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ORIGINAL ARTICLE

Motivations and personality characteristics of candidate sperm and oocyte donors according to parenthood status: a national study from the French CECOS network

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STUDY QUESTION: In a non-commercial national gamete donation programme, do the motivations and personality characteristics of candidate sperm and oocyte donors differ according to their parenthood status?

SUMMARY ANSWER: Moderate differences exist between non-parent and parent candidate donors in motivations for gamete donation and representations as well as in personality characteristics.

WHAT IS KNOWN ALREADY: Several studies have analysed the motivations and experiences of oocyte or sperm donors, but mainly in countries where gamete donation is a commercial transaction, and very few studies have reported results of personality traits using personality inventory tests. No study has specifically investigated the motivations and personality characteristics of candidate gamete donors according to parenthood status.

STUDY DESIGN, SIZE, DURATION: A prospective study was carried out including 1021 candidate donors from 21 centres (in university hospitals) of the national sperm and egg banking network in France between November 2016 and December 2018.

PARTICIPANTS/MATERIALS, SETTING, METHODS: In total, 1021 candidate gamete donors were included in the study. During their first visit, male (n = 488) and female candidate donors (n = 533) completed a questionnaire on sociodemographic characteristics, their

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motivations for donation and their representations of donation, infertility and family. Secondly, a NEO Personality Inventory (NEO-PI-R) exploring the Big Five personality traits was completed online. Results were compared between parent and non-parent candidate donors.

MAIN RESULTS AND THE ROLE OF CHANCE: Altruistic values were the principal motive for donation irrespective of parenthood status. Reassurance about their fertility or preservation of sperm for future use was more often reported in non-parent than in parent candidate donors. With regard to representation of gamete donation or of the family, independently of their parenthood status, candidate donors more frequently selected social rather than biological representations. Mean personality characteristics were in the normal range. Non-parent candidate donors had higher scores on openness and depression than parents, while parent candidate donors appeared more social than non-parents.

LIMITATIONS, REASONS FOR CAUTION: The personality characteristics inventory was not completed by all candidate donors included in the study. However, family status did not differ between the two groups (NEO-PI-R completed (n = 525) or not), while the group who completed the NEO-PI-R had a higher educational level. This national study was performed in a country where gamete donation is subject to strict legislation.

WIDER IMPLICATIONS OF THE FINDINGS: In a global context where reproductive medicine is commercialized and gamete donor resources are limited, this study found that altruism and social representations of gamete donation and family are the main motivations for gamete donation in a country which prohibits financial incentive. These findings are relevant for health policy and for gamete donation information campaigns.

STUDY FUNDING/COMPETING INTEREST(S): Grant from the Agence de la Biomédecine, France. The authors have nothing to disclose related to this study.

TRIAL REGISTRATION NUMBER: N/A.

Key words: gamete donation / oocyte donation / sperm donation / motivations / personality characteristics / parenthood status / NEO Personality Inventory / social representation / altruism

WHAT DOES THIS MEAN FOR PATIENTS?

In a national sperm and egg donation programme, this study looks at whether candidate donors have different motivations and personality characteristics according to whether they themselves are parents or not.

In previous analyses of the motivations and experiences of sperm and egg donors, their personality traits have rarely been examined using standardized questionnaires. Moreover, most studies were carried out in countries where donors can be paid, whereas under French regulations on gamete donation at the time of study, donation is voluntary, anonymous and unpaid.

We studied 1021 candidate sperm and egg donors from 21 centres of the national sperm and egg banking network in France. During their first visit, 488 men and 533 women completed a questionnaire on sociodemographic characteristics, their motivations for donation and their perceptions of donation, infertility and family. They then completed an online questionnaire exploring the five main personality traits. Results were compared between parent and non-parent candidates.

Irrespective of the candidate donors' parenthood status, their main motivation for donation was altruistic. Non-parents were more likely to seek reassurance about their own fertility or to preserve sperm for future use. Both parent and non-parent candidate donors tended to consider sperm and egg donation or the family as social rather than biological concepts. Overall, the personality characteristics of all candidate donors were in the normal range. Non-parent candidate donors had higher scores on openness and depression than parents, while parent candidate donors appeared more social than non-parents.

In conclusion, the altruistic motivation of candidate donors and their social representation of gamete donation and of the family should be reassuring for patients who resort to gamete donation in order to have children. Our findings regarding donor motivation will be useful to guide information campaigns aiming to recruit new donors.

Introduction

Couple infertility is a major social concern and an important public health issue worldwide. In developed countries, it is estimated that between 9% and 14% of couples will have difficulties in conceiving, and in France, one couple in seven will consult for infertility during their reproductive life (Thonneau *et al.*, 1991; Boivin *et al.*, 2007). While a number of infertility conditions can be treated medically or by reducing risk factors, a significant number of couples will need to undergo ART in order to procreate. However, the cumulative success rates of ART are variable but always under 70% (Stolwijk *et al.*, 2000; Olivius *et al.*, 2002; Sharma *et al.*, 2002; Lintsen *et al.*, 2007; Walschaerts *et al.*, 2012). Where ART is not possible or was unsuccessful, couples can choose between adoption or procreation using gamete donation in order to have a child. Worldwide, the demand for sperm or oocyte donation appears to exceed the availability of men and women willing to donate their gametes. Laws and regulations of gamete donation differ greatly from country to country (Calhaz-Jorge et al., 2020; ASRM, 2021). A variety of practices of gamete donation can be observed: commercial versus altruistic donors, anonymous versus open donors,

donors who are parents versus donors who have no children, single donation versus donation during intraconjugal ART (such as egg sharing). Consequently, the demographic characteristics, attitudes, motivations and experiences of candidate donors differ between countries. In France, since the first bioethics law of 1994, gamete donors (sperm or oocytes) must be parents (gift from a parent to a future parent) and unpaid volunteers (altruistic donors). In 2011, in order to increase the number of gamete donations, the bioethics law was modified to allow men or women who are not parents to donate their gametes. This legal innovation came into force by decree in 2016. Moreover, for non-parent donors, the law permitted that a proportion of gametes (usually 50%) may be preserved for future use by the donor herself if ovarian puncture yielded more than five oocytes. In France, gamete donation is performed in centres authorized by the Agence de la Biomédecine, which supervises activities related to ART. In France, 97% of sperm donations and 80% of oocyte donations are performed in the national sperm banking CECOS network (Centres d'études et de conservation du sperme et des oeufs humains, CECOS).

Several studies have analysed the psychosocial attitudes, motivations and experiences of oocyte donors (for review, see Bracewell-Milnes *et al.*, 2016) or sperm donors (for review, see Van den Broeck *et al.*, 2013). However, the majority of these studies were carried out in countries where gamete donation is a commercial transaction, a practice that is contrary to French regulations. Moreover, only a few published studies have administered personality inventories to gamete donors (Schover *et al.*, 1991, 1992; Lessor *et al.*, 1993; Klock *et al.*, 1999; Sydsjo *et al.*, 2011, 2012; Areias *et al.*, 2022) and no study has specifically investigated candidate donors according to their parenthood status.

In this context, we conducted the first national prospective study to analyse the demographic characteristics, motivations and psychological characteristics of candidate sperm and oocyte donors, as well as their representations of donation, infertility and the family, according to their status as parents or non-parents.

Materials and methods

Twenty-one centres from the French CECOS network took part in this prospective study. This network includes the large majority of centres involved in the recruitment of sperm and oocyte donors and in ART in France. All the participant centres were in university hospitals.

During the period 2016–2018, in each centre, all candidate gamete donors were invited to take part in the study. Its objectives were explained to the candidate donors who were informed that participation required the completion of two questionnaires, one paper and one online. The first questionnaire was completed in the centre and took about 20 min. The candidate donors were given a URL in order to complete the second questionnaire online at home, taking approximately 30–40 min.

The objective of the first questionnaire (Supplementary File S1) was to obtain data on: sociodemographic characteristics: age, education, employment status, relationship status, parental status, sexual orientation; what the candidate knew about gamete donation before attending the centre; motivation for donation; experience of donation and disclosure (partner, friends); what donation meant for the candidate; the meaning of infertility and ART for the candidate; and preferences regarding the conditions of gamete donation. This questionnaire was developed by our research group after a study of the literature and was pretested before use in the current study. Each participant answered the items according to a 4-point Likert scale ranging from strongly disagree to strongly agree.

The objective of the second questionnaire was to evaluate the personality of the candidate gamete donor. We used the revised NEO Personality Inventory (NEO-PI-R, Costa and McCrae, 1992), which is a questionnaire exploring various personality traits divided into five broad dimensions (Big Five personality traits): neuroticism, extraversion, openness, agreeableness and conscientiousness (Costa and McCrae, 2008). The NEO-PI-R also reports on six subcategories (facets) of each Big Five personality trait. Each participant answered 240 items according to a 5-point Likert scale ranging from strongly disagree to strongly agree. The result was expressed as a T-score, which is a gender-normalized score. Both the male and female normative samples had a mean T-score of 50 and a standard deviation of 10. The NEO-PI-R questionnaire is used extensively throughout the world in a variety of domains such as counselling, clinical psychology and psychiatry, health psychology, behavioural medicine, industrial/organizational and career psychology. A total of 1021 candidate gamete donors agreed to participate in the study and gave their written informed consent.

Under French regulations on gamete donation at the time of study, donation is voluntary, anonymous and unpaid. The centres involved in donation are public or non-profit organizations. At the request of the donor, travel expenses incurred in attending the centre are reimbursed and any loss of income arising from donation can be compensated on presentation of supporting documents. If the donor has no children, he/she may be offered the possibility of storing their gametes for personal use. For oocytes, 5 oocytes are always reserved for donation if ovarian puncture yields 10 mature oocytes, and if puncture yields than 10 mature oocytes, at least half of the oocytes are reserved for donation. Donation is strictly anonymous and the number of children from the same donor cannot exceed 10. Candidate donors undergo medical consultations to evaluate their motivation, medical history, and personal and family health status. Donors who are not parents have a mandatory psychological consultation, which is optional for parent donors. Donors are accepted on the basis of the overall conclusions of these consultations and the results of semen and blood tests.

Statistical analysis

Data were anonymized and then centralized for processing and statistical analysis in the reference Toulouse centre. Data distribution was compared between the two groups defined by parenthood status using the χ^2 test and Fisher's exact test. Values of NEO-PI-R results were compared between non-parent and parent groups with the Wilcoxon test. Analyses were performed using SAS software (version 9.3, SAS institute, Inc., Cary, NC, USA) with a significance level of 5%.

Ethical approval

In accordance with French regulations on non-interventional studies, the study was approved by the Comité Consultatif sur le Traitement de l'Information en matière de Recherche dans le domaine de la Santé (CCTIRS N° 16.458) and the Commission Nationale Informatique et Liberté (CNIL N° 2037987).

Results

A total of 1021 candidate gamete donors were included in this study. Less than 5% of those who were invited to participate declined to do so, mainly because of the time required or because they considered the questions too personal. All 1021 candidate donors, 488 men and 533 women, completed the first questionnaire in the centre but one man and three women did not report their parenthood status and were excluded from followed analyses. Among them, 525 completed the second questionnaire online: 275 men and 250 women, one man was excluded from analyses because of no reported parenthood status (Fig. 1). Mean age (±SD) was lower for non-parent donors than parent donors: men 31.89 ± 7.22 versus 36.61 ± 4.92 years, women 28.97 ± 4.91 versus 32.48 ± 3.28 years ($P < 0.01$). Of all candidate donors, 50.1% were parents while 49.5% did not have a child (missing data 0.4%). Of women, 59% were parents while only 41% of men were parents ($P < 0.01$).

Sociodemographic characteristics

Sociodemographic characteristics are presented in Table I. Distribution of education levels did not differ according to parenthood status for male candidate donors. Conversely, women with children had a lower level of education than childless women. As could be expected, male and female candidate donors with children were more often married or cohabiting than childless male and female candidate donors. Distribution of occupational status differed between parents and non-parents, as fewer of the latter were in stable employment. As could also be expected, fewer students were parents.

A total of 96.63% of candidate donors with children and 80.76% of childless candidate donors stated that they were heterosexual ($P < 0.01$), while the others stated that they were homosexual or bisexual.

Regarding previous donations, 62% of candidate sperm donors who were parents, 53% of non-parent candidate sperm donors and 68% of candidate oocyte donors regardless of parenthood status had a history of donation, mainly blood donation. Candidate donors who had children were more likely to have infertile couples among their relatives and friends than childless candidate donors (men 66% versus 42%, women 75% versus 55%, $P < 0.01$).

Family status did not differ between candidate donors who completed the second questionnaire online and those who completed only the first questionnaire. However, occupation and professional status differed between the two groups. Farmers and employees were more numerous and executives and teachers less numerous in the group which did not complete the online questionnaire than in the group who completed it (data not shown). The group who completed the online questionnaire thus had a higher educational level than the group who did not.

Motivation for donation and donation representation

Figure 2 shows candidate donor self-representation, where the individual selected the personality traits that they considered were best

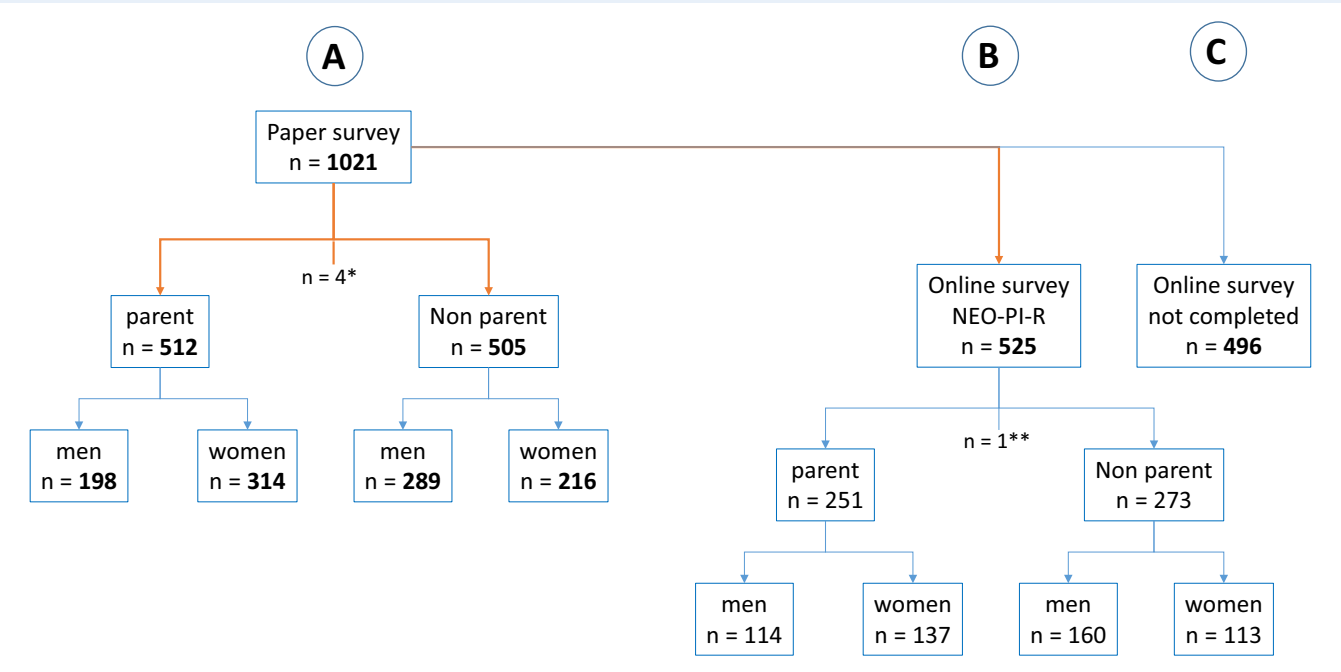


Figure 1. Study population of gamete donation candidates. All participants were invited to complete a paper survey at the first visit in the centre and secondly to complete an online survey at home, if possible in the same day. (**A**) Participants who completed the first questionnaire (paper survey), (**B**) participants from A who completed the second questionnaire (NEO Personality Inventory online survey) and (**C**) participants from A who did not complete the online survey. The participants with missing parenthood data were not included in the analyses (*four in A and **one in B).

Table I Sociodemographic characteristics of candidate gamete donors.

	Men		Women	
	Non-parent (n = 289)	Parent (n = 198)	Non-parent (n = 216)	Parent (n = 314)
Education				
No diploma	1.40	3.57	0.47	2.89
Technical school	8.74	10.2	2.80	10.93
Professional baccalaureate	12.59	11.73	11.21	9.65
General baccalaureate	7.34	4.08	5.14	6.11
University first and second cycle	30.77	28.57	36.45	34.41
University third cycle	36.71	39.29	36.92	27.33
Other diploma	2.45	2.55	7.01	8.68 *
Family situation				
Single	60.28	6.67	58.29	7.37
Cohabiting	20.91	24.10	23.70	20.51
Domestic partnership	9.76	18.46	7.58	19.55
Married	8.01	44.10	9.00	45.51
Divorced	1.05	6.66	0.94	7.05
Widower	0.00	0.00 *	0.47	0.00 *
Occupational status				
Trainee	4.12	0.00	2.53	0.00
Apprenticeship	1.12	0.54	2.02	0.00
Independent profession	10.49	9.78	7.58	11.15
Public service	16.10	29.89	19.19	23.69
Fixed-term contract	9.74	2.72	17.17	6.62
Permanent contract	43.45	49.46	42.42	55.40
Other	14.98	7.61 *	9.09	3.14 *
Occupation				
Farmer	1.40	2.05	0.47	0.97
Medical or paramedical	1.75	1.54	4.25	1.95
Military	0.70	1.54	0.47	0.32
Artisan, tradesperson, entrepreneur	5.24	8.72	3.30	4.87
Executive, teacher	31.12	44.62	28.30	25.00
Intermediate occupations	5.25	7.18	10.85	10.07
Employee	23.08	23.08	32.08	44.16
Worker	9.09	6.15	1.42	2.92
Student	16.78	1.03	15.57	0.65
No occupation	5.59	4.10 *	3.30	9.09 *

*Significant difference in the distribution of items from education, family, occupational and occupation status, between parents and non-parents ($P < 0.01$). Values are percentages.

suited to him or her. A large majority of candidate donors described themselves as responsible, cheerful, courageous and generous and also altruistic, calm and persevering. Non-parent male candidate donors appeared more extrovert than those who were parents. Significant differences were observed according to parenthood for female candidate donors: parents declared themselves a little less generous (97% versus 100%), less depressive (50% versus 63%), more carefree (52% versus 38%) and kinder (52% versus 42%) than non-parents.

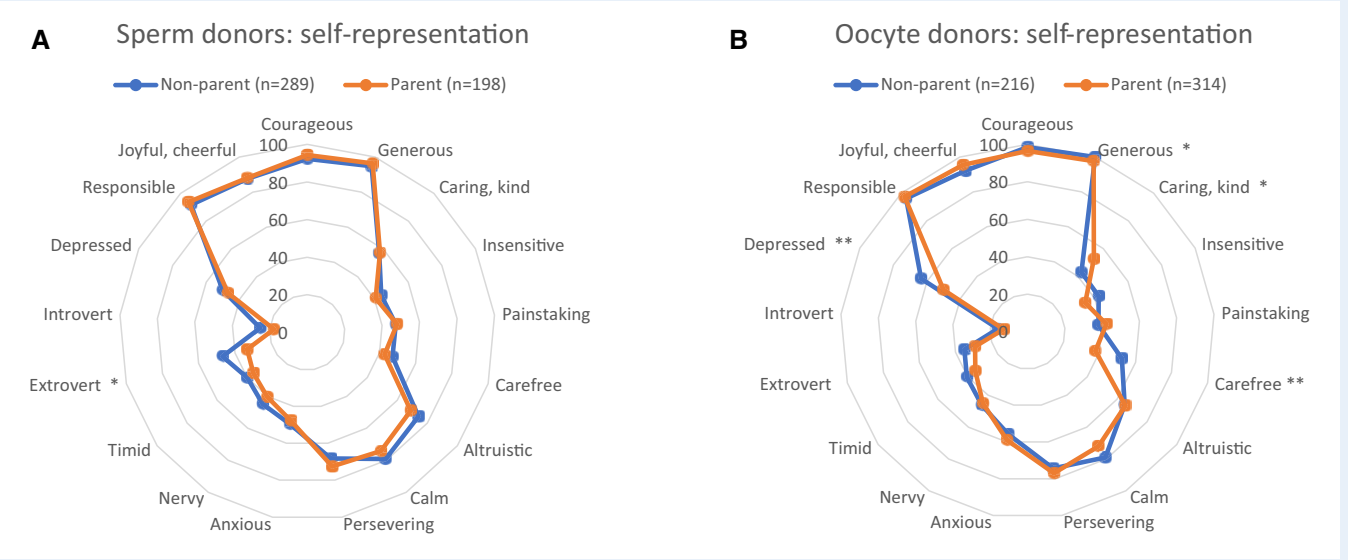


Figure 2. Self-representation of candidate gamete donors according to parenthood status (question: which of these qualifiers do you think suits you best?). Data are presented as percentages. (**A**) Sperm donors and (**B**) oocyte donors. *P <0.05 and **P <0.01 between no parent and parent donor groups (χ^2 or Fisher's exact test).

Motivations for gamete donation are presented in Fig. 3. Altruistic motives (helping infertile couples or individuals, solidarity) were the main reason (90% of responders) for gamete donation for both men and women. They also wished to donate because they believed they were fertile, although this reason was less frequently given by women who did not have children than by those who did. It was noteworthy that about 70% of donors considered that gamete donation was a gift like any other gift. Non-parent candidate donors more often stated that they donated to preserve their future fertility, to reassure themselves of their fertility or to ward off destiny. Interestingly, non-parent men and women reported more frequently than parent candidate donors that they wanted to have many children, but this statement was made more frequently by men than by women.

Less than 12% of male or female candidate donors self-defined themselves as a mother or father. It was noteworthy that non-parents qualified themselves as a biological mother or father or a progenitor more frequently than parents (Fig. 4).

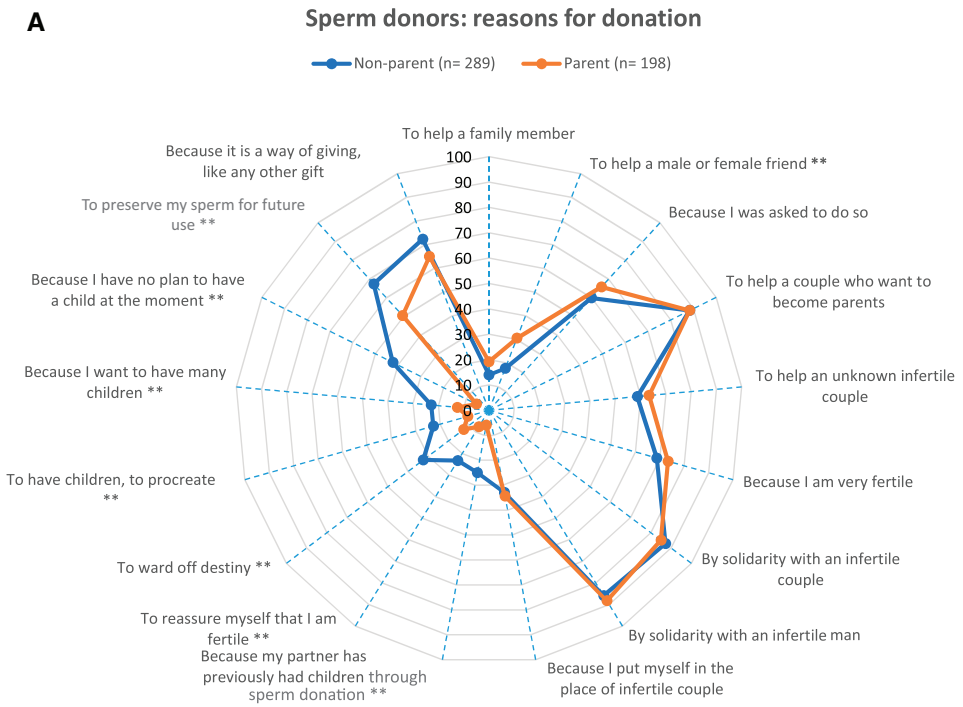
Whether the candidate donors were parents or not, gamete donation was mainly represented as helping an infertile couple or individual (Fig. 5). The representation of donation as a gift of oneself differed between non-parent (64.6%) and parent sperm donors (49.7%, $P < 0.05$). For women, those with children had a better representation of donation as a gift of oneself (62.9%) than those without (53.8%, $P < 0.05$) and a higher representation as a gift of life (72.4 versus 61.1%, $P < 0.01$). Candidate donors considered that their gamete donation was similar to gamete donation by the other sex. Non-parent candidate sperm donors more frequently considered that donation was similar to a humanitarian act (62.1%) than parent candidate sperm donors (52.2%, $P < 0.05$). No other difference was observed according to parenthood status. However, in relation to the sex of the candidate donors, we observed that oocyte donation was more frequently considered to be like organ or bone marrow donation (respectively, 64.6% and 66.3%) than sperm donation (49.6% and 52.9%, $P < 0.01$) and less frequently like embryo donation (women: 56.9% versus men: 65.4%, $P < 0.01$).

Figure 6 presents the candidate donors' representation of the family. Both parent and non-parent candidate sperm or oocyte donors considered that education, the gift of love and passing on knowledge and values were the best representation of a family, while biological or physical or name transmission were less often cited. Candidate donors who were parents represented a family as having a child more frequently than non-parents ($P < 0.05$).

With regard to anonymity and payment for donation, to the question asking what is the best mode of donation, 91.07% of non-parent candidate donors and 93.16% of parent candidate donors agreed with anonymous donation ($P > 0.05$) and 96.44% of non-parent donors and 98.43% of parent donors chose unpaid donation ($P > 0.05$).

Personality characteristics

A total of 525 individuals completed the NEO-PI-R questionnaire online: 275 were not parents and 250 had at least one child. The results of the five-factor personality model (Big Five) evaluation are presented in Fig. 7. Mean T-scores of the Big Five factors were in the average range for the standardized French population, i.e. between 45 and 55. Significant differences between non-parent and parent candidate donors were found for the openness and agreeableness domains. Non-parent candidate donors had a higher mean T-score for openness (openness to experience) than parents, indicating greater aesthetic sensitivity, active imagination, intellectual curiosity and independence of judgement than parent candidate donors. Parent candidate donors had a higher mean T-score for agreeableness (dimension of interpersonal tendencies) than non-parents, indicating greater altruism, sympathy towards others and eagerness to help than non-parent candidate donors.



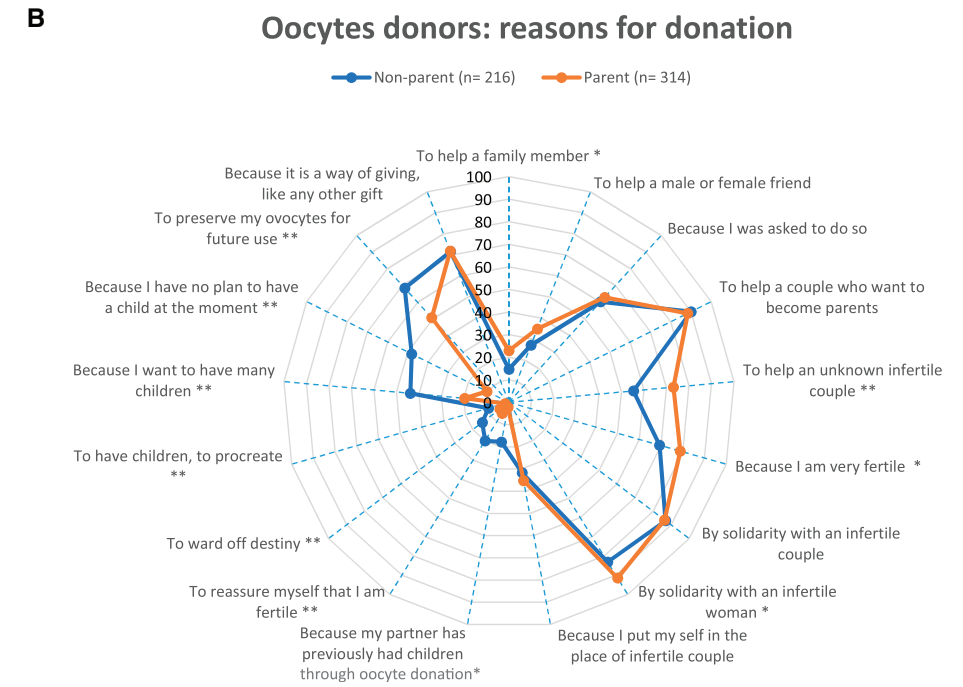


Figure 3. Reasons for gamete donation (question: what are the reasons, both direct and indirect, that led you to donate?). Data are presented as percentages. (**A**) Sperm donors and (**B**) oocyte donors. *P <0.05 and ** P <0.01 between no parent and parent donor groups (χ^2 or Fisher's exact test).

Each of the five domains was represented by six more specific scales that measure facets of the domain, thus providing a more fine-grained analysis of the groups (Fig. 8). The mean T-scores of these facets were all in the average range for the standardized French population, i.e. between 45 and 55, except for the ideas facet from the openness factor, which was slightly increased.

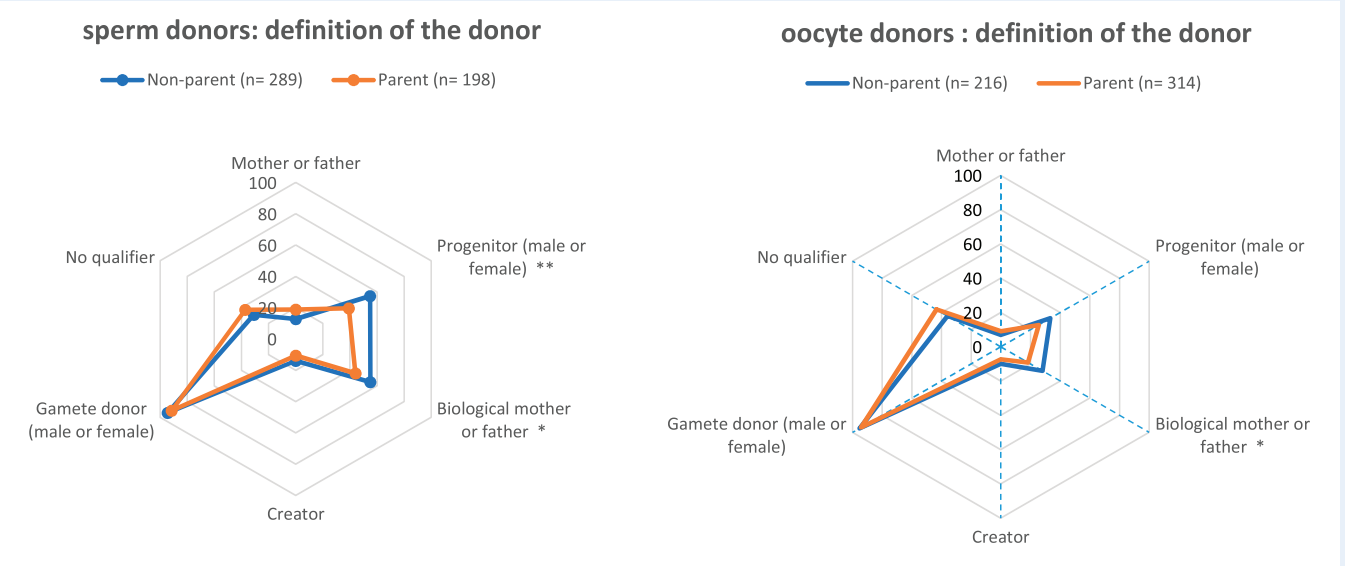


Figure 4. Self-definition of candidate gamete donors (question: Of the following terms, which do you think best fits the person who donates sperm or oocytes?). *P <0.05 and **P <0.01 between no parent and parent donor groups (χ^2 or Fisher's exact test).

Only the mean T-score for the depression facet, in the neuroticism domain, differed between non-parent and parent candidate donors, indicating that non-parents were more pessimistic, glum and despondent than parents. In the extroversion domain, only the mean T-score for the activity facet differed between the two groups: parent candidate donors appeared to be more active, energetic and vigorous than non-parents.

All mean T-scores for the facets of the openness domain differed between the two groups except for the actions facet. Non-parent candidate donors had higher mean T-scores than parents, indicating slightly more imagination, fantasy life, appreciation of art and beauty, sensitivity to the emotions and open-mindedness.

All mean T-scores for the facet items of agreeableness and conscientiousness were above 50, except for modesty in the non-parent group. Only the mean score of the trust facet differed between the two groups, indicating that parents were slightly more trusting than non-parents.

Discussion

This multicentre prospective study investigated the motivations and personality characteristics of male and female candidate gamete donors who attended 21 centres that were part of the national French CECOS network. These centres, located in university hospitals, are spread over all regions of France and are all specifically authorized for gamete donation by the Agence de la Biomédecine that regulates activities related to ART. In the first phase, using a structured questionnaire we investigated motivations and donation representations. In the second phase, using the revised NEO-PI-R (Costa and McCrae, 1992, 2008) we explored candidate donors' personalities both according to whether they had children or whether they did not. To the best of our knowledge, no prospective study comparing the motivations and personality characteristics of candidate gamete donors according to their parenthood status has previously been published. It is noteworthy that this study included 1021 candidate donors.

The majority of candidate donors, whatever their gender or parenthood status, had a high educational level (university or baccalaureate). However, unlike men, women with children had a lower educational level than women without. This could possibly reflect difficulty in reconciling parenthood and high academic achievement. As could be expected, male and female candidate donors who were parents were older than non-parents and consequently were more often employed in public service or had permanent contracts. The occupations most represented were executives, teachers and employees. As could be expected, students were more strongly represented in the non-parent than in the parent group.

The proportion of men and women who had a history of donation, mainly blood donation, was around 53% and 68%, respectively, which was twice as high as in a recent Belgian study (Thijssen *et al.*, 2017). Whatever their sex, parent candidate donors were more likely to have infertile couples among their family and friends.

Altruism was the principal motivation for donation in our population of French candidate gamete donors, whether men or women. The donor acts out of solidarity, wanting to help infertile couples or individuals to become parents. More than 60% of candidate donors considered that gamete donation is a gift like any other gift, thus underlining the altruistic nature of donation. This is in accordance with French legislation that prohibits payment for gamete donation but allows reimbursement of expenses incurred (the donation is financially neutral). Several studies have investigated donor motivations and classically at least three main motivations have been identified: altruistic, financial, or both (Van den Broeck *et al.*, 2013; Bracewell-Milnes *et al.*,

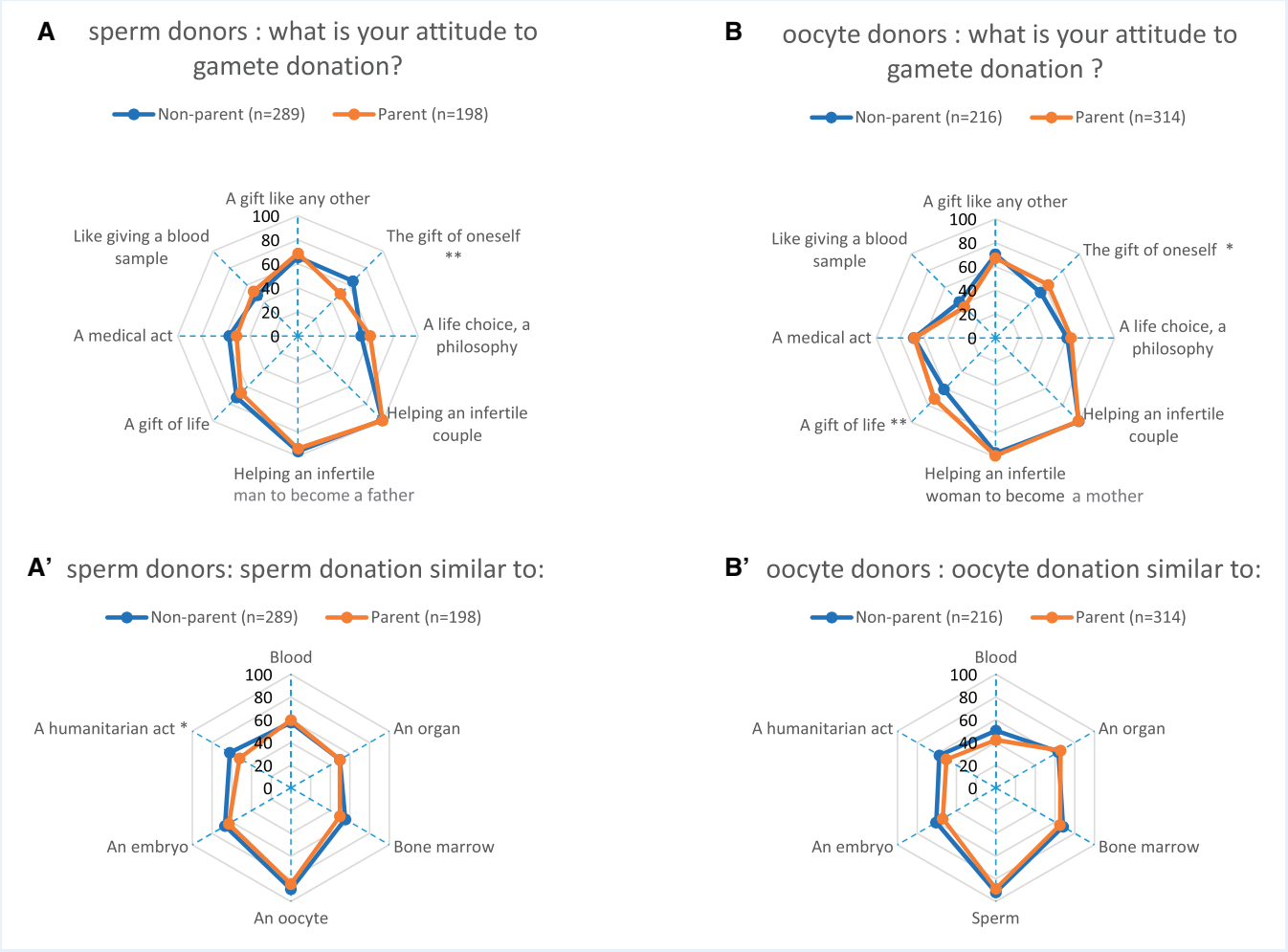
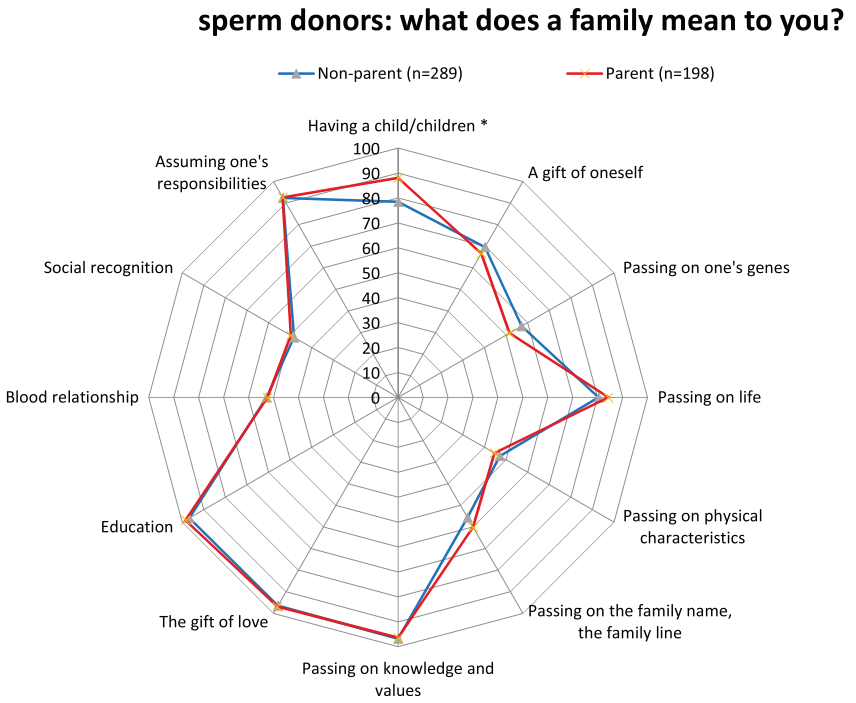


Figure 5. Representation of gamete donation by candidate sperm and oocyte donors. (**A** and **B**) Question: what is your attitude to gamete donation? (**A'** and **B'**) Question: what is your gamete donation similar to? *P <0.05 and **P <0.01 between no parent and parent donor groups (χ^2 or Fisher's exact test).

2016). Less frequent donor motivations were to investigate their own fertility, to procreate or to pass on their genetic material (Handelsman *et al.*, 1985; Daniels *et al.*, 1996; Kalfoglou and Geller, 2000; Jordan *et al.*, 2004; Jadva *et al.*, 2011). These latter motivations were also cited but were infrequent in our population, and were more frequent in non-parent candidate donors who were younger and had not yet confirmed their fertility status (Thijssen *et al.*, 2017; Areias *et al.*, 2022) than in parent candidate donors. Non-parent candidate donors were more likely than parents to state that they had no current plans to have a child, and the wish to have many children was a reason for donation, particularly for women. An original finding was that 65–70% of male and female candidate donors without children cited the preservation of gametes for personal use as a reason for donation. This possibility was in fact introduced, for non-parent donors only, in the 2011 French bioethics law, at the same time as the possibility of donation by individuals who had no children, and came into force in 2016. As of 2018, only 42.9% of non-parent women and 50.5% of non-parent men who have donated have stored their gametes (data from Agence de la Biomédicine, 2020a, 2020b). As this possibility could raise ethical issues, such as hidden compensation or inequality between donors according to parenthood status, it has been withdrawn in the new law of August 2021.

In order to understand their motivations, we questioned the candidate donors about their representation of donation, the definition of the donor and the similarity of the act to other donations. Candidate donors considered donation as giving help, a gift and a life choice. Non-parent candidate sperm donors considered the donation as a gift of oneself more frequently than parents, while the opposite was true of oocyte donors. Almost half of candidate donors considered donation as a medical act. Less than 15% of candidate donors defined a donor as a father or a mother, which is in accordance with the importance that they gave to social roles of parenting rather than to genetic connection. Less than 50% of candidate donors considered the donor as a biological mother or father and this opinion was more frequent in non-parent candidates.

Moreover, when candidate donors were questioned on their definition of a family, both parents and non-parents chose social items (assuming one's responsibilities, education, passing on knowledge



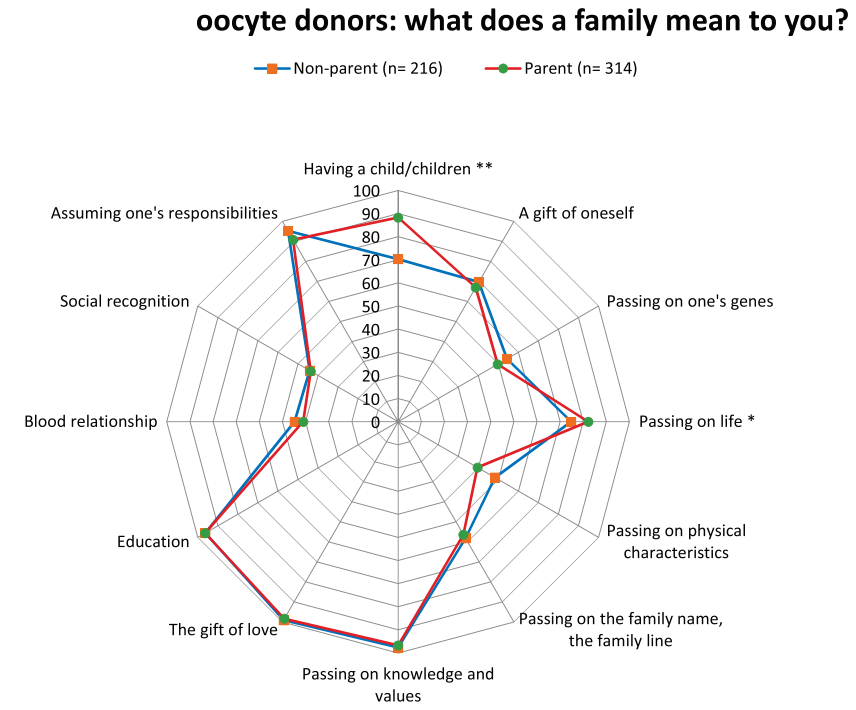


Figure 6. Representation of the family (question: what does a family mean to you?). *$P < 0.05$ between no parent and parent donor groups (χ^2 or Fisher's exact test).

and values, the gift of love) rather than biological or classic hereditary notions (blood relationship, passing on one's genes or physical characteristics, passing on the family line). Owing to their experience of parenthood, candidate donors who were parents were more likely than non-parents to consider that family meant having a child.

The few studies that have used validated personality inventories were mainly conducted in countries with different rules of gamete

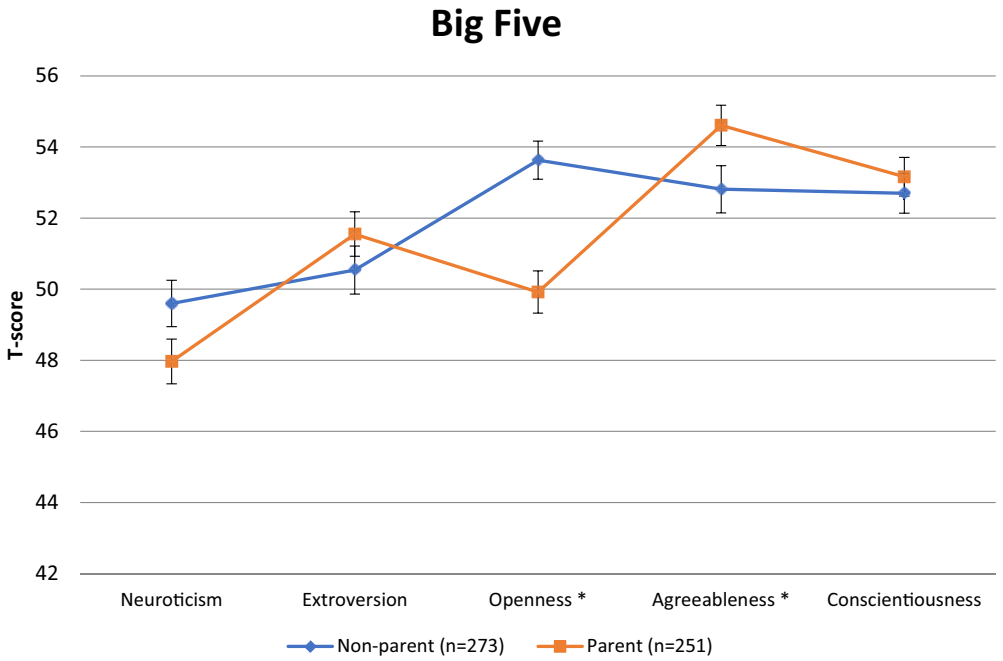


Figure 7. T-scores of the Big Five factors evaluated by the NEO-PI-R personality inventory. Data are mean (±SEM). *P <0.05 between no parent and parent donor groups (Wilcoxon test). NEO-PI-R, NEO Personality Inventory.

donation and did not take into account the parenthood status of the candidate gamete donors (Schover *et al.*, 1992; Sydsjo *et al.*, 2011; Hedrih and Hedrih, 2012; Sydsjo *et al.*, 2012; Makvandi *et al.*, 2019). The personality of 525 donors was investigated here using the Revised NEO-PI-R, which is a tool used extensively throughout the world (Costa and McCrae, 1992; McCrae and Terracciano, 2005). The mean T-scores of the Big Five factors of personality (neuroticism, extroversion, openness, agreeableness, conscientiousness) showed that the candidate donors were within the normal range of a French population standardized according to age and gender. In the same way, in Sweden, where gamete donation is not paid, sperm and oocyte donors had personality characteristics within the normal range. Oocyte or sperm donors felt less worried and experienced less uncertainty, shyness and fatigability than controls, but they were not investigated according to their parenthood status (Sydsjo *et al.*, 2011, 2012). In our study, non-parent candidate donors appeared more open to experience, with more active imagination and intellectual curiosity, than parents, whereas the latter appeared more agreeable, i.e. warm, trusting and eager to cooperate. The facet study showed that parent candidate donors were less depressed, more optimistic, active, energetic and trusting than non-parents. Non-parent candidate donors were more imaginative, had greater aesthetic sensitivity, were more ready to examine their values and more open to new ideas than parents. In several countries, particularly the USA, gamete donors received financial compensation. It is difficult to compare the results of personality inventories between commercial and non-commercial donors. The majority of commercial donors reported financial motives or both financial and altruistic motives (Purewal and van den Akker, 2009; Van den Broeck *et al.*, 2013). Few studies used personality inventories to investigate the personality of candidate donors. In some cases, questionnaire results were used as a basis for acceptance or non-acceptance of donors, which could modify the results of the tests. Moreover, no study reported personality inventory results according to the parenthood status of candidate donors. Schover *et al.* (1992) using the Minnesota Multiphasic Personality Inventory (MMPI), found that half of the commercial oocyte donors reported mild depressive episodes or anxiety symptoms. Conversely, the mean MMPI profile of the population of prospective oocyte donors was in the normal range (Lessor *et al.*, 1993; Klock *et al.*, 1999). The clinical scores showed that oocytes donors did not endorse traditional feminine role behaviours, appearing as being somewhat unconventional and inclined to take risks (Klock and Covington, 2010). Using the temperament and character inventory Makvandi *et al.*, in Iran, found that egg donors have lower score in the self-transcendence dimension and harm avoidance than women in the control group but eggs donors were more cooperative, persistent and self-directed individuals (Makvandi *et al.*, 2019).

A limitation of this work is that the NEO-PI-R was not completed by all individuals included in this prospective study. This personality inventory has to be completed online on a website and just over half of candidate donors completed it, but with equality between parents and non-parents. One explanation given for non-completion was the need to connect to the website at home, unlike the questionnaire completed in the centre, the fact that it was a personality questionnaire and also the time required to complete it (40 min). Family status did not differ between the total population and individuals who completed the NEO-PR-I, but the latter had a higher educational level, which could affect the results.

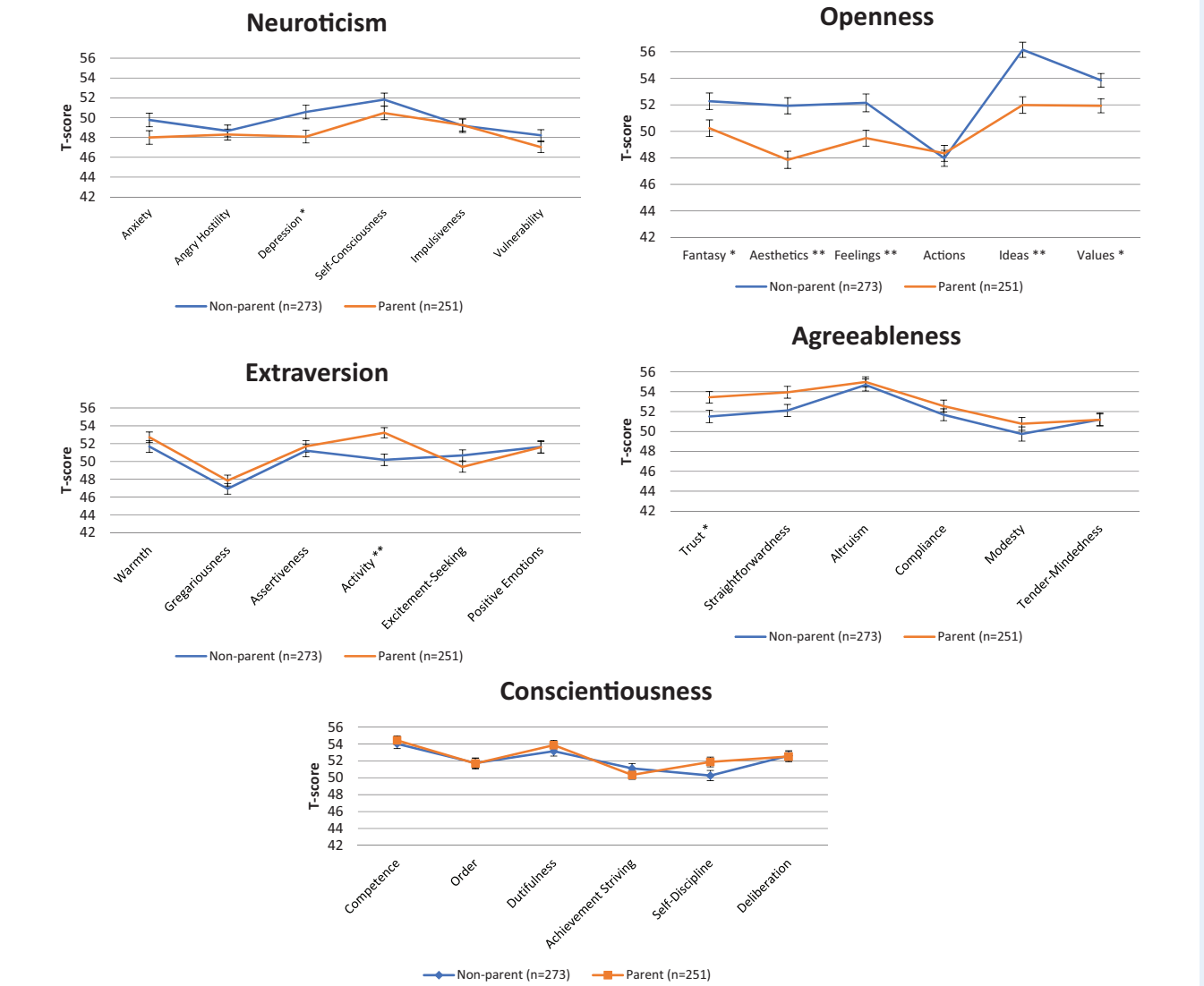


Figure 8. T-scores of facets of each of the Big Five factors evaluated by the NEO-PI-R personality inventory. Data are mean (±SEM). *P <0.05 and **P <0.01 between no parent and parent donor groups (Wilcoxon test). NEO-PI-R, NEO Personality Inventory.

The strength of our national prospective study is the recruitment of 1021 donor candidates from 21 centres, representing the majority of centres involved in gamete donation in France, where such donation is unpaid.

Conclusion

In a country where gamete donation for financial gain is prohibited, this study showed that altruistic values are the principal motivation for donation irrespective of parenthood status. Gamete donation candidates selected social representations of gamete donation and of family rather than biological or family lineage aspects. Moderate differences existed between non-parent and parent candidate donors in gamete donation motivations and representations as well as in personality characteristics, while mean personality characteristics were in the normal range for the French population. These findings have relevant implications for health policy, particularly in order to study the new population of candidate donors following law changes in 2021, and for gamete donation campaigns.

Supplementary data

Supplementary data are available at *Human Reproduction Open* online.

Data availability

The data underlying this article will be shared on reasonable request to the corresponding author.

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Authors' roles

L.B. and N.N. carried out the literature search and designed the study. L.B., A.P.-R., B.D., F.B., C.R., N.R., M.T., V.D., B.D., I.B., C.M.-G., A.D., C.F., E.T., O.B., M.A.C., C.D., V.L.C., P.F., M.B. and F.E. recruited volunteers and organized the research in each centre, L.B. and N.N. participated in interpretation of the data and wrote the manuscript, C.R., F.B., A.D., B.D. and N.R. participated in discussion and all the authors have approved the manuscript. The study protocol and manuscript writing were coordinated by L.B.

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Conflict of interest

The authors have nothing to disclose related to this study.

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