Gender in Chess: a mixed-method approach

ASTRID BARBIER

Student number: 01811554

Promotor: Prof. dr. Veerle Draulans

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ABSTRACT

The primary purpose of this study is to determine the profile of a female chess player. 709 male and female chess players completed an international survey examining a chess player's profile, the perceived image of a good chess player and societal gendered expectations. Furthermore, in-depth interviews were carried out with ten female chess players from Flanders and the Netherlands in order to gain an understanding of the impact of the female chess player's minority position. The results reveal that, on average, chess players have a high 'chess capital', even before they start playing chess. A conflict is found in the self-description of female chess players and what they associate with femininity. Female chess players have the feeling that they stand out due to their minority position, which in turn leads to advantages and disadvantages.

Keywords: chess players, gender, gender roles, minority

ABSTRACT (Nederlands)

Het hoofddoel van deze studie is om het profiel van een vrouwelijke schaker te bestuderen. 709 mannelijke en vrouwelijke schakers vulden een internationale enquête in die het profiel van een schaker, de beeldvorming rond een goede schaker en de maatschappelijke verwachtingen op het gebied van gender onderzocht. Verder zijn diepte-interviews afgenomen bij tien vrouwelijke schakers uit Vlaanderen en Nederland om inzicht te krijgen in de impact van hun minderheidspositie. De resultaten laten zien dat schaakspelers gemiddeld een hoog 'schaakkapitaal' hebben, zelfs voordat ze begonnen met schaken. Een conflict is gevonden in hoe vrouwelijke schakers zichzelf beschrijven en wat ze associëren met vrouwelijkheid. Vrouwelijke schakers vinden dat ze opvallen door hun minderheidspositie, wat leidt tot voor- en nadelen.

Kernwoorden: schakers, gender, genderrollen, minderheid

Index

I. INTRODUCTION

In the chess world, there is a substantial difference between the performance of male and female players. Male chess players outperform female players in all categories and the current top 100 only includes one female chess player. In each country, male chess players hold the top FIDE rating scores which are considered an objective measure of a chess player's strength (FIDE International Chess Federation, 2020). Research has been conducted to examine the behaviour and differences between men and women in chess (Subia, Amaranto, L., Amaranto, C., Bustamante & Damaso, 2019, among others). One difference that is often highlighted is the large participation gap between men and women, with women being a strong minority in both chess tournaments and training events (Bilalić, McLeod & Gobet, 2007; Smerdon, 2019).

In the STEM area, which is often considered chess-like in terms of gender issues, studies have approached the low participation rates of female students at STEM faculties by profiling these students (Blanch, 2016). The present study will likewise approach the low participation rates of female chess players by profiling female chess players. A survey among chess players tries to answer two of the main research questions, namely 'What is the profile of a chess player?' and 'What characteristics do male and female chess players associate with being a (good) chess player and with masculinity and femininity?'. For the last research question, 'How do female chess players experience their minority position in the chess world?', ten in-depth interviews were carried out with female chess players from Flanders and the Netherlands.

To describe the various studies on chess and gender, the three approaches presented by Schiebinger and Schraudner are used as a guideline. These approaches are 'fixing the numbers', *i.e.* focusing on increasing female participation; 'fixing the institutions', *i.e.* transforming structures and removing barriers, and 'fixing the knowledge', *i.e.* incorporating gender analysis into research (Schiebinger & Schraudner, 2011).

RESEARCH REGARDING CHESS AND GENDER

Part I: Fixing the numbers

No woman has ever been world champion and only two percent of all grandmasters (the highest attainable title in chess) are female. When looking at these data, a male superiority is quickly assumed. However, one of the first studies on this topic by Charmess and Gerchak (1996), pointed out that relative group sizes should be taken into account before group differences in performance can be properly assessed. In chess, this means that the participation rate needs to be taken into account before any assumptions about the difference in the performance can be made. From the figures in the table below it is clear that women still make up a small percentage of the total chess population (FIDE International Chess Federation, 2020).

Table 1

Participation rate of female chess players

		Total all	Percentages all	Total under 20 years	Percentages under 20 years
1	All FIDE members	38028 out of 360977	11%	19005 out of 98139	19%
2	Georgia	348 out out of 1282	25%	162 out of 559	29%
3	Belgium	169 out of 3316	7%	75 out of 520	14%
4	The Netherlands	261 out of 4470	6%	68 out of 341	20%

A study from 2006, which contains data from more than 250,000 tournament players from all over the world over the age of 13, shows that more boys than girls play in the younger age groups. This results in quantitative dominance of men at the highest level of chess. This study suggests that researchers should investigate why fewer girls participate in competitive chess (Chabris & Glickman, 2006).

A study from 2009, based on the analysis of the ratings of German chess players, concludes that the higher performance of men is mainly explained by a basic principle of statistics which states that extreme values are more often found in larger populations. Considering that more men play chess, this leads to higher performing male players (Bilalić, Smallbone, McLeod & Gobet, 2009).

Using the same data as in the previous study, Knapp (2010) claims that participation rates explain only two-thirds of the performance gap. Further research by Blanch, Aluja and Cornadó (2015) based on the Swiss-manager database, which contains worldwide information, and data from six tournaments in Spain suggests that biosocial factors such as age and training could also play an important role in explaining the performance gap: women train less, and the rating difference between men and women was smaller among players in the 25 to 30 age bracket. A study by Blanch (2016), based on information from 24 Euro-Asian countries, suggests that similar factors such as age and involvement play an important role.

According to Wiesend (2019), a gender-specific difference in performance is already present from the age at which players first participate in tournaments. The study focused on players in the FIDE and German databases who were active between the ages of 12 and 18.

Part II: Fixing the institutions: context matters

Most chess tournaments are open to all genders. However, female-only tournaments do exist, aiming to promote and increase female participation (Smerdon, 2019; Root, 2020). In addition to women's tournaments, other measures intended to promote women's chess, such as special women’s titles and prizes, exist. Although these measures are often implemented, the remaining participation gap shows that they are not sufficient.

In 2019, Smerdon analysed how women’s participation rates vary across the world, using both the UN gender equality index and data from Jeff Sonas. The UN gender equality index scores countries according to their gender equality. Meanwhile, Sonas is a statistical chess analyst whose data include female participation rates in chess in various countries between 1999 and 2015 (Sonas, n.d.). Smerdon concludes that countries ranking higher in gender equality do not have higher female participation rates. Instead, the female participation rate gets higher as the equality scale goes down. This

phenomenon, known as the gender equality paradox, is also found in STEM. Research shows that countries which score higher on gender equality often have fewer women in the STEM field (Stoet & Geary, 2018).

According to Smerdon, although there is only a small percentage of female chess players in all countries, large differences in female participation rates between countries still exist. The age distribution of a country's chess community plays a decisive role in the participation rate of female chess players. The countries with the highest participation rates of female chess players have a large proportion of girls playing from a young age. This could be explained by the priority within these countries to teach chess to everyone. Smerdon points out that the global phenomenon of girls leaving chess after school and the likelihood that they will not return to the chess world is an issue that should be addressed (Smerdon, 2019).

In 2002, Galitis noticed that in her primary school's chess club in Australia the majority of the participants were boys. Galitis' study includes eighteen interviews with primary school girls about their experiences. A valuable point is the importance of family and friends. Two-thirds of the girls who joined the chess club already have knowledge of the game, mostly imparted by their male family members. Almost half of the girls left the chess club because their peers did not participate or left the club. Other reasons are the perception of hostility from boys, the aversion of the boys' aggressive attitudes and their 'win at any costs'-approach (which may include cheating). Another observation of Galitis is that girls were silent when participating in the mixed-gender groups while they were very verbal when playing among girls only. Verbal exclusion and lack of attention by the tutor could also be drop-out factors (Galitis, 2002).

Part III: Fixing the knowledge

Beyond the numbers

In addition to participation rates, other factors have been looked into in order to explain the gender difference in chess performance. Howard (2005) notes that different interest patterns and more chess practice by male chess players could be a possible explanation. Based on FIDE-data from 1985-1989, Howard found that on average women play fewer games and tend to become inactive faster. Howard (2014) investigated whether the total number of chess games played could be a reason for the difference in performance, meaning that playing more chess games could lead to more experience and higher chess performance. This FIDE-data based study found that the differences between the number of chess games played by men and women could not fully explain the performance difference. Howard suggests an innate advantage for men in chess skills. However, he acknowledges that his analysis did not take into account the extent to which participants studied chess, which might have been different for male and female chess players. This was investigated by Bruin, Smits, Rikers and Schmidt in 2008. They analysed the training activities and performance ratings of young, elite chess players who were either in or had dropped out of the Dutch national chess training. They found that the influence of gender on chess performance proved to be significantly lower than the effect of deliberate practice of chess. On the basis of a longitudinal study, they concluded that serious study and practice against other players was important for the performance of chess players. Women appear to have a lower level of intentional chess practice.

The stereotype threat
Studies show that due to stereotypes and cultural beliefs, women underperform in the STEM field (Avolio, Chávez & Vilchez-Román, 2020).

In the field of chess, the stereotype threat was first explored in 2008 by Maass, D'Ettole and Cadinu. They conducted an experiment with 42 male and 42 female Italian chess players. Their results showed that gender stereotypes can lead to a 50 per cent drop in performance when women play against men, as opposed to when they play against women. The experiment provides two possible explanations for this phenomenon. The first is that women play more defensively when they play against men. The second explanation is that women show a lower self-confidence in their chess skills, which can be a consequence of gender stereotypes. A study from 2016, based on data from more than 10,000 games, confirmed that the performance of women declines against men (Backus, Cubel, Guid, Sanchez-Pages & Mañas, 2016). However, another study based on data from 5.5 million games, found no evidence that the stereotype threat in chess is real (Stafford, 2018). Smerdon et al. (2020) emphasise that these results of Stafford are based on the rating-system, and that the rating underestimates the current abilities of young or inexperienced players. The analysis should take age into account, since the average female tournament chess player is younger than the average male player. When controlling for age, the multiverse analyses confirm stereotype threat effects. A study based on data from twelve chess tournaments in schools in Louisville, Kentucky, shows that young girls suffer from the stereotype threat: girls lose to boys far more often than can be explained - purely on the basis of their ratings. Moreover, the participants who were most susceptible to the stereotype threat were more likely to drop out of chess (Rothgerber & Wolsiefer, 2014). However, Smerdon et al. (2020) made an important observation about explaining underperformance in terms of rating: since women tend to underperform when playing against men, their rating should already be adjusted to take this fact into account. The studies by Rothgerber and Wolsiefer (2014) and Smerdon et al. (2020) did not address this issue in their investigations.

Research shows that men change their play style when they are playing against women. The study by Gerdes and Gränsmark (2010), based on a sample of chess players comprising people from (almost) all over the world, shows that men choose more aggressive strategies when they are playing against women. Additionally, men take on average longer to resign when they are playing against women (Backus, Cubel, Guid, Sanchez-Pages & Mañas, 2016).

Personality of a chess player
A study based on nine interviews with elite female chess players from around the world found that gender-specific expectations in society restrict women in chess. According to one respondent, many female chess players have a very feminine appearance. The study explains this as a possible compensatory behaviour for competition over the chess board, as competition has an image of being 'bitchy'. Furthermore, one respondent noted that competitiveness is the opposite of women's gender-specific expectations in society. Moreover, technology plays an important role in contemporary chess. However, technology is often associated with masculinity. The study concludes that traditional gender-specific expectations in society and the lack of female role models in chess keep girls away from chess (Baasanjav, 2016).

A study of the personality of elite male and female chess players around the world shows that male chess players with high rating scores tend to be more introverted compared to

their peers with a lower rating. However, the opposite applies to female chess players with high rating. Thus, being the minority in a domain may result in different personality traits. The study used the revised Freiburg Personality Inventory, a personality questionnaire that measures 12 personality traits (Vollstädt-Klein, Grimm, Kirsch & Bilalić, 2010). A study on the personality profiles of young chess players suggests that the aggressive and competitive component of chess attracts more boys than girls. The results of the study are based on children from four primary schools in the United Kingdom. The study shows that girls score, on average, more on agreeableness and that male chess players score lower on agreeableness. Chess players score higher on energy/extraversion and intellect/openness (Bilalić, McLeod & Gobet, 2007).

Research on the gender paradox and the gender stereotype threat shows an analogy between STEM and chess. Since both areas have to deal with large discrepancies between male and female participation rates, inspiration can be drawn from one area when dealing with these same issues in the other. Some STEM studies have approached the low participation rates of female students at STEM faculties by profiling these students (Draulans & van Huffel, 2011). Chess research can do the same by profiling female chess players, as the present paper will attempt to do. Some relevant studies around this topic in this STEM field are described in the following section.

RESEARCH REGARDING STEM AND GENDER: INSPIRATION FOR CHESS & GENDER RESEARCH

Part I: (Family) Science Capital

When examining the profile of science students, the idea of 'science capital' is often used, which refers to the scientific competence and the access of students to science-related cultural and social resources. The science capital of a student has a strong influence on the interest in scientific studies. Moreover, children from a family with higher levels of 'science capital' are more likely to be supported in developing scientific interests and aspirations (Archer et al., 2015). Several studies have examined the influence of social environment on a student's decision to study a STEM subject. The importance of a student's parents is shown by a study of first-year engineering students at the University of KU Leuven (Belgium) who completed a survey. One in three participants had chosen the same education subject as their father. Furthermore, about half of the participants' fathers and one in three participants' mothers had a university degree. The parents of female respondents were more likely to have a university degree than the parents of male respondents (Hoydonckx, 2005).

Archer et al. (2012) found that children with a close family member working in a science-related profession, are much more likely to pursue a science-related career. Archer et al. (2015) found that an important predictor of a student's decision to study physics or mathematics was being motivated and encouraged by a 'key adult', usually a teacher or family member. Their results are based on a survey of 3,658 secondary school students aged 11-15 years in England. Another study, conducted among 461 Flemisch secondary school pupils in subjects with heavy mathematics, examined the reasons for studying engineering. The study shows that girls have more social motives and boys more utilitarian motives (Herbots, 2007). A study based on longitudinal data of secondary school students from STEM in the Netherlands found that the probability of girls choosing to study STEM decreases drastically when friends have more traditional gender norms. Their findings suggest that an environment with gender-normative

perceptions pushes girls out of the STEM pipeline (van der Vleuten, Steinmetz & van de Werfhorst, 2018).

Part II: Dual identity of female engineers

Various studies have pointed out that female students who aspire to a science career may have conflicting feelings: the social expectations associated with being a woman seem to be at odds with the expectations of an engineer. Chu noted that "*Women engineering students try to adapt to engineering identity prescriptions and, as a result, they sometimes distance themselves from their gender identity*" (Chu, 2007, p. 61).

In 2013, Vanthienen investigated the gender-typical and gender-untypical choice of studies at KU Leuven. Her study, based on GRAS (the Groningen Androgyny Scale), explores self-description in relation to masculinity and femininity. Her results, based on three surveys conducted among 863 first-year students of psychology and engineering, show that the results are significant predictors of study choice. A male self-description has a positive correlation with the probability of studying engineering. In contrast, a feminine self-description has a negative correlation with the probability of studying engineering (Vanthienen, 2013). A study based on a survey with more than 9,000 10/11-year-old schoolchildren and 170 interviews with 92 children and 78 parents in England, found that there was a dominant association of science with masculinity. Therefore, girls who want to pursue a career in science need to balance a socially acceptable performance of femininity and their engagement with aspects of science (Archer, et al., 2012).

Hobin conducted research among Flemish female students of industrial engineering through focus groups. She examined the effects of image and identity constructions, and the experience of minority positions and stereotypes. Because of their minority position, the students experience more visibility, which they reported as having advantages and disadvantages. One advantage is that they are known by name, and a disadvantage is the unwanted comments of mainly male lecturers. They also stated that they have to prove themselves more than their male fellow students (Hobin, 2011).

AIMS FROM THIS GENDER & CHESS STUDY

The first goal is to describe the profile of a chess player and to study the 'chess capital' in analogy with how 'science capital' is examined. The influence of parents, teachers and friends, already observed by Galitis (2002) will be explored further. Moreover, the educational level of parents and chess players are also investigated. Furthermore, the motives for playing chess are investigated: do female chess players consider more social motives and male chess players more utilitarian motives, as the literature suggests? The first research question is therefore: 'What is the profile of a chess player?'

The second objective relates to the impact of social gender roles, perceptions and expectations on the participation of men and women in chess. Do female chess players experience a conflict triggered by different expectations associated with being a woman and a chess player? Therefore, the research question for this topic is: 'What characteristics do male and female chess players associate with being a (good) chess player and with masculinity and femininity?'. Of particular interest are contradictions and similarities between the characteristics ascribed to a chess player and the social expectations of gender.

The third objective is to study the minority position of female chess players, focusing on the advantages and disadvantages that female chess players experience due to their minority position and on the stereotyping practices they encounter due to their gender. In addition, the degree of pressure they experience to perform will be investigated. The research question for this goal is: 'How do female chess players experience their minority position in the chess world?'

II. DATA AND METHOD

A mixed-methodological approach was chosen to answer the different research questions (Baarda et al., 2018): an online survey among 709 international chess players intends to answer research questions one and two; ten semi-structured interviews with female chess players from Flanders and the Netherlands were conducted to provide information about the impact of their minority position for research question three.

SURVEY

The questions of the survey are based on gender research in chess and STEM. The majority of the questions consist of a five- or seven-point Likert-scale (Baarda, et al., 2015). The questions were originally formulated in Dutch. Translated versions of the survey in French, Spanish and English were provided in order to reach international participants. A two-step translation process was chosen, with one person translating the original survey into another language and another person back into Dutch to ensure that no translation errors occurred. The six translators are either bilingual or have a degree in a relevant language study subject. The survey was then created online using LimeSurvey version 2.73.1+. The survey was first examined by several test persons before it was published and distributed worldwide on May 5, 2020. Social media and email were used as distribution channels. The survey was picked up by many individuals, FIDE associations, FIDE itself and Chessbase India. The latter published an article about it, which included a call for participation. The survey was virtually available from 5 May 2020 to 5 July 2020 and a total of 709 valid surveys were completed. The survey lasted on average 24 minutes for the participants.

The participants were first provided with an introduction to the study and were asked to consent. Participants were guaranteed that their data will be treated confidentially and processed anonymously (Baarda, et al., 2015). The analysis of the survey data was carried out with Excel and SPSS Statistics 26.

Figure 1

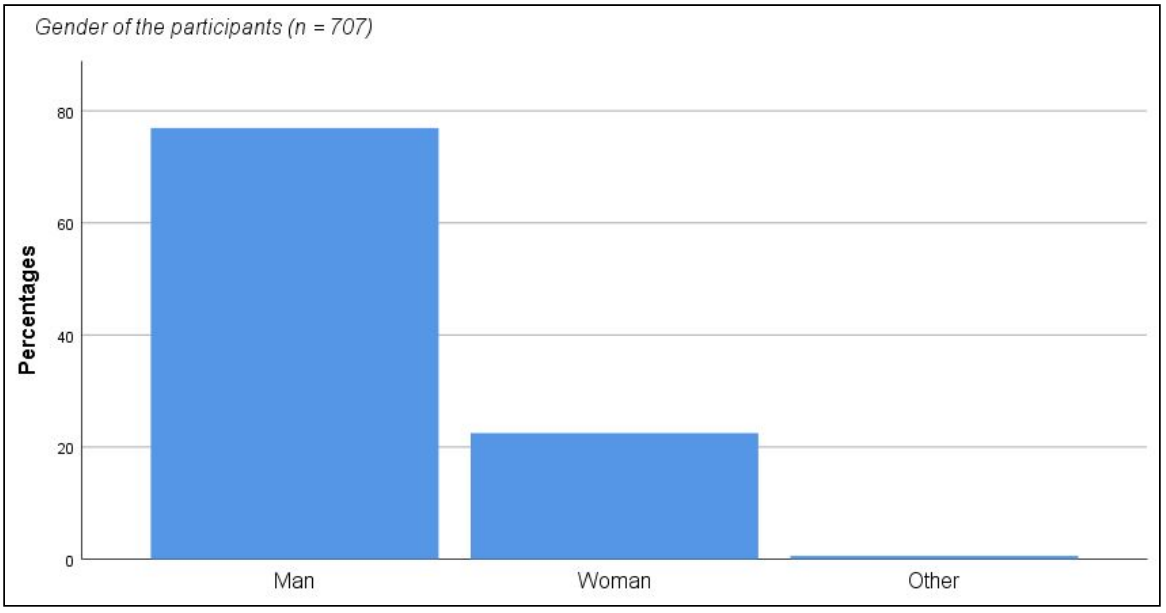


Figure 2

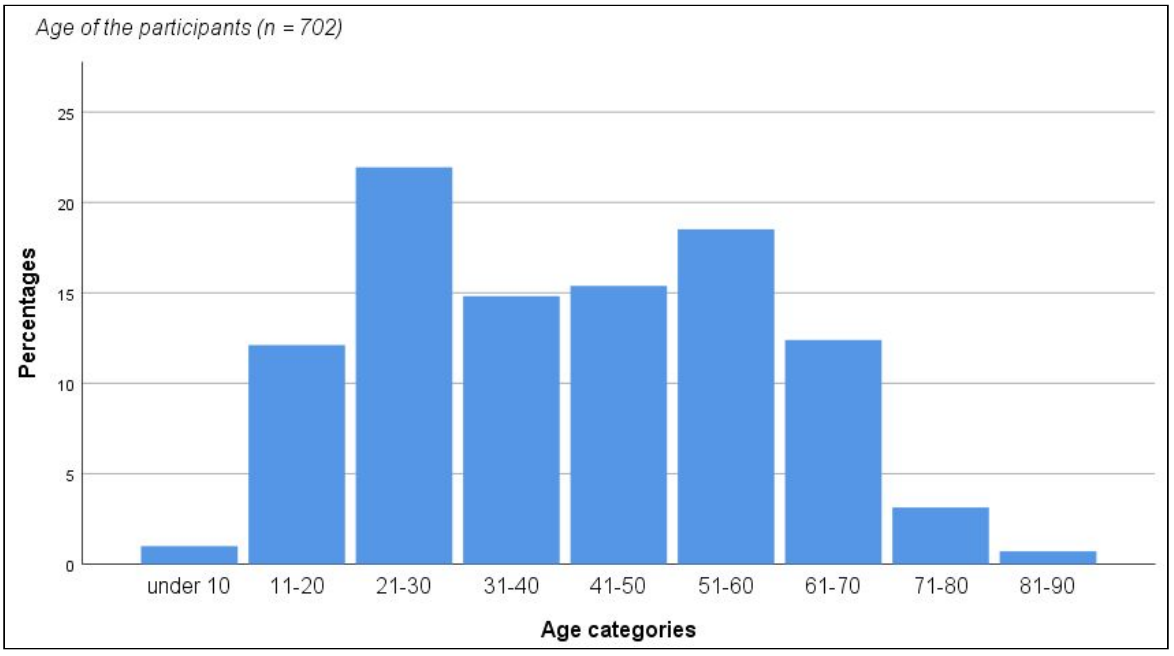


Figure 3

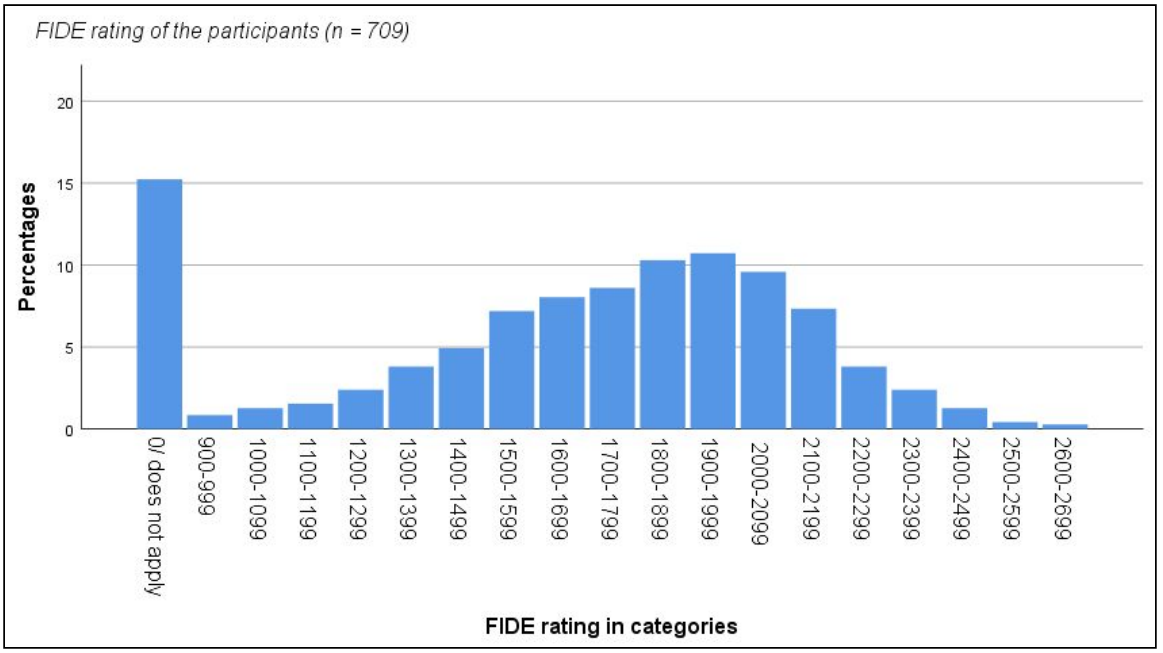
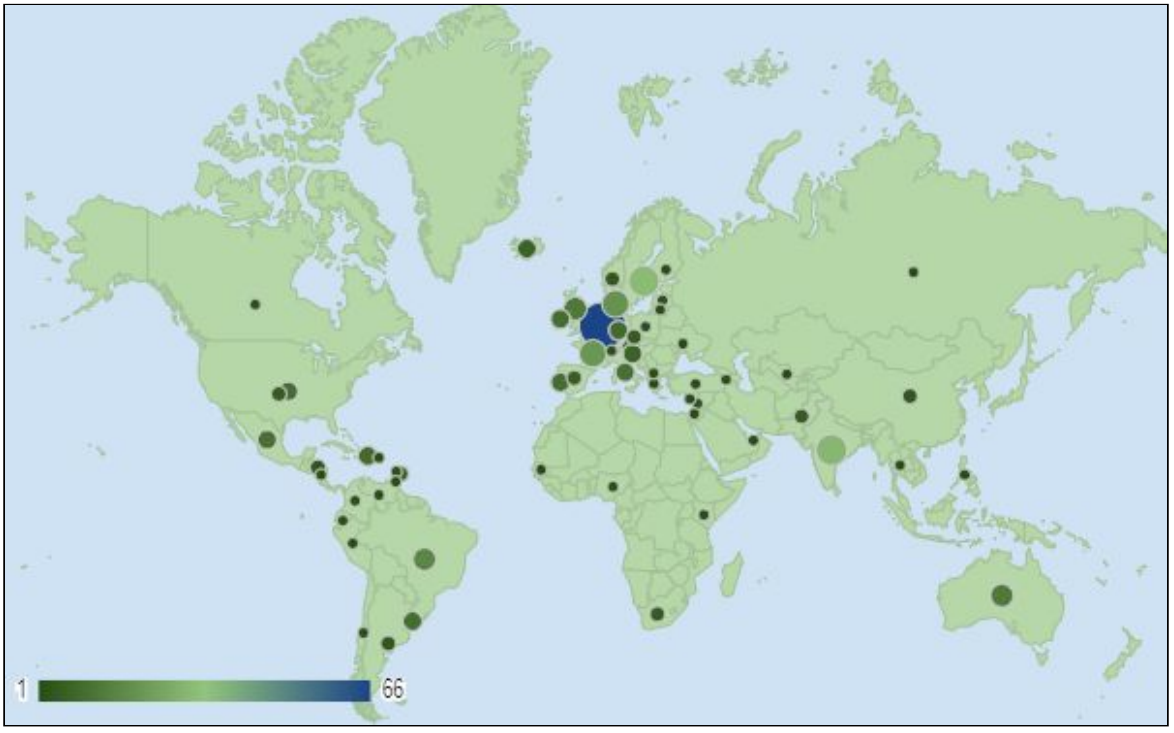


Figure 4

Countries of the participants



INTERVIEWS

In order to investigate personal experiences of female chess players, ten interviews were conducted with questions inspired by the literature analysis. The semi-structured formation of the interview left room for additional questions (Baarda, Hulst & Goede, 2015). A test interview was conducted, which is not included in the analysis (Baarda et al., 2018). The interviews took place between the end of April and the beginning of May 2020. Due to the COVID-19 measures, interviews were conducted with VoIP (Voice over

Internet Protocol) technologies, such as Skype, instead of face-to-face (Lo Iacono, Symonds, Brown, 2016).

The interviewee criteria were Dutch-speaking women, with a minimum age of eighteen years, who are chess players with a minimum rating of 1500, and affiliated with the KBSB (Chess Federation of Belgium) or the KNSB (Chess Federation of the Netherlands). The respondents were reached by general announcements through Facebook groups or by the snowball method (Baarda, et al., 2015). In order to avoid the possibility of confidentiality issues in the study, it was established that the respondents were participating on a voluntary basis, an informed consent, explained the purpose of the study and the rights of the respondents, ensured a fully confidential analysis and signed an anonymous processing of their data. It was also ensured that the researcher could not gain access to those who had seen or refused the invitation to participate. Every relevant candidate who had applied to participate was interviewed. As no new information emerged from the last interviews, it was decided that no new recruitment was necessary, assuming that the saturation rate had been reached (Guest, Bunce & Johnson, 2006).

The interviews had a maximum duration of one hour. They were recorded with Audacity, literally transcribed and analysed with NVivo 12 (Mortelmans, 2011).[1]

Table 2

Profile interview respondents (n = 10)

		Count
Age categories	21-25	5
	26-30	3
	31-35	2
FIDE rating	1500-1799	3
	1800-2099	3
	2100-2399	4
Chess federation	KBSB	4
	KNSB	6
Highest level of education respondent obtained	Secondary education	0
	Tertiary education	10
Highest level of education respondent's mother obtained	Secondary education	2
	Tertiary education	8
Highest level of education respondent's father obtained	Secondary education	3
	Tertiary education	7

III. RESULTS

THE PROFILE OF A CHESS PLAYER

The first research question, 'What is the profile of a chess player?' is examined by the survey and divided into three parts. The first part contains information about the (family) social capital of a chess player. The second part examines factors that may play a role in

[1] The transcribed interviews, interview and survey questions, as well as the informed consents are provided to the supervisor as an attachment.

a chess player's choice to start, to continue or to stop playing chess. The third part measures the characteristics that chess players attribute to themselves.

At the same time, each component follows a two-step composition. First, the results from each component are discussed in their entirety. Then the difference in the answers from male and female participants is analysed by means of Chi-Square tests. The overall results of the survey show a significant age difference between male and female participants *[$X^2(8, N=697)= 110.251, p <.001$]*. The age group of 11-30 years old was chosen as the subject of analysis, since age within this group is not a gender-specific predictor.

Part I: (Family) social capital of a chess player

The vast majority of the participants have a tertiary education (74%) and have both a mother (45%) and a father (47%) with a tertiary education. Figure 6 shows that the majority (60%) of participants learned to play chess when they were less than 10 years old. Before the participants started to play chess, the majority (65%) had someone in their immediate environment (friends, family or acquaintances) who played chess. Of those people in the immediate environment who played chess, the majority (83%) were male, a small minority (4%) were female, and 13% referred to both male and female persons. No significant difference was found between male and female participants in these categories.

Figure 5

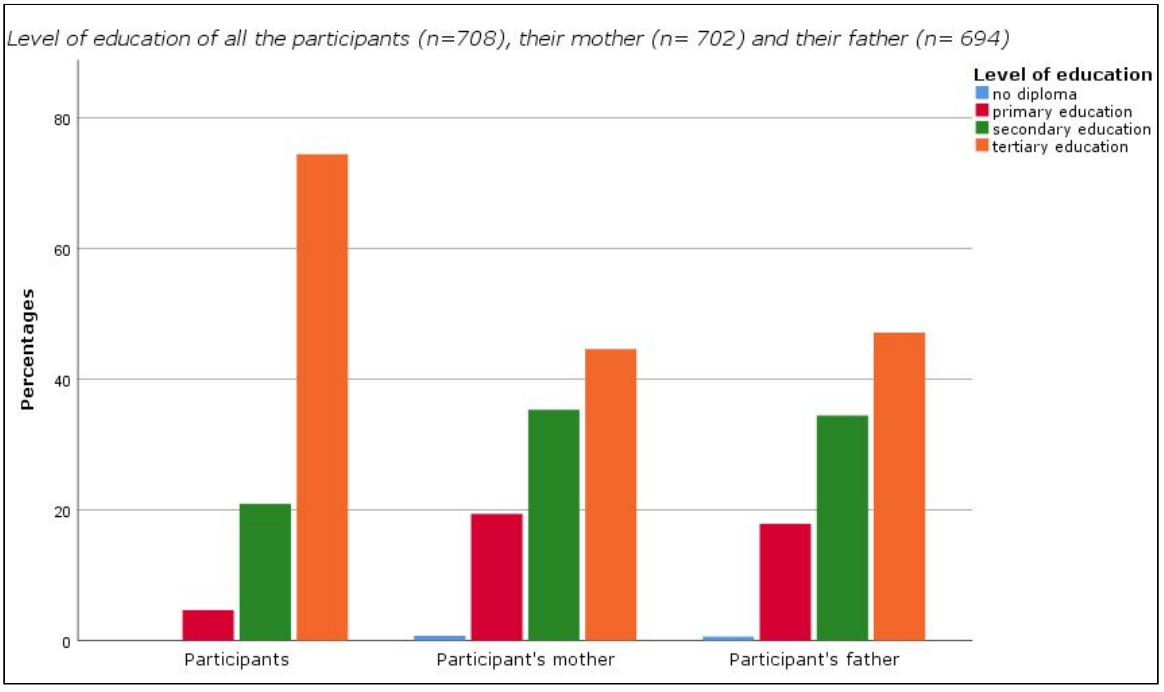


Figure 6

Figure 7

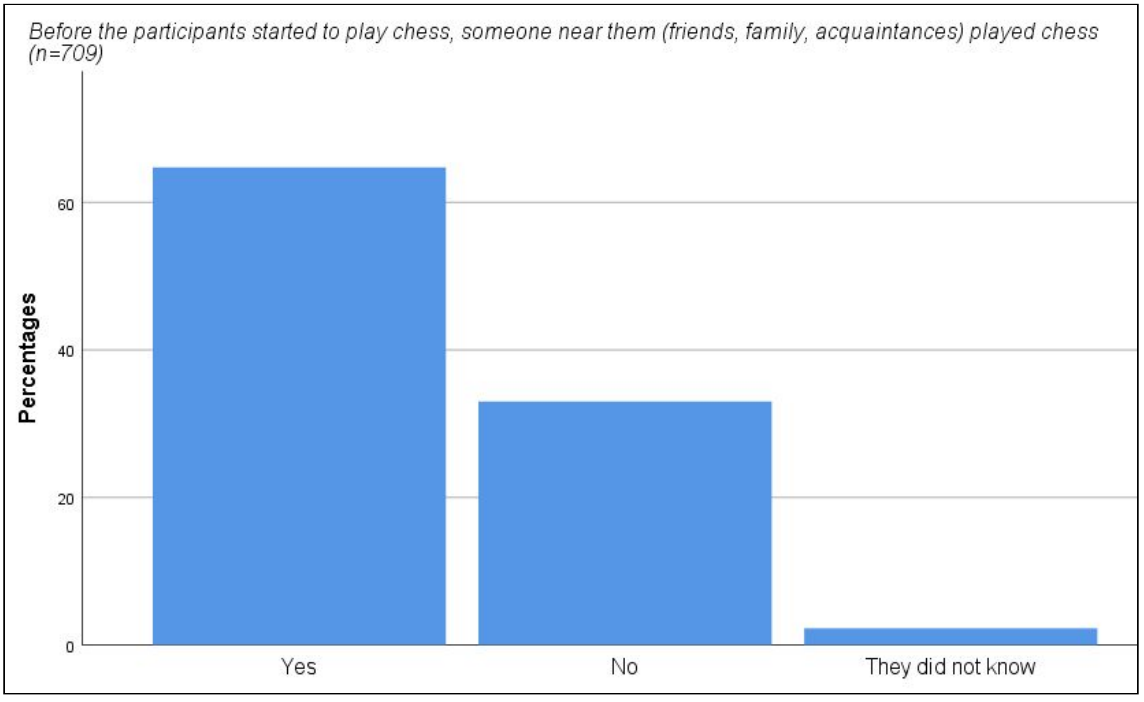
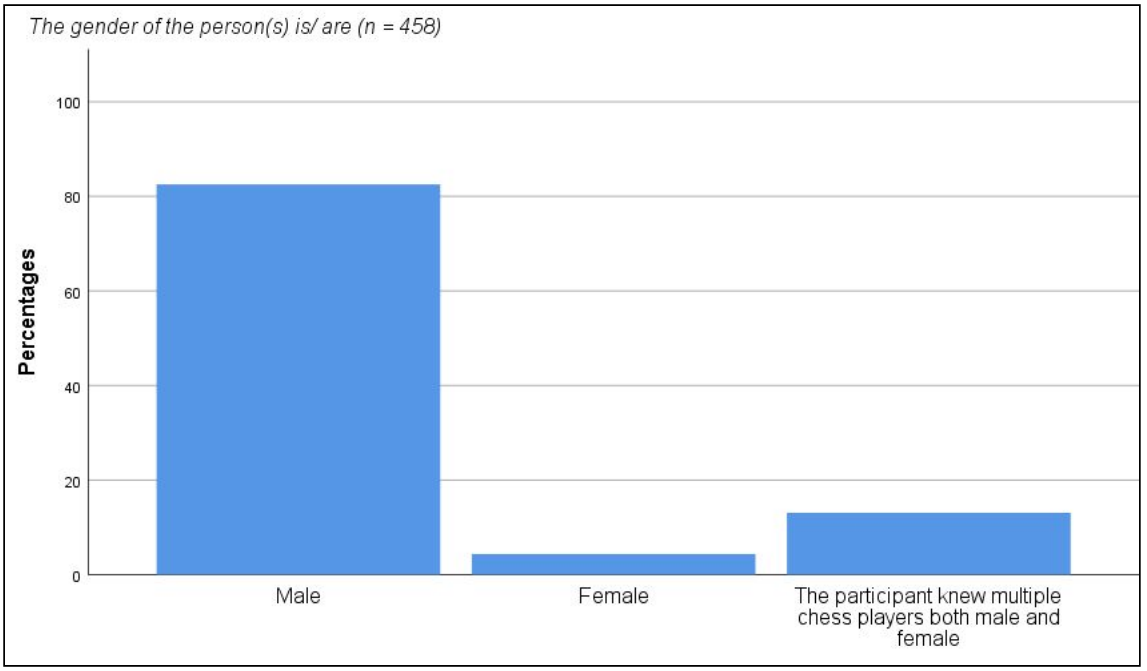
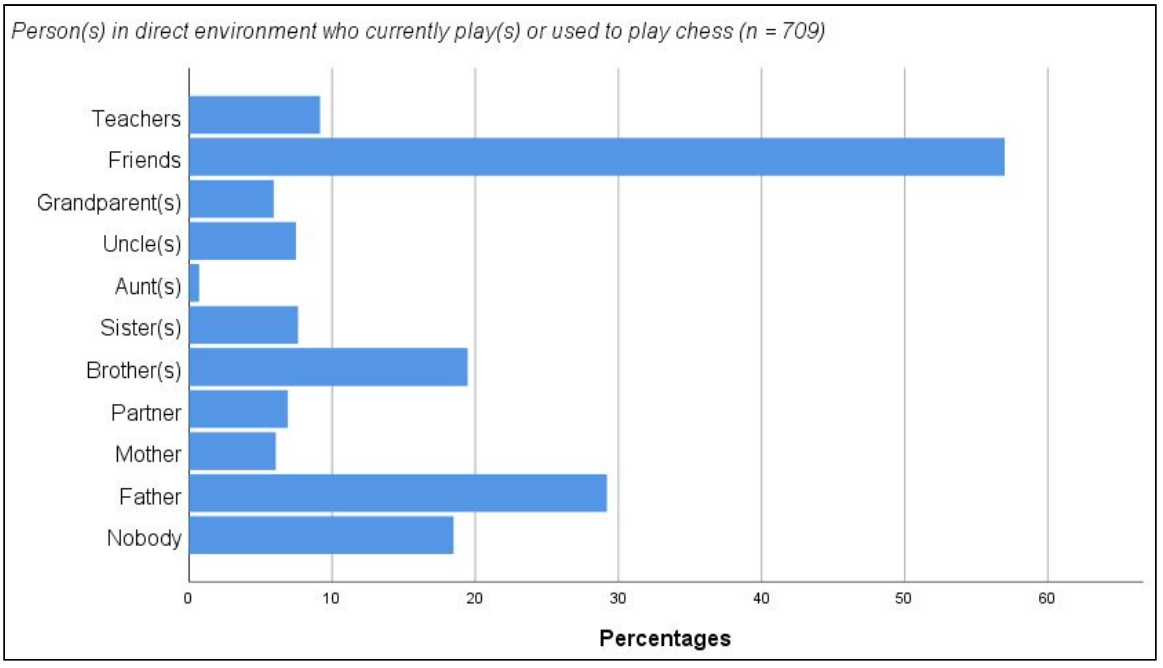


Figure 8



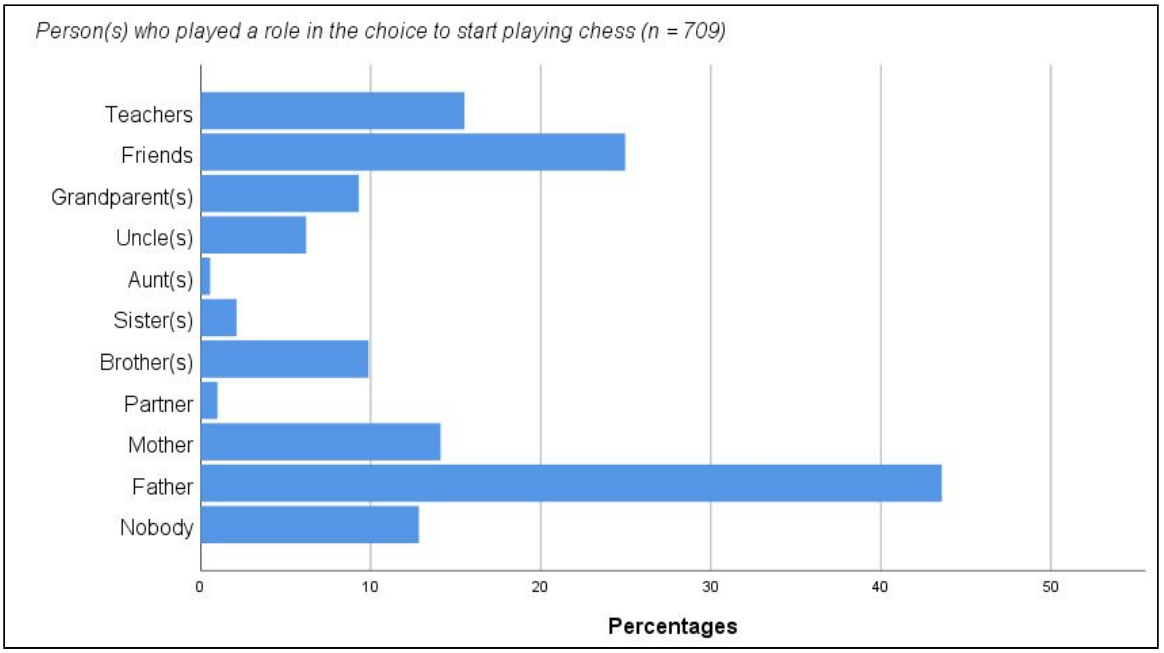
The majority (57%) of participants have friends who play chess or used to play chess. Almost one in three has a father (29%) who plays or used to play chess. In comparison, only 6% have a mother who plays or used to play chess. Female participants are significantly more likely to have nobody [$X^2(1, N=237) = 4.12$, $p = .042$] in their direct environment who plays or used to play chess, they also have significantly more likely a partner [$X^2(1, N = 237) = 16.66$, $p < .001$] and teachers [$X^2(1, N=237) = 5.08$, $p = .024$] in their direct environment who play or used to play chess.

Figure 9



In the choice to start playing chess, the father is a source of influence for almost half (44%) of the participants. In the same manner, friends count for 25%, teachers for 16% and the mother for 14%. A significant difference is found between female and male participants in the influence of friends [$X^2(1, N=237)= 4.31, p=.038$] and teachers [$X^2(1, N=237) = 11.85, p=.001$], with male participants being influenced more by friends, and female participants more by teachers.

Figure 10



The participants indicated the importance of various people in their decision to continue playing chess on a five-point Likert-scale with one meaning 'not at all' and five meaning 'to a very high degree'. The participants could also indicate that the person did not apply to them. They then did the same for various people who might influence or have influenced them to stop playing chess.

Friends score the highest on having an influence on the choice to continue playing chess ($\bar{X} = 3.02$). The father ranks the second ($\bar{X} =2.41$). A significant difference between male and female participants is found with female participants indicating the influence of their father [$X^2(4, N=230)= 12.61, p=.013$], mother [$X^2(4, N=225)=13.78, p=.008$], partner [$X^2(4, N=141)=16.62, p=.002$] and teachers [$X^2(4, N=209)=9.47, p=.050$] as being more important in contrast to the male participants. The means show that in general nobody has a large influence on their decision to stop playing chess. Female participants indicated the influence of school teachers as significantly more important in their choice to stop playing chess than male participants [$X^2(4, N=198)=14.76, p=.005$].

Figure 11

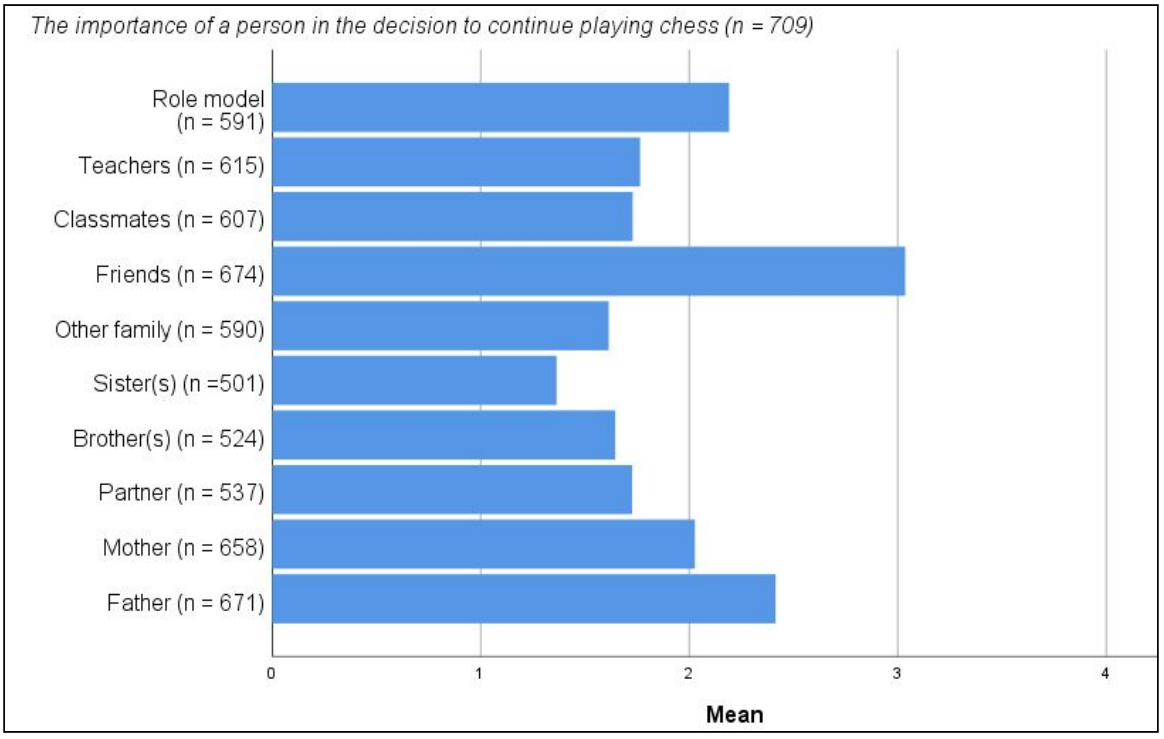
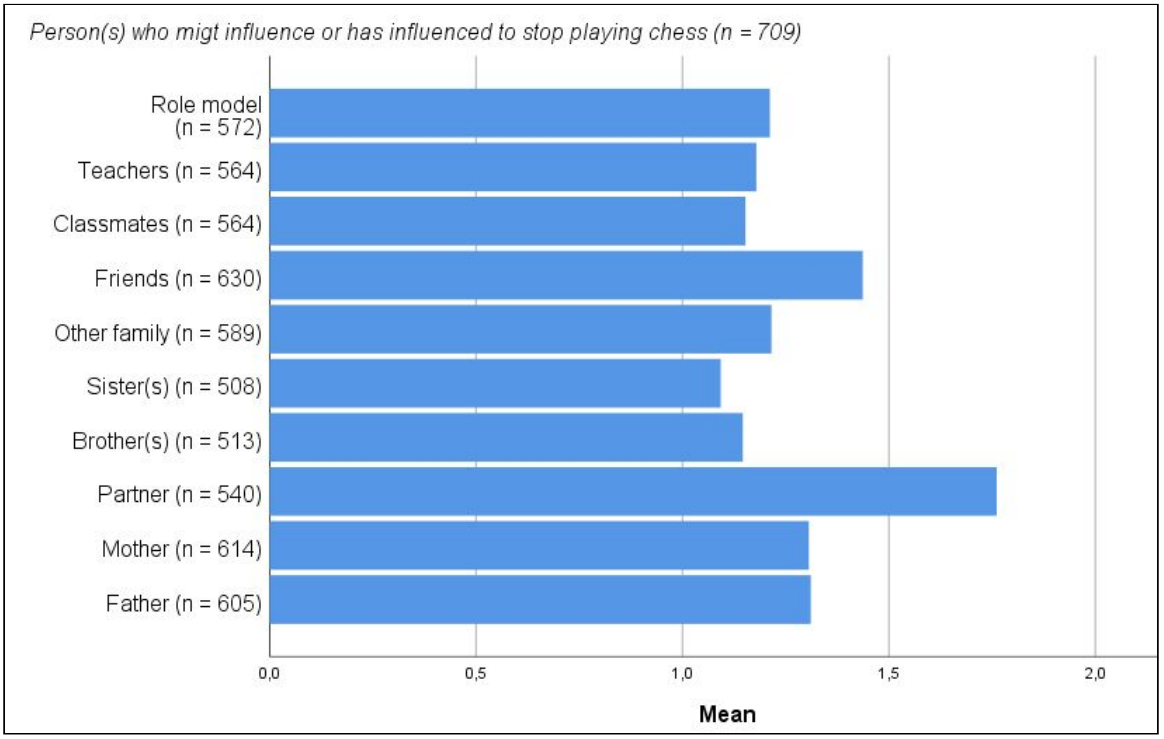


Figure 12



The results of part I show that the participants have on average a high chess capital. The majority of participants indicated that before they started chess, they knew someone in their immediate environment who played chess. Additionally, one in three has a father who plays chess or used to play chess. The influence of teachers on female participants is remarkable. In contrast to the male participants, the female participants attributed a greater significance to the influence of a teacher on them to

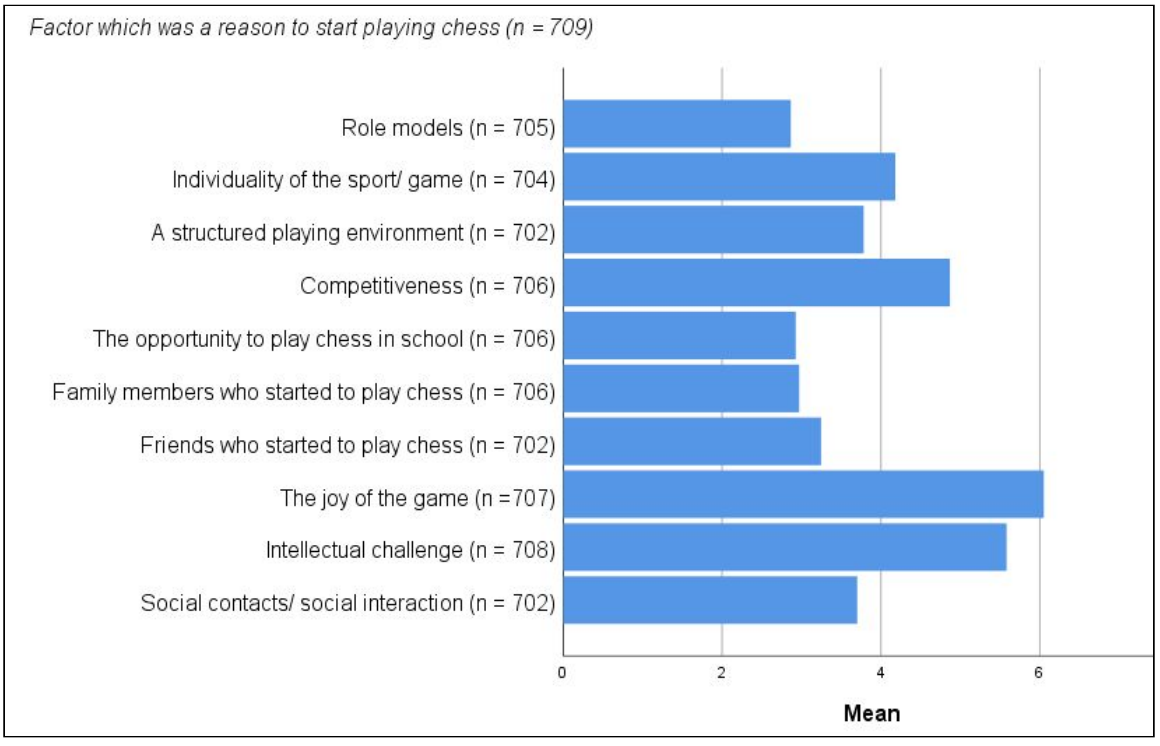
start, continue and stop playing chess. Moreover, more female participants know a teacher who plays chess or used to play chess.

Part II: Influencing factors to start, to continue, or to stop playing chess

A set of factors were given to the participants. They were asked to indicate for each factor whether this was a reason for them to start playing chess. The question was structured as a seven-point Likert-scale with one meaning 'completely inapplicable' and seven meaning 'completely applicable'. They were then asked to do the same, whether a factor was a reason to continue playing chess and whether a factor could be a reason to stop playing chess.

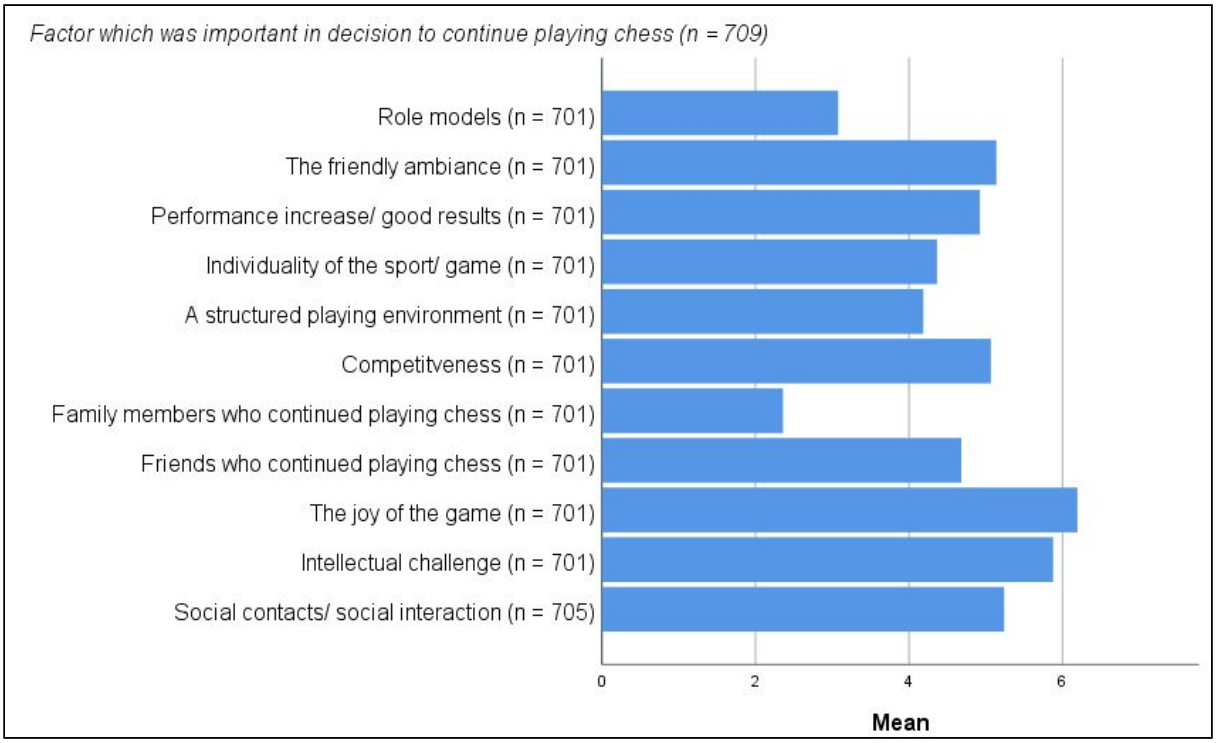
In general, factors that have contributed to a chess player's choice to start playing chess are the joy of the game ($\bar{X}$ = 6.05) and the intellectual challenge ($\bar{X}$ = 5.58). Factors indicated as the least important are role models ($\bar{X}$ = 2.87) and the opportunity to play chess in school ($\bar{X}$ = 2.93). However, there is a significant difference in role models in terms of gender, with female participants finding this more applicable [$X^2(6, N=237)=13.69$, $p=.033$].

Figure 13



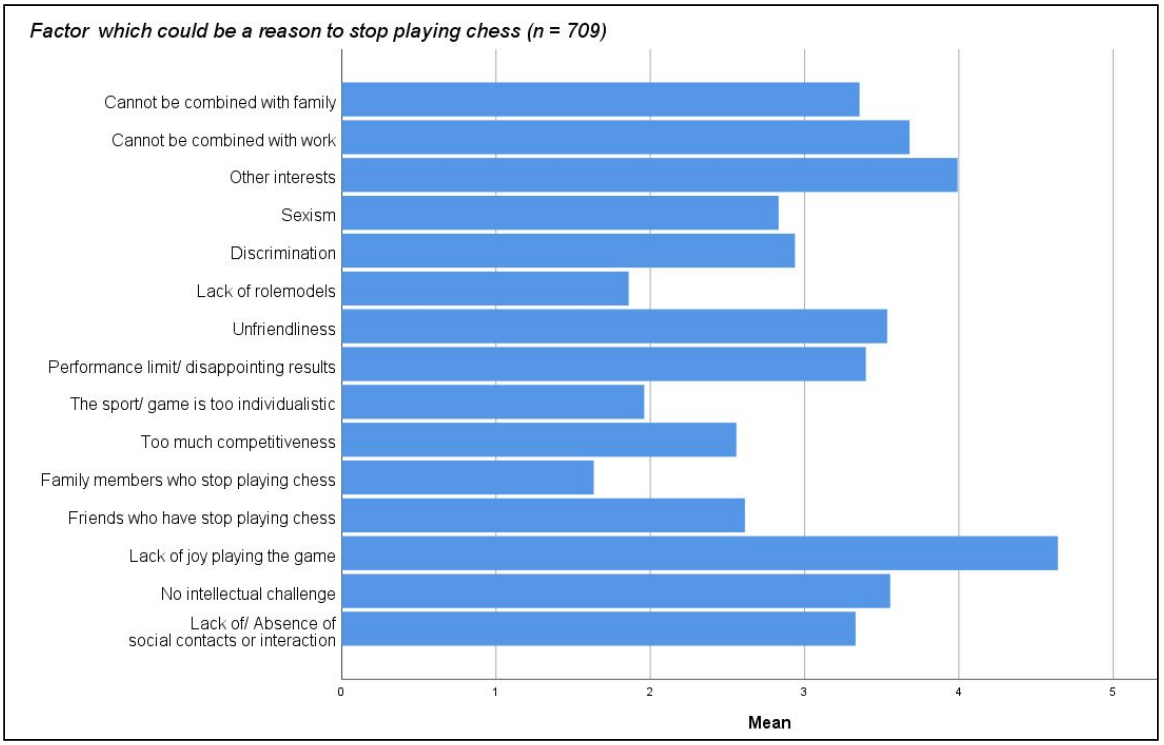
The factors which are a reason for the participants to continue playing chess are the joy of the game ($\bar{X}$ = 6.19), the intellectual challenge ($\bar{X}$ = 5.88) and social contacts/ social interaction ($\bar{X}$ = 5.24). Family members who continued to play chess ($\bar{X}$ = 2.36) and role models ($\bar{X}$ = 3.08) are indicated as less important. Looking at female and male chess players separately, a significant difference is found for social contacts/ social interaction [$X^2(6, N=237)=14.75$, $p=.022$], friendly ambiance [$X^2(6, N=236)=14.36$, $p=.026$] and role models [$X^2(4, N=236)=14.78$, $p=.022$], with all being more applicable to female participants.

Figure 14



The factor which participants indicated as the most prominent reason to stop playing chess is the lack of joy in playing the game ($\bar{X}$ = 4.64). A significant difference is found between genders in the following factors: no intellectual challenge [$X^2(6, N=237)=17.78$, $p=.007$], performance limit/ disappointing results [$X^2(6, N=237)=15$, $p=.020$], unfriendliness [$X^2(6, N=237)=19.72$, $p=.003$], discrimination [$X^2(6, N=237)=23.53$, $p=.001$] and sexism [$X^2(6, N=237)=35.74$, $p<.001$], all of which are more likely to apply to female participants.

Figure 15

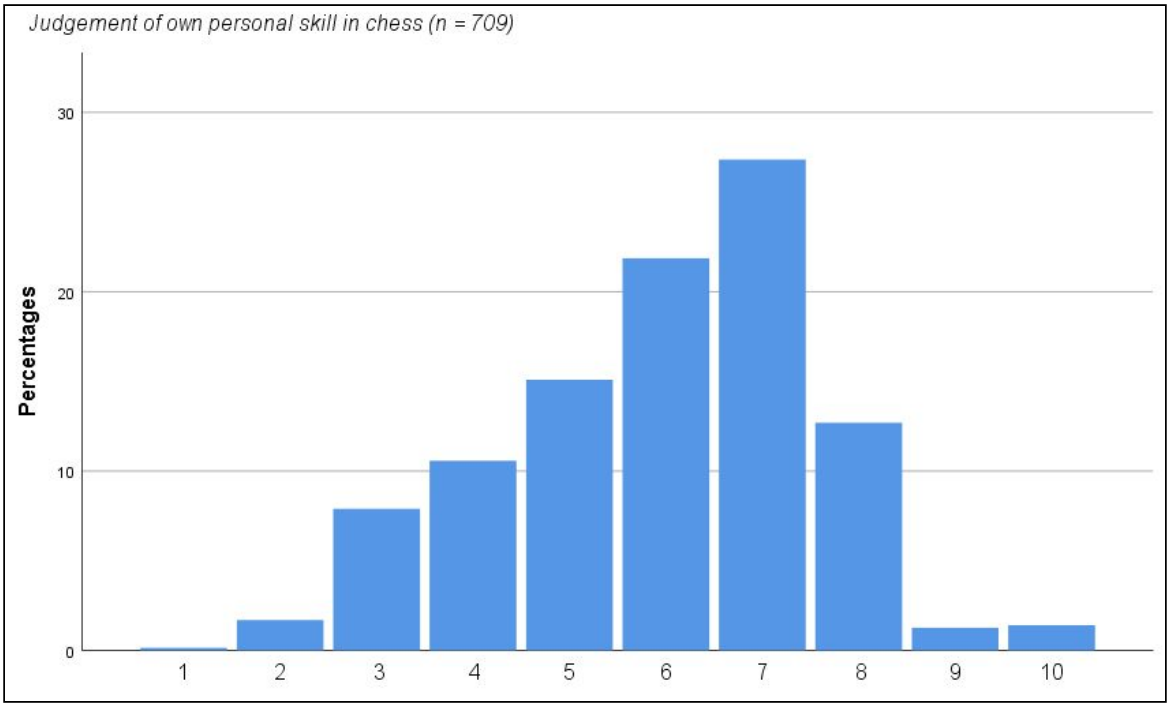


The results show that the most important factor to start playing chess is the joy of the game, which remains decisive over time. Family members are never indicated as an influential factor. Social contacts and interaction is not a large influencing factor to start playing chess, but it is to continue playing chess. A remarkable result is that female chess players tend to give a higher score for various factors such as unfriendliness as a probable reason to stop playing chess.

Part III: Characteristics chess players attribute to themselves

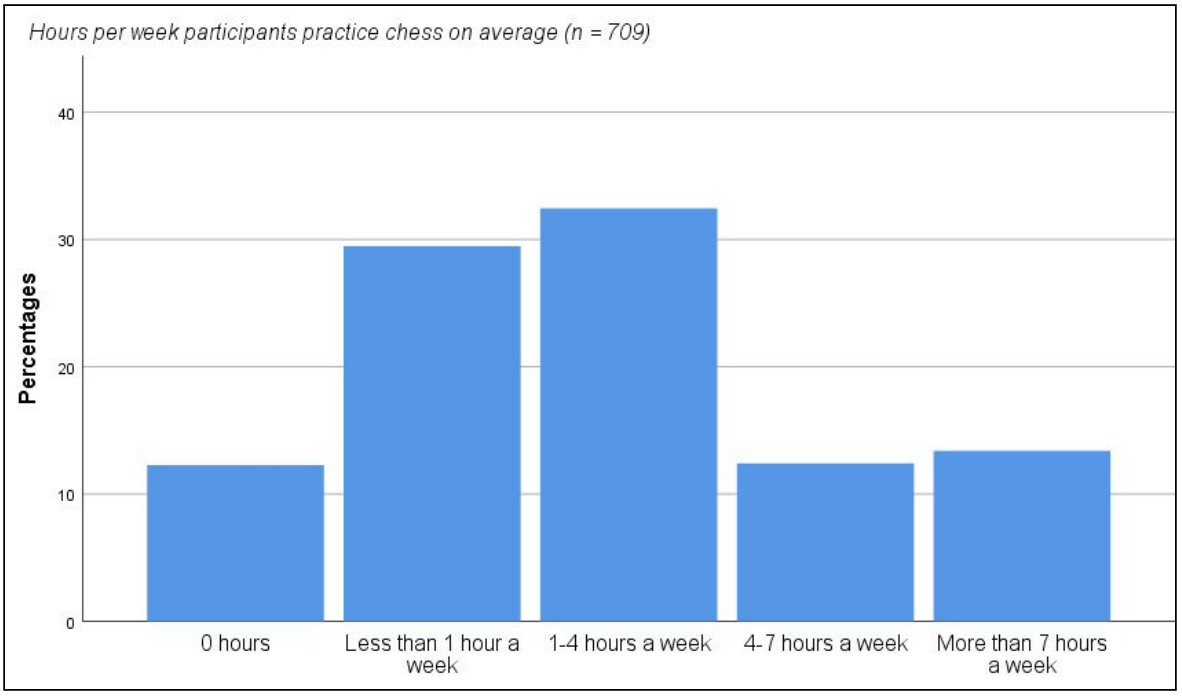
The participants rated their own chess skills on a ten-point Likert-scale with one meaning 'absolute incapability' and ten meaning 'perfection'. A Spearman correlation was used to determine the relationship between their FIDE rating and their self-assessment (= .46, n = 709, p < .001). The positive correlation shows that as the FIDE rating of the participants increases, the judgement of their own skills equally increases. When controlling FIDE rating for the relationship between gender and self-assessment with a partial correlation, no significant difference is found.

Figure 16



The participants indicated how many hours per week they practice chess. About one third (30%) practice less than one hour per week and another third (32%) practice between one and four hours per week. A Spearman correlation was used to determine the relationship between their FIDE rating and how many hours the participants practice per week (= .12, n = 709, p = .001). It shows that participants who have a higher FIDE rating, practice more on average. No significant difference is found when controlling FIDE rating for the relationship between gender and hours of practice per week. Additionally, within the different FIDE rating categories, no significant association is found between gender and hours of practice per week.

Figure 17



The participants scored the degree of applicability to themselves for thirty characteristics on a seven-point Likert-scale with one meaning 'not applicable at all' and seven meaning 'absolutely applicable'. They gave the highest scores to themselves for the following characteristics: 'logical', 'analytical prowess' and 'intelligence'. The lowest scores were given for 'aggressive', 'extravert' and 'physically attractive'. A significant difference between female and male participants was found in the characteristics 'quick worker' [$X^2(6, N=237)=14.60$, $p=0.024$], 'capable of dealing with deadlines' [$X^2(6, N=237)=20.5$, $p=0.002$], 'organised' [$X^2(6, N=237)=20.3$, $p=0.002$] and 'takes the initiative' [$X^2(6, N=237)=13.96$, $p=0.030$] whereby the female participants find these factors more applicable to themselves than the male participants.

Figure 18

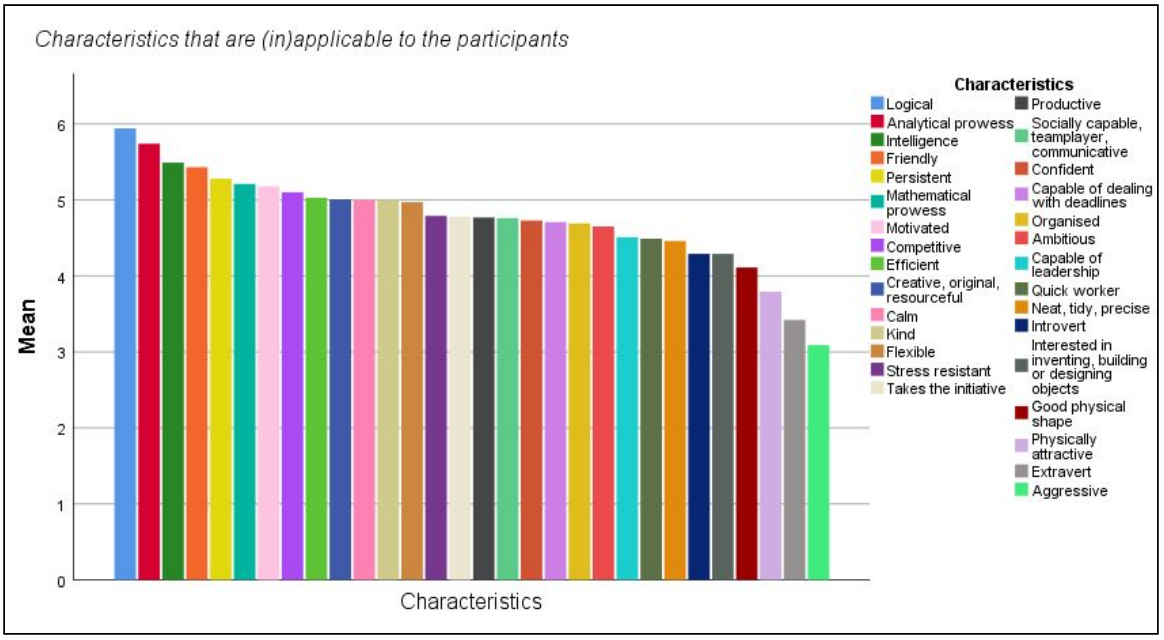


IMAGE OF CHESS PLAYERS AND GENDER ROLES

The second research question, 'What characteristics do male and female chess players associate with being a (good) chess player and with masculinity and femininity?' is examined with the survey and is divided into three parts. The first part contains information about which characteristics the participants associate with a good chess player and which characteristics they associate with masculinity and femininity. It also aims to examine their perception of the associations made by their respective countries' societies (hereinafter referred to as "perceived associations"). The second part continues the investigation of the information from part I by comparing the image of a chess player with the different 'societal gendered expectations'. Finally, the third part measures the potential existence of conflicts or similarities between the characteristics that participants have given themselves and the characteristics associated with a chess player and gender roles.

Part I: Association with a good chess player, masculinity and femininity

Thirty characteristics are examined on a seven-point Likert-scale to measure the degree of perceived applicability. Each section describes the results for all participants, followed by the notable differences between the associations the participants make themselves and perceived associations. Afterwards, the difference in responses between male and female participants within the age group of 11-30 years is analysed using the Chi-Square test.

A good chess player

On a seven-point Likert-scale, the participants indicated which characteristics and skills they think are important for a good chess player with one meaning 'not important at all' and seven meaning 'very important'. Indicated as the most important are 'analytical prowess', 'motivated' and 'logical', while 'physical attractiveness', 'kindness' and 'extravert' are indicated as the least important. The comparison of the means of the participants' associations with the perceived associations shows that 'mathematical

prowess', 'intelligence' and 'introvert' score higher on the perceived association, while 'good physical shape' scores higher on the participants' associations.

Male participants associate significantly more with a good chess player compared to female participants the following two characteristics: 'flexible' [$X^2(6, N=235)=13.88$, $p=.031$] and 'creative/ original/ resourceful' [$X^2(6, N=234)=12.58$, $p=.050$]. In terms of the perceived associations, female participants perceive seven characteristics as significantly more important for a good chess player in comparison to male participants, namely 'good physical shape' [$X^2(6, N=234)=15.14$, $p=.019$], 'persistent' [$X^2(6, N=231)=15.45$, $p=.017$], 'takes the initiative' [$X^2(6, N=233)=13.6$, $p=.034$], 'capable of leadership' [$X^2(6, N=233)=14.57$, $p=.024$], 'socially capable/ teamplayer/ communicative' [$X^2(6, N=232)=25.51$, $p<.001$], 'stress resistant' [$X^2(6, N=231)=15.81$, $p=.015$] and 'motivated' [$X^2(6, N=226)=14.34$, $p=.026$].

Masculinity

The participants indicated on a seven-point Likert-scale which characteristics they associate with masculinity with one meaning 'not associated at all' and seven meaning 'completely associated'. The most associated are 'competitive', 'ambitious', and 'aggressive', while 'neat/ tidy/ precise' and 'kind' are the least associated. The comparison of the associations made by the participants with the perceived associations shows that the scores are very similar. However, in comparison to the participants' own associations, almost every characteristic or skill is regarded as more associated with masculinity by the participants' perceptions of their respective countries' societies.

Male participants associate 'socially capable/ teamplayer/ communicative' [$X^2(6, N=232)=18.52$, $p=.005$], 'capable of dealing with deadlines' [$X^2(6, N=232)=16.39$, $p=.012$] and 'analytical prowess' [$X^2(6, N=233)=13.47$, $p=.036$] significantly more with masculinity than female participants. In terms of the perceived associations a significant difference between male and female participants is found for 'friendly' [$X^2(6, N=228)=22.03$, $p=.001$], 'calm' [$X^2(6, N=228)=15.41$, $p=.017$], 'interested in inventing/ building or designing objects' [$X^2(6, N=229)=18.82$, $p=.004$] and 'analytical prowess' [$X^2(6, N=229)=18.82$, $p=.004$]. The former two are perceived as more associated with masculinity by the male participants and the latter two are perceived as more associated with masculinity by the female participants.

Femininity

As with masculinity, the participants indicated on a seven-point Likert-scale which characteristics and skills they associate with femininity with one meaning 'not associated at all' and seven meaning 'completely associated'. The most associated are 'neat/ tidy/ precise', 'kind' and 'physically attractive', while 'aggressive', 'competitive' and 'introvert' are the least associated. The scores of the associations the participants make with femininity and their perceived associations are similar. However, 'physically attractive' has a higher score in the perceived associations.

The female participants report a significantly stronger association between 'logical' [$X^2(6, N=233)=13.758$, $p=.032$], 'mathematical prowess' [$X^2(6, N=234)=13.2$, $p=.040$] and 'analytical prowess' [$X^2(6, N=233)=13.1$, $p=.041$], and femininity. Furthermore, they report a significantly higher perception of 'neat/ tidy/ precise' [$X^2(6, N=226)=12.77$, $p=.047$] and 'organised' [$X^2(6, N=224)=13.79$, $p=.032$] being associated by their countries societies with femininity

Table 3

Characteristics important for a (good) chess player (n = 709)

	Characteristics	Mean association participants themselves	Mean perceived association by participants countries' society	Differences between the means
1	Analytical prowess	6,45	6,46	-,01
2	Logical	6,30	6,47	-,17
3	Motivated	6,29	5,74	,55
4	Stress resistant	5,99	5,40	,59
5	Persistent	5,99	5,32	,67
6	Competitive	5,93	5,87	,06
7	Confident	5,80	5,18	,62
8	Ambitious	5,61	5,36	,25
9	Creative, original, resourceful	5,46	4,75	,71
10	Intelligence	5,42	6,45	-1,03
11	Efficient	5,11	4,92	,19
12	Calm	5,00	4,96	,04
13	Mathematical prowess	4,81	6,10	-1,29
14	Flexible	4,73	3,98	,75
15	Capable of dealing with deadlines	4,64	3,96	,68
16	Good physical shape	4,60	3,07	1,53
17	Neat, tidy, precise	4,45	4,66	-,21
18	Organised	4,42	4,32	,10
19	Quick worker	4,41	3,93	,48
20	Takes the initiative	4,36	3,91	,45
21	Productive	4,32	4,23	,09
22	Interested in inventing, building or designing objects	3,99	3,89	,10
23	Aggressive	3,59	3,51	,08
24	Socially capable, teamplayer, communicative	3,37	3,11	,26
25	Friendly	3,01	2,94	,07
26	Capable of leadership	3,00	3,04	-,04
27	Introvert	2,69	3,74	-1,05
28	Kind	2,59	2,63	-,04
29	Extravert	2,57	2,64	-,07
30	Physically attractive	1,73	1,95	-,22

Table 4

Characteristics associated with masculinity (n = 709)

	Characteristics	Mean association participants themselves	Mean perceived association by participants countries' society	Differences between the means
1	Competitive	4,63	5,55	-,92
2	Aggressive	4,63	5,41	-,78
3	Ambitious	4,23	5,14	-,91
4	Confident	4,05	4,83	-,78
5	Takes the initiative	3,87	4,91	-1,04
6	Capable of leadership	3,87	5,18	-1,31
7	Interested in inventing, building or designing objects	3,82	4,74	-,92
8	Logical	3,79	4,90	-1,11
9	Mathematical prowess	3,79	4,99	-1,20
10	Analytical prowess	3,73	4,85	-1,12
11	Stress resistant	3,66	4,49	-,83
12	Good physical shape	3,59	4,37	-,78
13	Persistent	3,54	4,42	-,88
14	Motivated	3,51	4,40	-,89
15	Productive	3,26	4,17	-,91
16	Extravert	3,24	3,94	-,70
17	Creative, original, resourceful	3,14	3,80	-,66
18	Efficient	3,12	3,93	-,81
19	Intelligence	3,10	4,32	-1,22
20	Socially capable, teamplayer, communicative	3,08	3,67	-,59
21	Quick worker	3,07	3,86	-,79
22	Capable of dealing with deadlines	2,99	3,82	-,83
23	Flexible	2,91	3,48	-,57
24	Physically attractive	2,87	3,38	-,51
25	Friendly	2,85	3,01	-,16
26	Calm	2,83	2,99	-,16
27	Organised	2,82	3,52	-,70
28	Introvert	2,73	2,69	,04
29	Neat, tidy, precise	2,56	3,07	-,51
30	Kind	2,55	2,64	-,09

Table 5

Characteristics associated with femininity (n = 709)

	Characteristics	Mean association participants themselves	Mean perceived association by participants countries' society	Differences between the means
1	Neat, tidy, precise	4,47	4,79	-,32
2	Kind	4,41	5,01	-,60
3	Physically attractive	4,38	5,16	-,78
4	Organised	4,32	4,47	-,15
5	Socially capable, teamplayer, communicative	4,28	4,54	-,26
6	Friendly	4,18	4,74	-,56
7	Creative, original, resourceful	3,95	3,98	-,03
8	Efficient	3,92	3,98	-,06
9	Capable of dealing with deadlines	3,87	3,71	,16
10	Flexible	3,86	4,00	-,14
11	Intelligence	3,83	3,47	,36
12	Calm	3,82	4,31	-,49
13	Motivated	3,79	3,67	,12
14	Productive	3,76	3,73	,03
15	Persistent	3,70	3,61	,09
16	Good physical shape	3,66	4,09	-,43
17	Quick worker	3,65	3,61	,04
18	Capable of leadership	3,42	2,91	,51
19	Stress resistant	3,39	3,30	,09
20	Analytical prowess	3,38	2,90	,48
21	Ambitious	3,37	3,08	,29
22	Logical	3,35	2,96	,39
23	Extravert	3,34	3,54	-,20
24	Confident	3,32	3,31	,01
25	Takes the initiative	3,32	3,03	,29
26	Mathematical prowess	3,23	2,76	,47
27	Interested in inventing, building or designing objects	3,13	2,80	,33
28	Competitive	3,11	2,81	,30
29	Introvert	2,95	3,18	-,23
30	Aggressive	2,44	2,18	,26

The results of part I and the image the participants have of themselves, show that all participants stated 'analytical prowess', 'intelligence' and 'logical' as very applicable. This set of characteristics is also highly associated with a chess player. However, the association with femininity in this set is low.

Part II: Image of a chess player compared to gender roles

This part examines the conflicts and similarities between the image of a good chess player and the images of gender roles. These comparisons are made by subtracting the means of the set of characteristics associated with masculinity and the means of the set associated with femininity from the means of chess players. The comparisons show certain tendencies: the comparisons with masculinity show that 'motivated', 'analytical prowess', 'logical' and 'persistent' score a lot higher in the association with a good chess player, while, 'aggressive' and 'physically attractive' score a lot higher in the association with masculinity. The comparisons with femininity show that 'analytical prowess', 'logical', and 'competitive' score a lot higher in the association with a good chess player, while 'physically attractive' and 'kind' score a lot higher in the association with femininity.

Table 6

Image of a chess player compared to masculinity (n = 709)

	Characteristics	The difference between the means of the associations with masculinity and a chess player	The difference between the means of the perceived association with masculinity and the association with a chess player	The difference between the means of the association with massculinity and the perceived association with a chess player	The difference between the means of the perceived associations with masculinity and a chess player
1	Motivated	2,78	1,89	2,23	1,34
2	Analytical prowess	2,72	1,60	2,73	1,61
3	Logical	2,51	1,40	2,68	1,57
4	Persistent	2,45	1,57	1,78	,90
5	Stress resistant	2,33	1,50	1,74	,91
6	Creative, original, resourceful	2,32	1,66	1,61	,95
7	Intelligence	2,32	1,10	3,35	2,13
8	Calm	2,17	2,01	2,13	1,97
9	Efficient	1,99	1,18	1,80	,99
10	Neat, tidy, precise	1,89	1,38	2,10	1,59
11	Flexible	1,82	1,25	1,07	,50
12	Confident	1,75	,97	1,13	,35
13	Capable of dealing with deadlines	1,65	,82	,97	,14
14	Organised	1,60	,90	1,50	,80
15	Ambitious	1,38	,47	1,13	,22
16	Quick worker	1,34	,55	,86	,07
17	Competitive	1,30	,38	1,24	,32
18	Productive	1,06	,15	,97	,06
19	Mathematical prowess	1,02	-,18	2,31	1,11
20	Good physical shape	1,01	,23	-,52	-1,30
21	Takes the initiative	,49	-,55	,04	-1,00
22	Socially capable, teamplayer, communicative	,29	-,30	,03	-,56
23	Interested in inventing, building or designing objects	,17	-,75	,07	-,85
24	Friendly	,16	,00	,09	-,07
25	Kind	,04	-,05	,08	-,01
26	Introvert	-,04	,00	1,01	1,05
27	Extravert	-,67	-1,37	-,60	-1,30
28	Capable of leadership	-,87	-2,18	-,83	-2,14
29	Aggressive	-1,04	-1,82	-1,12	-1,90
30	Physically attractive	-1,14	-1,65	-,92	-1,43

Table 7

Image of a chess player compared to femininity (n = 709)

	Characteristics	The difference between the means of the associations with femininity and a chess player	The difference between the means of the perceived association with femininity and the association with a chess player	The difference between the means of the association with femininity and the perceived association with a chess player	The difference between the means of the perceived associatons with femininity and a chess player
1	Analytical prowess	3,07	3,55	3,08	3,56
2	Logical	2,95	3,34	3,12	3,51
3	Competitive	2,82	3,12	2,76	3,06
4	Stress resistant	2,60	2,69	2,01	2,10
5	Motivated	2,50	2,62	1,95	2,07
6	Confident	2,48	2,49	1,86	1,87
7	Persistent	2,29	2,38	1,62	1,71
8	Ambitious	2,24	2,53	1,99	2,28
9	Intelligence	1,59	1,95	2,62	2,98
10	Mathematical prowess	1,58	2,05	2,87	3,34
11	Creative, original, resourceful	1,51	1,48	,80	,77
12	Efficient	1,19	1,13	1,00	,94
13	Calm	1,18	,69	1,14	,65
14	Aggressive	1,15	1,41	1,07	1,33
15	Takes the initiative	1,04	1,33	,59	,88
16	Good physical shape	,94	,51	-,59	-1,02
17	Flexible	,87	,73	,12	-,02
18	Interested in inventing, building or designing objects	,86	1,19	,76	1,09
19	Capable of dealing with deadlines	,77	,93	,09	,25
20	Quick worker	,76	,80	,28	,32
21	Productive	,56	,59	,47	,50
22	Organised	,10	-,05	,00	-,15
23	Neat, tidy, precise	-,02	-,34	,19	-,13
24	Introvert	-,26	-,49	,79	,56
25	Capable of leadership	-,42	,09	-,38	,13
26	Extravert	-,77	-,97	-,70	-,90
27	Socially capable, teamplayer, communicative	-,91	-1,17	-1,17	-1,43
28	Friendly	-1,17	-1,73	-1,24	-1,80
29	Kind	-1,82	-2,42	-1,78	-2,38
30	Physically attractive	-2,65	-3,43	-2,43	-3,21

Part III: Participant's image compared to the image of a chess player and gender roles

This part examines the existence of potential conflicts or similarities between the participants' self-perception and their perception of a good chess player, and between the participants' self-perception and their perception of their respective gender roles. This will be investigated separately for male and female participants.

The first analysis is done by subtracting the means of the set of characteristics that the participants associate with a good chess player from the means of the set they have given themselves, and the second analysis is done by subtracting the means of the set they associate with masculinity and femininity respectively from the means of the set they have given themselves.

In a comparison between the set of characteristics that the male participants assigned to themselves and the set they associate with a good chess player, higher values for self-perception were found for 'friendly', 'kind' and 'physically attractive', while the means of 'ambitious', 'motivated' and 'stress resistant' were rated higher for the chess player. The comparison between the characteristics that the male participants assign to

themselves and to masculinity shows that the participants give themselves higher scores on almost everything, in particular, 'calm', 'friendly' and 'kind'. A noteworthy exception is 'aggressive'.

In the comparison between the set of characteristics that the female participants assigned to themselves with the set they associated with a good chess player, higher scores on self-perception were found for 'friendly', 'kind' and 'physically attractive', while the means of 'stress resistant' and 'confident' score higher for the chess player. The comparison between the characteristics the female participants assigned to themselves and to femininity shows that the participants give themselves higher scores on almost everything, in particular 'analytical prowess', 'mathematical prowess', 'logical' and 'competitive'. Noteworthy exceptions arer 'neat/ tidy/ precise' and 'physically attractive'.

Table 8

Image of male participants on themselves compared to images on a chess player and masculinity (n = 544)

	Characteristics	Means of self-perception of the male participants	The difference between the means of the association with a chess player and the self-perception	The difference between the means of the perceived association with a chess player and the self-perception	The difference between the means of the association with masculinity and the self-perception	The difference between the means of the perceived association with masculinity and the self-perception
1	Logical	5,91	-,36	-,54	2,16	1,19
2	Analytical prowess	5,75	-,65	-,67	2,04	1,08
3	Intelligence	5,44	,08	-,96	2,35	1,33
4	Friendly	5,37	2,32	2,43	2,52	2,43
5	Persistent	5,23	-,74	,00	1,76	,98
6	Mathematical prowess	5,20	,47	-,88	1,45	,35
7	Motivated	5,07	-1,17	-,55	1,64	,83
8	Calm	5,07	,14	,14	2,21	2,08
9	Competitive	5,01	-,89	-,78	,52	-,38
10	Creative, original, resourceful	5,00	-,44	,27	1,88	1,27
11	Flexible	4,96	,25	1,05	2,06	1,49
12	Efficient	4,94	-,14	,07	1,87	1,14
13	Kind	4,90	2,28	2,27	2,34	2,28
14	Stress resistant	4,87	-1,03	-,39	1,27	,52
15	Confident	4,83	-,94	-,27	,91	,22
16	Takes the initiative	4,77	,56	,99	,99	,01
17	Socially capable, teamplayer, communicative	4,71	1,44	1,73	1,66	1,12
18	Productive	4,65	,42	,60	1,45	,60
19	Capable of dealing with deadlines	4,58	-,01	,73	1,59	,85
20	Organised	4,58	,24	,33	1,70	1,03
21	Capable of leadership	4,45	1,56	1,51	,70	-,58
22	Ambitious	4,43	-1,09	-,78	,32	-,54
23	Neat, tidy, precise	4,38	-,05	-,24	1,75	1,28
24	Quick worker	4,32	-,08	,49	1,26	,58
25	Introvert	4,31	1,53	,51	1,57	1,59
26	Interested in inventing, building or designing objects	4,23	,22	,37	,48	-,36
27	Good physical shape	4,05	-,62	,96	,53	-,22
28	Physically attractive	3,68	1,91	1,71	,90	,41
29	Extravert	3,36	,75	,72	,18	-,48
30	Aggressive	3,08	-,57	-,42	-1,45	-2,25

Table 9

Image of female participants on themselves compared to images on a chess player and femininity (n = 159)

	Characteristics	Means of self-perception of the female participants	The difference between the means of the association with a chess player and the self-perception	The difference between the means of the perceived association with a chess player and the self-perception	The difference between the means of the association with femininity and the self-perception	The difference between the means of the perceived association with femininity and the self-perception
1	Logical	6,05	-,42	-,56	2,27	3,00
2	Analytical prowess	5,73	-,88	-,87	1,92	2,76
3	Friendly	5,69	2,76	2,74	1,34	,48
4	Intelligence	5,66	-,02	-,97	1,42	2,03
5	Motivated	5,57	-,92	-,61	1,30	1,64
6	Persistent	5,51	-,61	-,19	1,54	1,67
7	Ambitious	5,45	-,52	-,46	1,59	2,13
8	Competitive	5,45	-,60	-,71	1,96	2,55
9	Kind	5,38	2,86	2,75	,84	-,02
10	Efficient	5,35	,12	,21	,92	,81
11	Mathematical prowess	5,29	,17	-,91	1,75	2,49
12	Capable of dealing with deadlines	5,18	,34	,86	,72	1,01
13	Productive	5,17	,54	,35	,87	,93
14	Creative, original, resourceful	5,09	-,45	,29	,67	,78
15	Flexible	5,06	,26	,81	,70	,62
16	Organised	5,06	,37	,50	,09	-,19
17	Quick worker	5,04	,55	,80	,96	1,14
18	Socially capable, teamplayer, communicative	5,00	1,23	1,45	,31	,10
19	Takes the initiative	4,87	-,06	,49	1,25	1,78
20	Calm	4,78	-,43	-,28	,63	-,05
21	Neat, tidy, precise	4,77	,19	-,08	-,18	-,74
22	Capable of leadership	4,76	1,36	1,37	,89	1,86
23	Interested in inventing, building or designing objects	4,53	,56	,53	1,12	1,82
24	Stress resistant	4,52	-1,82	-1,34	,69	,91
25	Confident	4,41	-1,50	-1,00	,91	,94
26	Good physical shape	4,35	,01	1,35	,51	-,08
27	Introvert	4,21	1,83	,72	1,34	1,01
28	Physically attractive	4,18	2,59	2,31	-,10	-1,23
29	Extravert	3,62	1,19	1,05	,42	,10
30	Aggressive	3,12	-,28	-,43	,74	1,13

Masculinity is highly associated with aggressiveness, as opposed to a chess player who has a low association with aggressiveness. Meanwhile, male participants find 'aggressive' less applicable to themselves in contrast to how they associate it with masculinity. Similarly, all participants associate 'physically attractive' to a high degree with femininity as opposed to how they associate it with a chess player. Meanwhile, female participants associated 'physically attractive' more with femininity than with themselves.

THE EXPERIENCE OF FEMALE CHESS PLAYERS WITH RESPECT TO THEIR MINORITY POSITION

The third research question, *'How do female chess players experience their minority position in the chess world?'*, examined by ten semi-structured interviews, is divided into

two parts: the experiences of the minority position, and the perceptions and stereotypes around female chess players.

All respondents have experience playing in chess tournaments, a majority having experience playing in international tournaments. They all learned to play chess under the age of ten and joined a chess club within a year of learning the rules. Most of them did not know any female chess player in their first learning phase, with the exception of some whose mother or sister could play chess. Almost all respondents managed to meet a few other female chess players from the moment they joined a chess club, while all of them met other female chess players at the moment they started playing chess tournaments. At the interview date, the respondents generally know a few other female chess players in their immediate environment (friends and family). The majority of them still play national and international tournaments and know on average twenty other female chess players (acquaintances). Some of the interviewees are not only members of a chess club, but also have a more active role in chess organisations, for example as chess teachers, where they have the opportunity to meet other female chess players.

Part I: The minority position of girls and women in the chess world

A prominent remark made by the respondents is that it is regrettable that there are only a small number of female chess players. Some respondents believe that the chess world would be "healthier" if there are more female chess players, given that the ratio of men to women is currently rather extreme. One respondent felt that if other women had the chance to learn chess, some would enjoy it as much as she does.

All respondents agree that the presence of more female chess players would make them feel more at home in the chess world. According to one respondent, the presence of more female chess players in the chess world can show to other girls and women that it is not just a sport for men. Several respondents believe it is important to have more girls and women in the chess world in order to make it easier for girls to form friendships in chess. Furthermore, some respondents added that the importance of social contact with other girls in the chess world is especially important for teenage girls. One respondent expressed the opinion that although she would like to see more female chess players in the chess world, the chess world might attract women who like to be in a male-dominated environment.

Upon being asked whether the chess environment is open enough to attract female players, the majority of the respondents agreed. In general, they felt that the organisations in the chess world are open to women and mentioned how they try to attract additional women by motivating them with special prizes. However, some of the respondents pointed out that it is difficult to enter the chess world as a girl or woman, as chess has the reputation of being a game for men. Some of the respondents felt that although the chess world is open, this does not mean that women always feel welcome. They claim that the predominance of men can be intimidating for women and can form a barrier to entering or staying in the chess world. Furthermore, all respondents agreed that they stand out more because they belong to a minority. Some respondents added that standing out is not a position that every girl or woman desires.

Most of the respondents are satisfied with the organisation of the chess world. The majority would prefer there to be more female chess players, although they do not

necessarily associate this with the organisation of the chess world. One respondent showed a desire for a more social orientation of tournaments, for example a dinner party after the closing ceremony.

Minority position: advantages and disadvantages
All respondents acknowledged the experience of belonging to the minority of female players in the chess world. According to them, this minority position has both advantages and disadvantages. An advantage that some identify is that female chess players receive more attention because they stand out more than male chess players. They explained that people are more eager to talk to them and that organisers are often delighted by their presence. At the same time, the extra attention is not always perceived as desirable or appropriate. Some respondents indicated that they have experienced sexist comments and even transgressive behaviour. The special treatment that comes from standing out more gives some respondents the feeling that they do not entirely belong to the chess world, which can lead to feelings of loneliness.

Some of the respondents experience a change in the way other chess players play because they are women. Sometimes, this change results from an underestimation by the opponents, which makes it easier to win. However, it is often the result of a fixation not to lose to a woman. Several respondents mentioned the experience of men finding it worse to lose to a woman than to lose to a man of equal strength. One respondent mentioned multiple occurrences of male players looking for excuses for their defeats, an action they do not seem to do when they lose to a man.

The different opportunities for female chess players, such as women's prizes, women's titles and international tournaments for women like the Olympiad are seen as an advantage and disadvantage by the same respondents. These opportunities make it easier for a woman to win prizes, get a title or be selected for an international tournament compared to a man of equal strength. However, these opportunities may give the impression that women are worse chess players. According to some respondents, prizes and titles specifically for women are less valued. A Belgian respondent stated that to receive training, female chess players need to keep up with the level of male chess players. At the same time, female chess players are allowed to have a lower level in order to be selected for international tournaments. This inconsistency gives an ambiguous position to female players in her opinion.

Two more disadvantages are experienced by a few respondents. Firstly, the low number of female chess players at the top can create a feeling for female chess players that the top is unattainable, which possibly leads to demotivation for growth in chess. Secondly, it is considered more difficult for a female chess player to develop a stable group of friends in the chess world.

Minority position: experiences
All interviewees felt valued and accepted as a person in the chess world. Almost all of them believed that they are not considered as equal but as a separate category within the chess world, which is not necessarily perceived as negative. The majority never felt excluded in the chess world. One interviewee mentioned that sometimes she feels excluded by chess players from other clubs who do not know her. She points out that she is in the minority in these clubs not only by gender, but also by age, which may play a role in her feeling of exclusion. Some respondents sometimes felt left out by the chess players they knew, for example because, as a female chess player, they are less likely to

be asked by male chess players to attend a tournament abroad. They felt that this was not done consciously and only occurred on a few occasions.

The respondents noted that they are treated differently to male chess players. Nevertheless, they believe that they are seen as full-fledged chess players. Some make the nuance that chess players who know them consider them to be full-fledged chess players, but people who do not know them do not always carry this idea immediately. This is not surprising for these respondents, since strong female chess players are an exception. When asked whether they believe that they have the necessary qualities to be good chess players, the majority responded positively. Some comment that although they have the necessary skills, they do not have the tenacity to train enough to become an exceptional chess player. Others state that they are not fanatical enough or have too many interests to concentrate fully on chess.

Minority position: more pressure
The interviewees were asked whether the preconception that people who belong to a minority have to work harder also applies to female chess players. Some respondents disagreed with this because they believe that women receive more recognition at the top level than men of equal strength. Several respondents disagreed, referring to special prizes and titles for women. When asked whether this idea would apply if these special treatments did not exist, the majority of these respondents agreed and gave different explanations for this. One recurring explanation was that female chess players are taken less seriously, based on the general assumption that men are better at playing chess. According to some respondents, when a woman and a man of the same rating play against each other, different reactions are observed depending on the outcome. If the man wins, he is immediately considered the stronger player. In contrast, the woman has to win several times against the same man in order to actually be perceived as the stronger player.

A few respondents stated that women always feel under pressure. They have the feeling that a female chess player is often perceived by male chess players as representing all female chess players, whereas a male chess player represents only himself. Moreover, as expectations for female chess players are lower, they feel more pressure to prove themselves to others. Likewise, one respondent feels that female chess players are taken less seriously. This means that female chess players have to prove themselves more than their male counterparts in order to be taken seriously. She also stated that men often play against her longer than they would play against a male chess player before agreeing to a draw. Lastly, one respondent pointed out that boys of the same age and strength often train together, which, she believes, makes it easier to be motivated and practice more. She mentioned that a girl has to train alone more often, as it is more difficult to find another girl of the same age and strength. This implies that girls find it easier to get along with girls than with boys.

Minority position: chances of entering and staying in the chess world
The respondents agreed that the opportunities to start playing chess within organisations and tournaments are the same regardless of gender. Some even believed that chess opportunities for women are higher because of the special female prizes, which means that women are more likely to perform well in terms of achievements. However, almost every respondent made the nuance that there is actually a difference between men and women in starting and continuing to play chess. Several respondents believed that the prominence of men in chess makes it more accessible to men. Some respondents

emphasised that this may also affect the likelihood that women will continue to play chess, as girls are less likely to find agreeable peers due to the lack of female chess players. Several respondents mentioned that this plays a major role in the teenage years.

Part II: Imaging and stereotyping

Several respondents experienced the perception that chess is for men and that men are better chess players than women. One respondent stated that the general image of a chess player is an old, boring man. She perceived this reputation as a problem in need of change. Multiple respondents pointed out that the notion of chess being a men's game could lead to boys being encouraged to play chess more often. In contrast, girls may experience a barrier because chess is not considered feminine. One respondent mentioned that she is perceived as a full-fledged chess player, although often in a separate category, namely as a female chess player. The idea that women are worse chess players leads to underestimation, which makes it easier to perform above expectations. At the same time, the lower expectations based on their sex are felt to be unfair.

The respondents were asked for their opinion on the statement that 'men are by nature better at chess'. A small minority disagreed completely. They believed that men and women have no natural difference. The majority felt that the statement is partially true. Most of them were of the opinion that men on average score more highly on some characteristics that are important for playing chess. Examples of these traits mentioned by the respondents are analytical thinking, spatial orientation and the ability to focus on one thing. In addition, the majority of respondents suspected that social and cultural factors also play a role in the performance difference between male and female chess players. Several respondents believe that male chess players are on average more determined and able to discipline themselves to reach the top, which may be a natural predisposition or a cultural influence.

The respondents were also asked to give their opinion on the following statement: 'female chess players like to look very feminine'. The majority strongly opposed this. One respondent stated that she is more likely to put on makeup or a dress in the chess world than at home or at university. However, she has not observed this behaviour in other female chess players. No other interviewee took this view, nor did they observe it in their environment. Some respondents even claimed that they do the opposite. They will deliberately dress more neutrally for chess, as they already stand out in the male-dominated chess world. A few respondents mentioned that this statement might apply to other countries, but not to the Netherlands or Belgium. One respondent indicated that this could be the case for high level chess players, as some of the top women are consciously looking for a partner within the chess world.

Following on from previous research, respondents were asked whether they felt that female chess players might dress more feminine to compensate for the competitiveness on the chessboard based on the perceived consideration of competitiveness as a male characteristic. No one agreed with this statement. The respondent who dressed more feminine in the chess world did not believe this was a compensation. Several respondents understood the logic of the statement but did not see it that way. Some pointed out that they did not consider competitiveness to be a more masculine characteristic.

The results of the analysis of the interviews show that the female respondents are aware of their minority position, agree that the chess world is open to female chess players, but state that it is not always easy to belong to a minority. The limited number of girls and women in the chess world makes it harder to find peers and role models. Multiple respondents experienced the existence of preconceived ideas that chess is for men and that women are worse chess players. These ideas have many consequences. For example, some men change their playing style against women, and women experience different treatment to men. Some respondents felt pressured by the feeling of representing all female chess players. Nonetheless, the respondents felt valued, accepted as a person and seen as a full-fledged chess player.

IV. DISCUSSION

The present study has explored the difference in participation rates in chess in relation to gender by investigating the profile of a chess player, and the image of a chess player and gender roles. Finally the experience of female chess players with regard to their minority position is investigated.

PROFILING CHESS PLAYERS

The results show that chess players are generally highly educated and many of them grew up under highly educated parents. This is consistent with the study by Hoydonckx (2005), which shows that fifteen years ago about half of the fathers of engineering students and one in three student mothers had a university degree. However, the present study does not find any difference between the educational level of the parents.

Various studies have pointed to the importance of the science capital for an aspiration to an education in the STEM field (e.g. Archer et al., 2012). In the case of chess, the present study shows that, on average, chess players have a high chess capital. One third of the participants have a father who plays chess or used to play chess. This is very similar to the results of Hoydonckx' study (2005), which showed that one third of engineering students had chosen the same education subject as their fathers. The results of the present study suggest that a high chess capital is a predictor to start playing chess, as even before learning the game, the majority knew someone in their immediate environment who played chess. This is consistent with the study by Galitis (2002) which pointed out that of the girls who joined the primary school's chess club, two-thirds knew the rules of the game before joining the club.

The main reason to start playing chess was the joy of the game for all participants, and the main reason to stop playing was the lack of joy in the game. This is in contrast to the study by Herbots (2007) which finds that girls have more social motives and boys more utilitarian motives when pursuing an engineering education. The present study found no evidence of this in the choice of participants to start playing chess. However, female participants consider more social motives, such as social contacts, when deciding to continue playing chess. For all participants, the most important criterion for continuing to play chess is still the joy of the game. However, social contacts and interactions gain in importance.

Female chess players indicated some factors as more relevant to their decision to stop playing chess, including performance limits and disappointing results. This is in line with

the study by Turnbull et al. (2019), which found that low achieving female physics students compared to their male counterparts were less likely to continue with physics after the first year. Other factors to stop play chess which were indicated more often by female players, are unfriendliness and discrimination. These results are similar to the study by Galitis (2002) which noted that hostility and exclusion were reasons for girls to drop out of their primary schools chess club. Galitis also observed that girls dropped out because their peers were not participating or dropping out of the chess club. The present study found no support for this. However, considering that the participants of the present study still play chess, it is possible that women and girls for whom this would be the main reason to stop playing chess are underrepresented. Finally, Galitis pointed out that girls drop out due to lack of attention from the tutor. The present study found a significantly higher influence of teachers on the choice of female participants' to start, to continue or to stop playing chess compared to male participants.

The results of the present study show that within the different rating categories, female and male participants invest about the same amount of time in chess training. It is shown that chess players in the higher FIDE categories practice more. Consequently, it can be hypothesised that fewer women are in the highest FIDE categories simply because they practice less. This would confirm the statement from the aforementioned studies that the differences in the number of hours of chess training may account for the performance gap (de Bruin Smits, Rikers & Schmidt, 2008; Blanch, Aluja & Cornadó, 2015; Blanch, 2016).

The present study also shows that female and male chess players evaluate their chess skills equally in relation to their rating strength. This contradicts the idea that female chess players have less confidence in their chess skills (Maass, D'Etolle & Cadinu, 2008). Nevertheless, it is still possible that female chess players lose confidence during a chess game as previous research suggests (Backus, Cubel, Guid, Sanchez-Pages & Mañas, 2016).

IMAGE OF A CHESS PLAYER AND GENDER ROLES

The results show that the participants found analytical prowess, intelligence and logical thinking to be very applicable descriptions of themselves and also associate these qualities to a large extent with chess players. In a previous study it was found that chess players scored above average on extraversion and intellect (Bilalić, McLeod & Gobet, 2007). The present study confirms this for intellect, but participants do not consider extraversion to be applicable to themselves. Moreover, they also do not consider extraversion to be an important characteristic of chess players. The study by Bilalić, McLeod and Gobet (2007) found that chess players score lower on agreeableness and that, in general, girls score higher on agreeableness. The present study likewise found that being friendly and kind are less associated with chess players. Nonetheless, on average, the participants did score themselves highly on being both friendly and kind.

Earlier research suggests that gender-related expectations in society limit women in chess (Baasanjav, 2016). Indeed, the present study finds some conflicts between the characteristics associated with a chess player and those associated with femininity or masculinity. Being physically attractive is associated with femininity to a high degree, but not with chess players. Furthermore, analytical prowess and being logical are highly associated with chess players and not with femininity. Meanwhile, female participants

score themselves low on physical attractiveness and high on analytical prowess and logic. Chu stated in 2007 "*women engineering students try to adapt to engineering identity prescriptions and, as a result, they sometimes distance themselves from their gender-identity*" (Chu, 2007, p. 61). To a certain extent, the female participants in the present study seem to do the same. The characteristics used to describe themselves are more consistent with their descriptions of chess players than with femininity. Vanthienen (2013) notes that self-description in female terms has a negative correlation with the likelihood of studying engineering. Based on the foregoing, this also seems to be the case for chess. In addition, there is a conflict between the characteristics associated with a chess player and the characteristics associated with masculinity, namely that aggressiveness is highly associated with masculinity but not with chess players. Neither do the male participants score themselves highly on this characteristic.

FEMALE CHESS PLAYERS' EXPERIENCES

The respondents felt that they are more visible and stand out more due to being a minority in the chess world. They reported that this is associated with advantages and disadvantages. This is similar to the experience of female industrial engineering students, who also reported advantages and disadvantages related to their minority position. Moreover, both female chess players and industrial engineering students feel that they need to prove themselves more than their male peers (Hobin, 2011). However, some female chess players point at the benefits of special treatment measures for female chess players as a mitigating factor in this respect.

Some respondents reported that male chess players change their playing style when they play against a female chess player. The study by Backus, Cubel, Guid, Sanchez-Pages & Mañas (2016) observes that men, on average, take longer to resign when playing against women. One respondent of the present study explicitly mentioned that she feels men take longer to resign against her, compared to male players.

The study by Baasanjav (2016) found that the lack of female role models in chess kept girls away from chess. Several respondents to the present study reported that the limited number of girls and women in the chess world makes it more difficult to find role models. The results of the survey show that although role models are not an important factor in to start, continue or stop playing chess, it is much more important for female participants than for male participants to start and continue playing chess.

The present study has found no evidence for the observation of Baasanjav (2016) that female chess players have a very feminine appearance. One respondent indicated that this could be the case for chess players at a high level. Since Baasanjav interviewed elite female chess players and the present study did not, this could indeed be a possible explanation for this discrepancy. According to Baasanjav, the feminine appearance of female chess players is supposed to compensate for competitiveness on the board, since competitiveness is considered to be a masculine characteristic. The respondents of the present study strongly disagree with this. Some even stated that they do not regard competitiveness as a masculine characteristic. However, the survey participants generally associate competitiveness with masculinity.

LIMITATIONS

Some limitations of the present study must be acknowledged. A possible limitation of this study is the voluntary nature of the respondents' participation. Since these

participants were willing to take part in the study, this could mean that they have a certain interest or commitment to the topic. Meanwhile people who have a negative association with the topic may not have participated, which may affect the outcomes (Baarda & et al., 2015).

Moreover, since some national chess organisations shared the survey with their members while others did not, certain continents and countries are over- or underrepresented in the study. Because of this uneven distribution, it was not possible to analyse the possible distinctions between countries. Furthermore, it cannot be excluded that this uneven distribution may have an impact on the outcome of the survey. As many participants were from Belgium and India, the views held in these countries could be disproportionately reflected in the present study.

The survey took on average 24 minutes to complete, which means that it required some persistence from the participants. Only one in three people who opened the survey fully completed it. This may have led to results that are only valid for a certain part of the chess population. In addition, the survey was available in four languages which can lead to the loss of participants who do not know any of these languages. Only four participants indicated not to identify as male or female, which made it statistically irrelevant to examine them separately. However, future research could investigate the impact of the chess world on a person who does not identify with the dominant gender discourse.

Due to COVID-19 measures, face-to-face interviews had to be replaced by digital interviews, which means that the physical aspect of the interviews was lost. However, this made it possible to conduct all ten interviews to be taken in a period of only two weeks, possibly in an environment comfortable for the respondents (Lo Iacono, Symonds, Brown, 2016). It is possible that the participants in the interviews gave socially desirable answers, which can affect the outcomes. Since the survey was conducted anonymously, these responses were probably less affected by social desirability.

RESEARCH AND PRACTICAL RECOMMENDATIONS

The present study questioned people who still play chess. Future studies should try to examine people who have left the chess world and ascertain their reasons for doing so. Specifically, the reasons why girls and women stop playing chess should be further investigated. In the results of the present study, the difference in the influence of teachers on female and male participants was significant. Further research should investigate this impact for both school teachers and chess teachers.

The majority of the interviewees of the present study stated that they would prefer the chess world to become more f/m equally balanced. They think that the chess world is open to girls and women. However, they say that the largest barriers are the absence of women and girls in the chess world and the perception that chess is a game for men. These two barriers are points of discussion in the chess world and should be further investigated. In addition, initiatives to promote women's chess can be investigated. The respondents indicated that more female chess players would make girls and women aware that chess is not just a sport for men. Initiatives that bring young chess playing girls together should be organized and investigated.

The present study shows that some female chess players are indeed aware of the change in the playing style of men when they are facing female chess opponents. It might be interesting to investigate the effect of this behaviour on female chess players.

CONCLUSION

As far as gender is concerned, there is a large difference in performance and participation rates in chess. Of all the FIDE members only eleven percent are female, in Belgium seven percent and in the Netherlands six percent. The present study has chosen to contribute to this topic by analyzing the profile of female chess players by analogy with studies in the STEM field. An international online survey was completed by 709 female and male chess players, which provided a better understanding of the profile of chess players and their image of a good chess player as well as gender roles. To explore the experiences of female chess players in their minority position in the chess world, ten female chess players from Flanders and the Netherlands were interviewed. The results show that, on average, chess players are highly educated and have high chess capital even before they learn to play chess. The joy of the game is the most important factor to start, to continue or stop playing chess. Social motives are becoming increasingly important as a factor in continuing to play chess. The results show that male and female participants in the same rating categories practice the same number of hours per week and judge their chess skills equally. The female participants did not describe themselves strongly in terms associated with femininity. However, they describe themselves in terms associated with chess players. This can mean that people who self-describe in femininity associated terms have a lower chance of taking up chess. Lastly, female chess players do not perceive their minority position as negative, but as 'different'. They have the feeling that they are more visible in the chess world and stand out more in comparison to male players. They experience advantages and disadvantages related to the minority position. Two stereotypes they referred to were that chess is a men's game and that women are worse at playing chess. The lack of women in the chess world is perceived as a factor which discourages girls to enter the chess world and makes it more difficult for a female chess player to find agreeable peers.

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