.,* 1998), intellectually gifted are more interested in investigative and realistic activities than their peers and low in social interest (Schlegler, 2022; Sparfeldt, 2007; Vock *et al.,* 2013), gifted present higher interest in investigative and social activities (Hoffler *et al.,* 2019), in investigative and enterprising (Lamas & Barbosa, 2015), and adolescents with high intellectual ability tend to report a high level of investigative interests, scientific investigation, and intellectual work (Jung, 2017). It has previously been demonstrated that gifted individuals have a higher interest in investigative and realistic fields, while a lower interest in social fields (Chen & Wong, 2013).

Decades of research aimed to investigate the association between gender and vocational interests (Tao *et al.,* 2022). Most commonly, differences between gifted males and females in career choices have been documented (Calahan & Hébert, 2020; Yu & Jen, 2019). The students of this group typically prefer careers that correspond to traditional societal stereotypes about gender roles (Jung, 2019). According to previous studies (Boston & Cimpian, 2018), peer pressure and negative stereotypes regarding women's intellectual abilities may discourage gifted girls from pursuing this type of career due to peer pressure, family, school, and community expectations, discouraging them from reaching their full potential (Nelson & Smith, 2001).

Thus, females are underrepresented in science, math, and engineering occupations, as well as in high-status occupations, which are traditionally seen as careers for men (Enman & Lupart, 2000). Despite their equal capacity, women choose health science careers oriented to helping others more often than other careers considered masculine, such as physical sciences (Chen & Wong, 2013). There are often fewer incentives for women to choose STEM majors (Jordan & Carden, 2017).

In gifted students, the results are not consensual. Males chose investigative and enterprising professions, and females choose investigative and social professions (Post-Kammer & Perrone, 1983), girls are more interested in social and artistic careers, whereas boys as more interested in realistic, investigative, and conventional activities (Schmidt *et al.,* 1998; Vock *et al.,* 2013), female gifted shows more investigative and artistic interests; male gifted shows more investigative and conventional interests (Lubinski *et al.,* 1995), girls have a stronger interest in artistic and social science than boys (Hoffler *et al.,* 2019). In recent years, students are deviating from traditional gender role norms, valuing more the importance of social roles in each profession than gender variables, even though men still outnumber women graduates in STEM (Jordan & Carden, 2017). This means that educational professionals must encourage gifted girls to maintain their interests, especially in math and science (Kim, 2013).

In the adolescent and adult samples, gender differences in RIASEC interests have shown (Lee *et al.,* 2022). Men presented higher realistic, investigative, and enterprising interests, whereas women have higher levels of social and artistic interests (Ambiel *et al.,* 2018; Hoff *et al.,* 2024; MacDonald *et al.,* 2023; Morris, 2016; Su *et al.,* 2009). Conventional interests show the greatest variability by gender. In this group, gender stereotypes about social roles also influence professional choice (Bubany & Hamsen, 2011), but reductions in differences between gender in investigative, enterprising, and conventional interests can be a result of changes in sociocultural factors.

Due to non-consensual results found in previous studies, this study sought to compare gifted students' professional interests and non-gifted students. The main goal is to examine some questions: Do the groups present significant differences? What kind of professional interests do the gifted students present predominantly? Is there an influence of sex and grade level on professional interest?

3. Method

3.1 Participants

Participants of this study were selected from a larger sample composed of 110,354 Brazilian students from 5th grade (n = 26,100; 23,7%), 9th grade (n = 41,303; 37,4%) and 11th grade (n = 42,951; 38,9%), 55,157 female (50,0%), aged between 10 and 19 years old (M = 14,83; SD = 2,62). Students come from seven different regions within the state of Sao Paulo. Before identifying only students with academic giftedness, a filter was applied to select the sample. The operational definition for academically gifted students proposed by Kim et al. (2012) considers students in the top 5% with significant distinction in any academic field. Using the student's grades in Portuguese and mathematics at the School Performance Evaluation System in the State of Sao Paulo (SARESP), a standardized test where students from 3rd, 5th, 7th, 9th, and 11th grades answered a test with questions of Portuguese language, mathematics, human sciences, natural sciences, and writing.

Students who presented percentile 95 in Mathematics, Portuguese or both were selected as a gifted (n = 9,121), approximately 8.2% of the total sample. The percentiles

were adopted because they apply to any measure. A cutoff at the 95th percentile is commonly observed as a criterion for identifying these individuals (McClain & Pfeiffer, 2012). The prevalence found is within the values indicated by the literature. From 5% to 20% of the general population in school-age children can be gifted, but this prevalence depends on the definition of gifted and the diagnostic criteria applied (Pfeiffer & Stocking, 2000). For example, the National Association for Gifted Children (2015) describes the giftedness rate as 6 to 10% of the population. The Mariland Report established in 1972, presents a statement that a minimum of 3% to 5% of the school population would be gifted, which is important to highlight the word minimum (Borland, 2009).

By this way, the group named academic giftedness was composed of students from 5th grade (n = 2,233), 9th grade (n = 3,373), 11th grade (n = 3,515), 50.8% female, aged between 9 to 21 years old (M = 14.67; SD = 2.59) who possibly show signs of academic giftedness. Their average score in Portuguese was 327.06 (SD = 39.55), and in mathematics was 341.53 (SD = 43.13). Another random sample, paired concerning school grade and sex, was selected as a control group (non-gifted). The participants were from 5th grade, 9th grade, and 11th grade, aged between 10 and 21 years (M = 14.82; SD = 2.69). Their average score in Portuguese was 246.86 (SD = 49.26), and in mathematics was 255.60 (SD = 47.53). It is important to note that some students are older than expected for the grades attended. A possible hypothesis to explain this fact involves the underachievement concept, which represents a discrepancy between potential and performance, grades, or test scores (Siegle, 2018; Worrell, 2009). Unfortunately, when these discrepancies appear, the student may have been underachieving for many years (Rimm, 2008). One of the possible causes is related to the lack of identification of giftedness, which can cause school maladjustments, such as demotivation, low performance, decreased motivation, absence of challenge, and, consequently, their students not performing to their full potential, which may have influenced the school performance of these students due to low expectations or inappropriate curriculum.

One of the advantages of the study presented here is based on the observation made by Vock *et al.* (2013) that most studies focusing on the professional interests of gifted students have used, as a sample, students attending special schools and special programs for the gifted. According to the authors, these students' vocational interests might not be representative of the entire gifted population, being still influenced by the high level of motivation that these students usually present. In this sense, in the study presented here, using a very large sample and selecting students who presented superior results in a standardized test, this problem seems to have been solved.

3.2 Instrument

3.2.1 18REST (Ambiel *et al.*, 2018)

A short interest measure for large-scale educational and vocational assessment. The scale is based on Holland's model named RIASEC and measures a large set of interest items,

referring to activities that people enjoy, occupations they want to try, or skills, competencies, and characteristics they might have.

The 18 items are divided into six interest dimensions (three items for each interest type): (1) realistic interest refers to preferences for technical or outdoor occupations, (2) investigative interest involves interests in thinking and research activities, (3) artistic interest is related to preferences for creating and developing new things, (4) social interest refers to preferences in interacting with people, (5) enterprising interest represents the interest in activities related to implementation, organization and leading, and (6) conventional interest involves the correct application of rules and standards. These dimensions are arranged in a hexagonal structure. Dimensions most similar are next, and different are on the opposite side of the hexagon.

To answer the scale, the participant must mark how much they like or would like to do each of the activities described in their daily work according to a five-point Likert scale: I would not like strongly, I would not like, I don't know, I like, I would strongly like. This instrument has very strong psychometric properties (Ambiel *et al.,* 2018; Martins *et al.,* 2024).

3.3 Data analysis

Initially, the descriptive statistic was conducted by the group, gender, and grade. The Multivariate Analysis of Variance was used to analyze the influence of these variables. The percentage of occurrence of each type was estimated, and as the most frequent codes for group, gender, and grade level. We conducted all analyses using R studio software.

4. Results

Initially, descriptive statistics were obtained for each group, grade, and sex. The result is presented according to the choice average and can range from 1 to 5. The results are reported in Table 1.

Table 1: Descriptive Statistic by Group, Grades, and Sex

Type	Sex	Group	Grade	Mean	SD
Realistic	F	NG	5	2.36	0.97
	F	NG	9	2.31	0.89
	F	NG	11	2.11	0.90
	F	G	5	2.21	0.90
	F	G	9	2.05	0.87
	F	G	11	1.89	0.91
	M	NG	5	2.63	1.01
	M	NG	9	2.80	0.99
	M	NG	11	2.93	1.02
	M	G	5	2.50	1.02
	M	G	9	2.81	0.95
	M	G	11	2.77	1.12
Investigative	F	NG	5	3.05	1.06

	F	NG	9	3.02	0.96
	F	NG	11	2.89	0.92
	F	G	5	3.29	0.97
	F	G	9	3.26	0.95
	F	G	11	3.11	0.98
	M	NG	5	2.88	1.06
	M	NG	9	2.79	1.03
	M	NG	11	2.81	0.96
	M	G	5	3.10	1.08
	M	G	9	3.23	0.98
	M	G	11	3.22	1.00
Artistic	F	NG	5	2.85	1.05
	F	NG	9	2.68	1.03
	F	NG	11	2.67	1.07
	F	G	5	3.05	1.04
	F	G	9	2.84	1.10
	F	G	11	2.85	1.15
	M	NG	5	2.53	1.06
	M	NG	9	2.25	0.94
	M	NG	11	2.38	0.99
	M	G	5	2.25	0.99
	M	G	9	2.23	1.00
	M	G	11	2.33	1.08
Social	F	0	5	3.27	0.88
	F	0	9	3.46	0.89
	F	0	11	3.72	0.84
	F	1	5	3.50	0.85
	F	1	9	3.61	0.81
	F	1	11	3.81	0.83
	M	0	5	3.16	0.98
	M	0	9	3.06	0.91
	M	0	11	3.24	0.92
	M	1	5	3.19	0.91
	M	1	9	3.12	0.83
	M	1	11	3.19	0.90
Enterprising	F	0	5	2.67	1.04
	F	0	9	2.95	0.97
	F	0	11	2.95	0.94
	F	1	5	2.74	0.93
	F	1	9	2.82	0.95
	F	1	11	2.81	0.97
	M	0	5	2.69	1.02
	M	0	9	2.94	0.97
	M	0	11	3.10	1.01
	M	1	5	2.69	0.97
	M	1	9	3.04	0.95
	M	1	11	2.96	1.06
Conventional	F	0	5	2.68	1.04
	F	0	9	2.81	0.98

	F	0	11	2.78	0.97
	F	1	5	2.65	0.96
	F	1	9	2.72	0.95
	F	1	11	2.65	0.99
	M	0	5	2.78	1.07
	M	0	9	2.81	0.99
	M	0	11	2.92	0.95
	M	1	5	2.64	1.02
	M	1	9	2.90	0.89
	M	1	11	2.87	0.93

Note: G = gifted; NG = non-gifted; F = female; M = male.

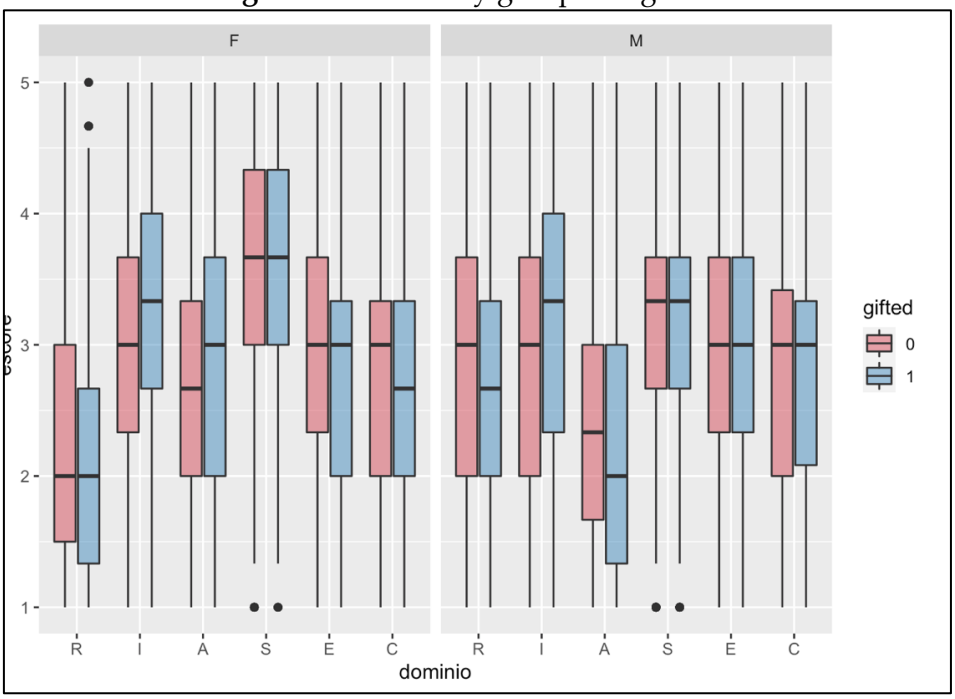
Then, multivariate analysis of variance was employed to identify the influence of gender, grade, and group and their interactions on professional interests. Results were considered significant if $p \leq 0,05$. The results pointed out that the three variables proved to be significant, as well as the interaction between sex and grade, group, and grade and the interaction between the three variables (Table 2).

Table 2: Multivariate Analysis of Variance Considering Group, Sex, and Grade Variables

Variable	Df	Square	F value
Sex	1	9.125	0,002
Group	1	6.959	0,008
Grade	2	16.229	0,001
Sex x group	1	0.002	0,962
Sex x grade	2	22.139	0,001
Group x grade	2	5.062	0,006
Sex x group x grade	2	13.113	0,001

In a general way, females presented more interest in social and artistic issues than males. Males presented more realistic interests (Figure 1).

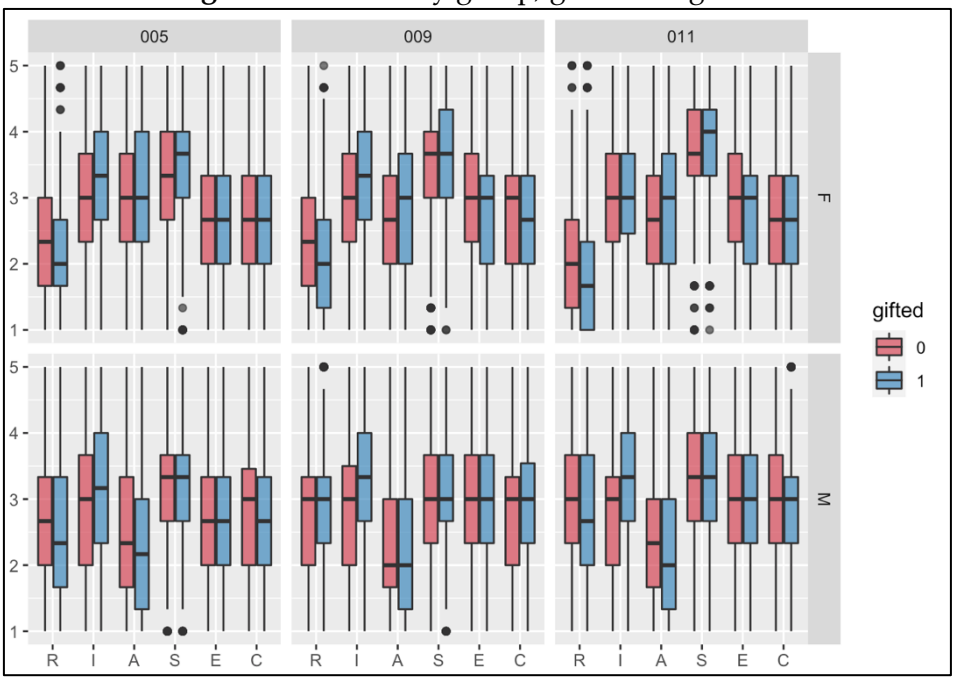
Figure 1: Interests by group and gender.



Note: 0 = non-gifted; 1 = gifted.

The same analysis was conducted to illustrate the differences due to gender, group, and grade. The results are presented in Figure 2.

Figure 2: Interests by group, grade and gender



Note: 0 = non-gifted; 1 = gifted.

Then, the percentage of each predominant type of interest was estimated considering the sex, grade, and group. It is important to say that the two codes were considered. For this reason, the percentage is more than 100% in each situation.

Table 3: Percentage of Type of Interest Considering Sex, Grade, and Group

Group	Grade	Sex	R	I	A	S	E	C
NG	5	F	13	36	29	57	30	35
		M	18	33	20	56	30	43
	9	F	8	31	20	67	37	37
		M	26	26	12	48	44	44
	11	F	4	26	21	77	38	34
		M	28	23	13	47	47	42
G	5	F	4	44	37	63	24	28
		M	13	45	13	59	34	34
	9	F	4	42	30	67	29	28
		M	21	44	11	43	41	40
	11	F	3	34	33	76	28	25
		M	24	40	15	44	38	39

It is possible to see that social interest is more frequent in both groups as a first choice (gifted and regular) and when considering grade and sex. Important changes can be noted when the second choice is analyzed. In the gifted group the investigative interest is predominant, while in the regular group, the results fluctuate between conventional and enterprising. Figure 3 illustrates the results, considering the three variables.

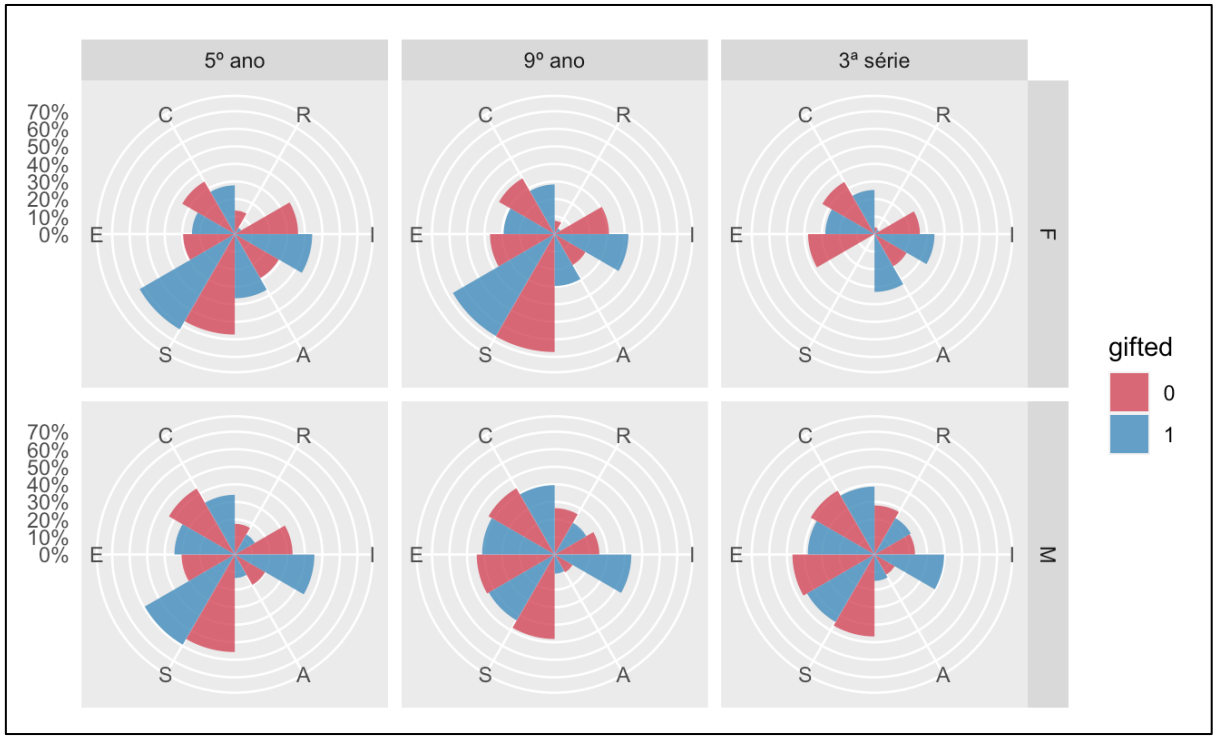


Figure 3: Type of interests according to the group, gender, and grade

The code of each student was known, being formed combining two stronger types of interest, in order of scoring. For this reason, it is possible to notice, inverted codes, for example SI and IS.

Table 4: Types of Interest by Group

Type	Gifted students	Regular students
AC	40	52
AE	54	48
AI	108	88
AR	18	21
AS	154	127
CA	23	39
CE	245	409
CI	98	75
CR	32	57
CS	198	284
EA	50	68
EC	129	165
EI	94	86
ER	52	74
ES	260	395
IA	72	51
IC	174	130
IE	130	79
IR	110	93
IS	272	192
RA	8	23
RC	75	125
RE	30	72
RI	47	36
RS	46	73
SA	334	288
SC	236	384
SE	197	348
SI	452	412
SR	38	137

It's possible to see that the most common code in the gifted group is SI – social investigative (n = 452) and IS – investigative social (n = 272). In the regular group, SI – social investigative (n = 412), CE – conventional enterprising (n = 409), ES – enterprising social (n = 395), and SC – social conventional (n = 384). In both groups, SI was more frequent and indicated interests in thinking and research activities and preferences in interacting with people.

In sequence, the results for interest, gender, and group, considering the grade, are illustrated in Figure 4 (5th grade), Figure 5 (9th grade), and Figure 6 (11th grade).

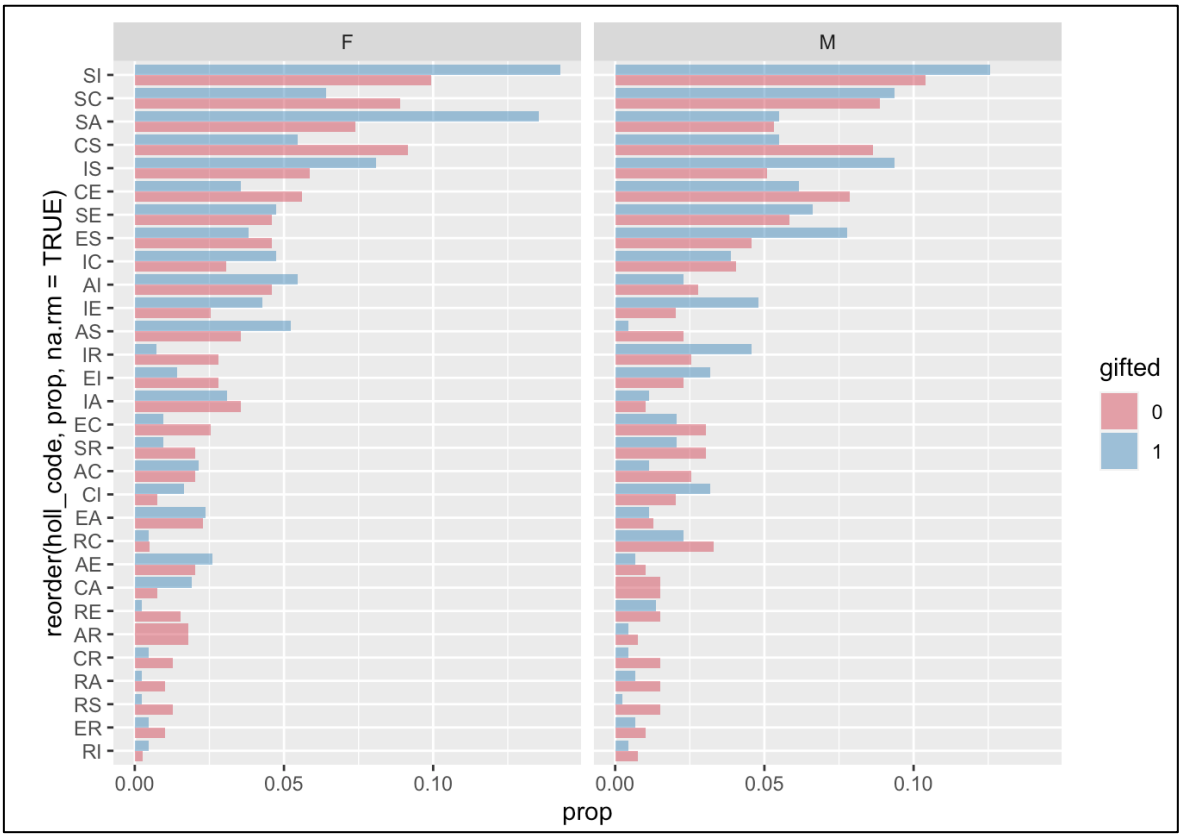


Figure 4: Codes by group and gender for 5th-grade students

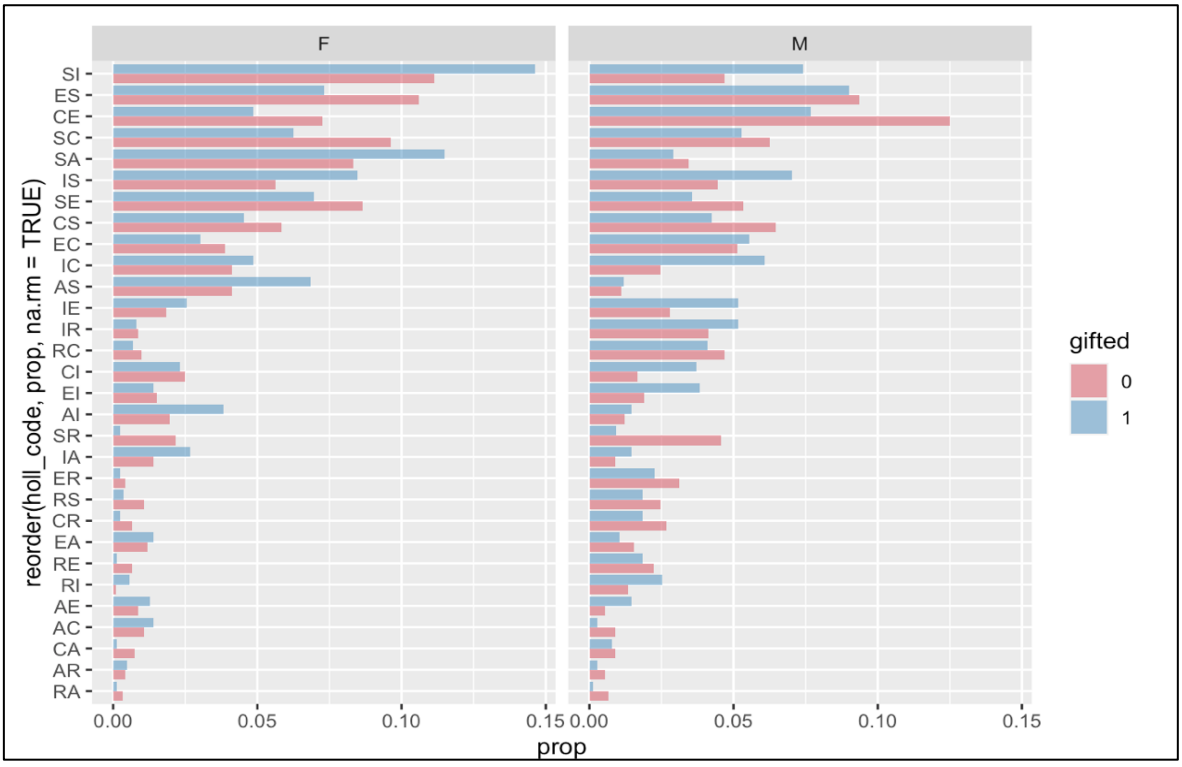


Figure 5: Codes by group and gender for 9th- grade students

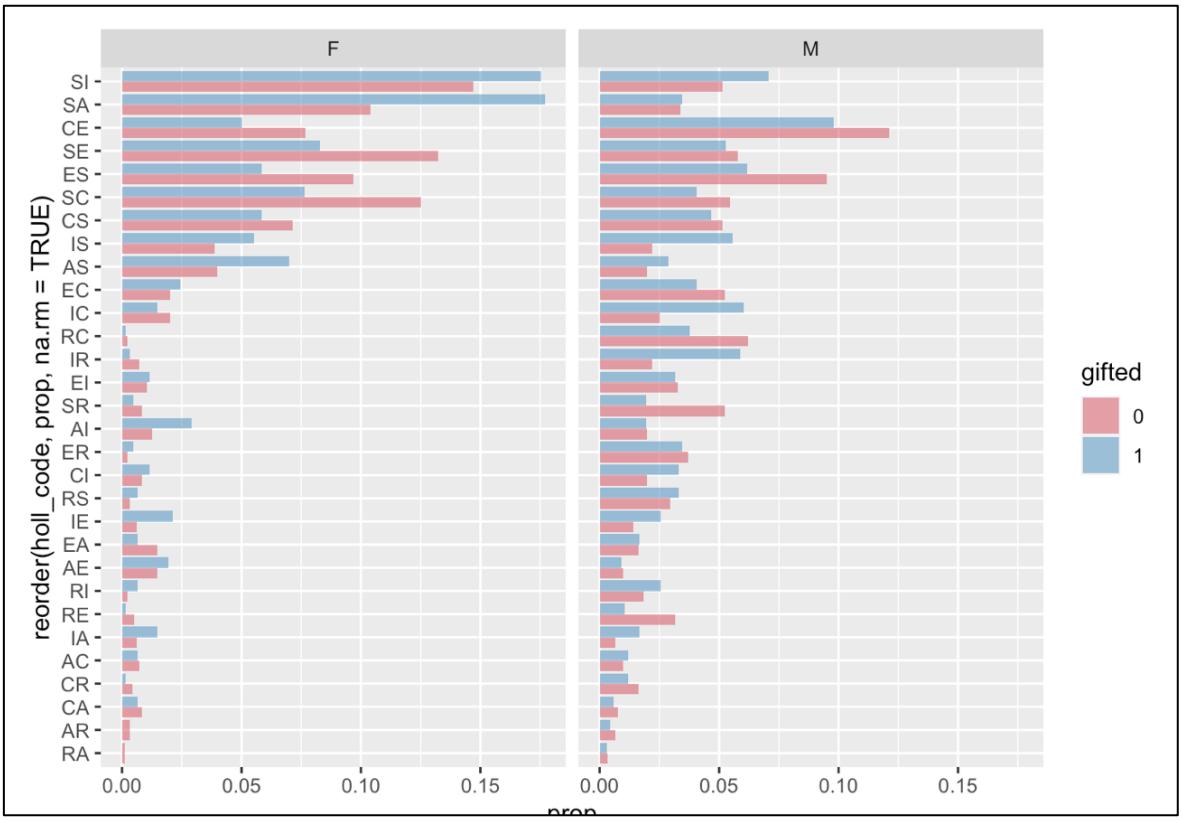


Figure 6: Codes by group and gender for 11th- grade students

5. Discussion

The data provide preliminary evidence and empirical support for the investigation of vocational interests in gifted students. The results provide evidence that gifted students' career decision-making processes may be, simultaneously, similar, and different from those of adolescents in general (Jung, 2014). The similarities between groups were that the investigative type was the most common in both groups. But differences were confirmed by multivariate analysis of variance. This finding is consistent with previous results showing the idea that intellectually gifted do differ from their peers in their intellectual abilities and vocational preferences (Vock *et al.*, 2013).

The predominant interest in investigative social type by gifted group confirms Yusof *et al.* (2020) findings. According to the authors, gifted students demonstrate an inclination towards the investigative type, the most common choice for many intellectually gifted individuals (Persson, 2009). Sparfeldt (2007) research showed that gifted displayed higher investigative interests and lower social than non-gifted.

Both groups were composed of a social investigative code that includes an interest in people's interests and helping professions as well as scientific interest, preferring to work with ideas, theories, and independent work. The differences between groups involved the fact that in the giftedness group, the second most frequently was investigative social (the exact code but in a different order) and, in the regular group, conventional enterprising, which includes preferred well-structured environments,

order, routine, and things under control and persuaders and leadership like to compete and dominate.

In the same way, differences were found between genders. These results confirm previous studies that showed that gender differences in professional interests are still present (Mendez & Crawford, 2002), following social stereotypes about gender roles (Greene, 2003; Jung, 2019; Kelly & Cobb, 1991; Leung, 1998). It is common to find women's under-representation in some careers, like mathematics and science, for example (Lubinski *et al.,* 1993). The earlier puberty, emotional maturation, and self-concept discrepancies, experienced by gifted girls can make the career decision process more stressful than for boys (Yu & Jen, 2019). The authors highlighted that counselling for these girls could help them to create a positive mindset about non-traditional career choices.

The results pointed that females presented more interest related to social and artistic than males, as pointed by Hoffler *et al.* (2019), Lubinski *et al.* (1995), and Vock et al. (2013). The first kind of interest, social, is related to people's interests and helping professions – teaching, social service, religion, therapists, and nurses (Kerr & Vuyk, 2013; Lubinski *et al.,* 1995). The second is artistic, present interest in creative expressions, attracted to the art, nonconformist, and original fields – music, dramatics art, writing, actors, dance, graphic design. In the other way, males presented more realistic interests, typically interested in working with things, tools and machines, physical and practical tasks – like agriculture, engineers, military, and mechanics (Kerr & Vuyk, 2013; Lubinski et al., 1995). The results confirm previous results found in the literature (Vock *et al.,* 2013).

Differences due to grade levels were also found. As in previous studies, the results of this analysis confirm the stability of vocational interests (Rottinghaus *et al.,* 2007) from early adolescence (age 12) to middle adulthood (age 40). Interest stability increases dramatically for 18-21 years, college years, remaining unchanged for the next two decades (Low et al., 2005). Previous studies showed that adolescents' career aspirations had a large drop between 10th and 12th grades, becoming more realistic over time (Yu & Jen, 2019).

It's important to highlight that the use of this type of instrument does not occur without difficulties. For example, it is common for gifted students to have high and flat profiles due to the wide variety of professions that they are interested in (Keer & Fisher, 1997). Two types of flat profiles are usually found: high-score undifferentiated (demonstrating weak interests) and low-score undifferentiated (marked by a variety of strong interests) (Rysiew *et al.,* 1999). As a result, gifted students scored higher on most basic interest scales than non-gifted students. Another problem is that since most career theories and assessments have been developed and normed to the typical population (Greene, 2003), being difficult to know to what extent their results show predictive validity for use in minority populations, for example, gifted students (Keer & Fisher, 1997).

6. Conclusions

Our findings suggest a need for studies in this field. Understanding the pattern of professional interests of gifted can help students, parents, policy makers, and researchers how to help adolescents during the professional choice process.

Much more must has to be learned about the professional interests of gifted individuals. Considering that this study was limited to analyze only academic giftedness, we would encourage researchers to examine other gifted students, like underachievement, with emotional and creativity giftedness (Greene, 2003), and the gifted twice exceptional or asynchronous development (Colangelo & Wood, 2015). Future research will have to assess the extent to which differences found here can be generalizable beyond the study sample.

It is important to think about the implications for understanding the differing career development needs of gifted early adolescent boys and girls (Mendez & Crawford, 2002). Professional orientation can also help students with multiple potentials become more focused on their vocations (Casey & Shore, 2000).

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Conflict of Interest Statement
The authors declare no conflicts of interest.

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