

# Attitudes towards Social Oocyte Freezing from a Socio-cultural Perspective

## Einstellungen zum Einfrieren von Eizellen aus nicht medizinischen Gründen unter soziokultureller Perspektive

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### Key words

social oocyte freezing, attitudes, cryopreservation, socio-cultural background, milieus

### Schlüsselwörter

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### ABSTRACT

**Introduction** The tendency to delay parenthood is increasing. It is partly driven by the availability of early reproductive technologies such as social oocyte freezing, the cryopreservation of oocytes for non-medical purposes. The goal of this study was to investigate relationships between attitudes towards social oocyte freezing and different socio-cultural backgrounds in a German sample cohort.

**Materials and Methods** A quantitative online questionnaire was compiled. A total of 643 participants completed the questionnaire which included items on attitudes toward social oocyte freezing, socio-demographics and items, obtained from the German DELTA Institute for Social and Ecological Re-

search, devised to indicate specific milieus. Data were analyzed using parametric and non-parametric methods.

**Results** There were clear correlations between attitudes towards social oocyte freezing and socio-cultural background, gender, cohort age, fertility problems, and attitudes to fertility. Positive attitudes towards social oocyte freezing were linked to struggles with fertility, a current or general wish to have a child, and flexible, progressive and self-oriented values. Participants who preferred to become parents at a younger age tended to reject cryopreservation.

**Conclusions** The huge number of university graduates, persons with fertility problems, and persons from specific socio-cultural backgrounds in our sample point to distinct groups interested in reproductive technologies such as social oocyte freezing. The investigated differences as a function of socio-cultural background suggest that more research into the desire to have children in German society is needed. In conclusion, it may be necessary to develop targeted family planning interventions to prevent affected women from buying into a false sense of security, thereby risking unwanted childlessness.

### ZUSAMMENFASSUNG

**Einleitung** Die Tendenz zur Verschiebung der Elternschaft auf einen späteren Zeitpunkt nimmt immer mehr zu. Angetrieben wird diese Tendenz zum Teil durch die Verfügbarkeit von Reproduktionstechniken wie das soziale Einfrieren von Eizellen, d. h. die Kryokonservierung von unbefruchteten Oozyten aus nicht medizinischen Gründen. Ziel dieser Studie war es, die Beziehungen zwischen den Einstellungen zum sozialen Einfrieren von Eizellen und den unterschiedlichen soziokulturellen Milieus in einer deutschen Kohorte zu untersuchen.

**Material und Methoden** Es wurde ein quantitativer Online-Fragebogen erstellt, der von insgesamt 643 Teilnehmern ausgefüllt wurde. Der Fragebogen enthielt Inhalte, die die Einstellung zum sozialen Einfrieren von Eizellen und soziodemografische Informationen erfragten, sowie Fragen, die vom DELTA-Institut für Sozial- und Ökologieforschung zur Eruierung spezifischer Milieus entwickelt wurden. Daten wurden mittels parametrischer und nicht parametrischer Methoden analysiert.

**Ergebnisse** Es fanden sich klare Zusammenhänge zwischen den Einstellungen zum sozialen Einfrieren von Eizellen und

dem soziokulturellen Hintergrund, dem Geschlecht, der Altersgruppe, dem Vorhandensein von Fertilitätsproblemen sowie den Einstellungen zur Fertilität. Zudem zeigten sich Verknüpfungen zwischen einer positiven Einstellung zum sozialen Einfrieren von Eizellen und Fertilitätsproblemen, dem aktuellen oder generellen Kinderwunsch und flexiblen, fortschrittlichen und selbstbezogenen Werten. Teilnehmer, die es vorzogen, in einem jüngeren Alter Eltern zu werden, neigten eher dazu, die Kryokonservierung abzulehnen.

**Schlussfolgerung** Die große Anzahl Universitätsabsolventen, Personen mit Fertilitätsproblemen und Personen mit spezi-

fischen soziokulturellen Hintergründen in unserer Stichprobe machen deutlich, dass klar definierte Gruppen sich für Reproduktionstechniken wie das soziale Einfrieren von Eizellen interessieren. Die untersuchten Unterschiede in Abhängigkeit von dem soziokulturellen Hintergrund zeigen auf, dass weitere Forschung über den Kinderwunsch in Deutschland nötig wäre. Zusammenfassend weist die Studie darauf hin, dass gezielte Interventionen zur Familienplanung nötig wären, um zu verhindern, dass Betroffene sich in einem falschen Sicherheitsgefühl wiegen und dadurch eine ungewollte Kinderlosigkeit riskieren.

## Introduction

Having children is a momentous event in most people's life [1] and an important occasion both personally and socially [2]. However, the tendency to delay parenthood and control fertility until the time is "right" to have children persists, bolstered by the apparent availability of early reproductive technologies which appear to allow people to plan their future parenthood [3–5]. In a Swedish study by Lampic et al. [6] nearly all of the participating students wanted to become a parent, yet many women reported concerns about work and children and more than half of the participants wanted to give birth after the age of 35 years. Other studies (from Australia and Sweden) found that although most of the 36–40-year-old participants wanted to have children, only 32% of women and 37% of men intended to become a parent at that point in time and many were still postponing childbearing. Reasons to postpone parenthood included the lack of a suitable partner, not feeling mature enough, wanting to achieve financial security, and wanting to do other things before starting a family [4, 7].

### Social oocyte freezing

Human oocyte cryopreservation for non-medical purposes, so called "social oocyte freezing" (SOF), offers healthy women the possibility of postponing having children for "social" reasons, such as career planning or lack of a partner. In this process, the woman's oocytes are aspirated, frozen and cryopreserved for eventual later use in intracytoplasmic sperm injection followed by re-transfer to the uterus as an embryo [8]. This method can counteract age-related fertility decline in women. SOF is a relatively new reproductive procedure but has stirred up many ethical, political and social debates (cf. e.g. [9–11]), particularly as the medical procedure was originally developed to help cancer patients but is now closely associated with economic goals, career planning, and relationship issues.

In recent years, a growing body of literature has addressed the question whether the public generally approves of social oocyte freezing and what the specific attitudes and goals of women prepared to potentially freeze their oocytes might be [12–18]. According to studies carried out in Germany and Canada, 31.5% of women considered themselves potential users of SOF, 3.1% of whom would definitely consider the procedure, while 41% of respondents stated that they would opt for SOF in the case of low

ovarian reserve [14, 17]. One third of all participants indicated that they would make use of all legally available reproductive medicine procedures which would allow them to have a biological child of their own [19]. Daniluk and Koert [17] additionally listed other reasons to opt for fertility preservation such as financial costs, health risks to themselves or their offspring, and success rates, as some of the primary factors that women felt would influence their decision to freeze oocytes.

Women who viewed themselves as potential oocyte freezers were characterized as younger than non-freezers, were more likely to be non-cohabiting, and usually did not have other children; they tended to be employed and have high incomes. They reported a strong desire for children and accepted parenting at a more advanced age [12].

### Socio-cultural backgrounds

Decision-making about one's own fertility goals is connected to general socio-demographic factors such as age and the number of children already in the family, and to the person's socio-cultural background, defined as mindset, values and life plans [20]. Social milieu concepts are used to assess socio-cultural backgrounds. In contrast to simple stratification systems, which usually look at objectively measurable criteria such as education, income and occupation, social milieu concepts additionally include the impact of mentalities and focus on the multilayered dimensions of society [21, 22]. Since affiliation to distinct socio-cultural backgrounds influences the identity and daily habits of members of specific milieu, social milieus are more specifically associated with behavior and decision-making than hierarchical models based on income and education alone [21].

However, because of their subjectivity which is also influenced by nationality and ethnicity, social milieu models lack comparability; there is no standard international social milieu model which would permit international comparisons. For the present study, we used the DELTA-Milieus<sup>®</sup> created by the German DELTA Institute for Social and Ecological Research. In Germany, DELTA-Milieus<sup>®</sup> are a well-established and validated concept to characterize people's lifestyles. They are based on social science theories and methods which were used to construct the social milieus [23]. DELTA Milieus<sup>®</sup> group people together based on similarities in their ideas and way of life (i.e., people who have similar values, lifestyles, and esthetic preferences, and are in similar social situations) and site the social milieu in a two-dimensional space

marked by two axes: social orientation and basic orientation. The social orientation axis is characterized by education, income and occupational position and is differentiated into lower, middle and upper class. The basic orientation axis captures differences in perceptions and everyday culture and is depicted with its own architecture of values and lifestyles (common traditions, self-realization, and self-management). Nine basic milieu clusters have been identified in this two-dimensional space: Conservative, Established, Post-Materialist (all classic upscale milieus), Performer, Expeditive (both of these are young, upscale, socio-cultural milieus), Traditional, Middle Class (both of them conventional mainstream milieus), and Disadvantaged and Hedonist (both modern underclass milieus). For a detailed description of the milieus see [23]. It has been shown that social-cultural backgrounds are strongly correlated with (in)voluntary childlessness [20, 24]: not only do people from different milieus differ with regard to their attitudes towards and the distribution of involuntary childlessness but also in their personal coping resources and their openness to reproductive medicine as a means of dealing with childlessness. Thus, socio-cultural background is a promising area for research into attitudes on fertility preservation and creating a family.

## Objectives

Attitudes towards reproductive medicine and different fertility treatment options can predict the probability that someone will turn to reproductive medicine. This applies especially to SOF since there are no medical reasons for cryopreservation. Studies on this topic and its association with different socio-cultural backgrounds are still lacking. The goal of this study was to investigate the relationship between attitudes towards social oocyte freezing and different socio-cultural backgrounds (in the following referred to as “milieus”) in a German cohort sample.

## Materials and Methods

### Procedure

The present quantitative online study was carried out from April to June 2015. The survey was presented online using the website platform Unipark. Participants were recruited via announcements on various media channels of Heidelberg University Hospital, internet homepages and chat rooms (e.g. Facebook, IDW-online, wunschkind.net) and newspapers which had previously published fertility-related articles. To reach people from every milieu, specific newspapers and magazines from every individual milieu cluster (e.g. Reader's Digest, Men's Health, Spiegel) [23] were contacted. All announcements included the information that the study was completely anonymous and a link to the online survey. The study was approved by the Ethics Committee of Heidelberg University Hospital.

### Participants

The homepage at the start of the survey included a short description of the procedure of oocyte cryopreservation to provide participants with basic information and enable them to answer the questions on their attitudes towards SOF. After signing the informed consent form by ticking “agree” online, a total of 740 par-

ticipants started the online questionnaire. 97 of them dropped out before completing the questionnaire, resulting in 643 completed questionnaires and a completion rate of 86.9%.

## Materials

Participants completed a sociodemographic questionnaire designed for this study which assessed age, national origin, sexual orientation, relationship and family status (e.g. whether they already had children), living situation, educational and occupational level, income, and awareness of any fertility problems. The survey contained questions about the participants' and their partners' general or current wish to have (more) children, and age-related questions about having children, e.g. preferred age for the first or last child.

Attitudes towards SOF were assessed using gender-sensitive questions for women and men. Women were asked whether they would personally consider donating or freezing their oocytes for social reasons or whether they had already done so. Men were asked if they would recommend generally/recommend that their partner freeze her oocytes for social reasons. Five-point Likert scales were used to assess these attitudes. In addition, the questionnaire contained various statements about SOF (e.g. “doesn't affect future fertility”) derived in part from [12], the possibility to give other potential reasons for or against SOF, and questions about the participant's fertility-specific knowledge [25].

To assign participants to particular milieu clusters, the questionnaire included 30 Likert-scaled items to indicate specific milieu, obtained from the German DELTA Institute for Social and Ecological Research.

## Statistical analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) for Windows, Version 20 (IBM Corp. 2011).  $\chi^2$  analysis was done to identify the percentages of different attitudes to SOF as a function of demographics, milieu clusters, parenting attitudes and beliefs. Partial correlations and univariate analyses of variance were used to determine the potentially moderating effects of variables (e.g. age, milieu clusters) on SOF-related attitudes. In logistic regression analysis with backward selection, statistically significant factors were entered to identify their interactions and main effects on attitudes towards SOF.

Statistical significance was set at  $\alpha = 0.05$ .

## Results

### Demographics

A total of 553 women (mean age: 34.2 years) and 90 men (mean age: 37.8 years) completed the online assessment and were included as participants in the study. Unspecified fertility problems were reported by 34.3% of women and 12.5% of men; 38.5% of women and 33.3% of men already had children. 69% of the participants were university graduates.

### Attitudes towards SOF

SOF attitude categories were created by splitting SOF attitude items into three groups of attitudes: the first group consisted of

► **Table 1** Sociodemographic data and attitudes towards social oocyte freezing.

|  | SOF Yes (n = 217) | SOF Uncertain (n = 91) | SOF No (n = 338) | $\chi^2$           |
|--|-------------------|------------------------|------------------|--------------------|
| Women                                  | 36.3%             | 13.4%                  | 50.3%            | 9.31**             |
| Men                                    | 20.0%             | 20.0%                  | 60.0%            |                    |
| Age clusters                           |                   |                        |                  | 31.18***           |
| ▪ < 30 years                           | 38.7%             | 47.3%                  | 41.8%            |                    |
| ▪ 30–45 years                          | 49.8%             | 41.8%                  | 31.7%            |                    |
| ▪ > 45 years                           | 11.5%             | 11.0%                  | 26.5%            |                    |
| Highly educated                        | 73.3%             | 68.9%                  | 65.0%            | 4.09* <sup>a</sup> |
| Nationality (German)                   | 93.8%             | 93.4%                  | 95.1%            | NS                 |
| Sexual orientation (heterosexual)      | 95.4%             | 97.8%                  | 95.7%            | NS                 |
| Own child/children                     | 36.4%             | 34.1%                  | 39.6%            | NS                 |
| Currently in a partnership             | 77.2%             | 79.1%                  | 82.4%            | NS                 |
| Aware of fertility problems            | 77.9%             | 60.4%                  | 77.4%            | 12.33**            |
| Fertility problem of their own/partner | 45.1%             | 31.1%                  | 21.9%            | 32.44***           |

SOF = social oocyte freezing

NS = not significant

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ <sup>a</sup> Difference was only significant between “SOF Yes” and “SOF No” groups

persons who had already had SOF and persons with a positive attitude (“yes, very much”, “rather yes”); the second group consisted of persons who were uncertain (“maybe”); and the third group consisted of persons with negative attitudes to SOF (“rather not”, “certainly not”). Overall, 217 participants (34%) had a positive, 91 participants (14%) a neutral, and 338 participants (52%) a negative attitude towards SOF (► **Table 1**).

Women tended to look more favorably on SOF compared to men ( $\chi^2 = 9.31$ ,  $p \leq 0.01$ ). Moreover, men tended to be more opposed to recommending SOF to their partners ( $2.42 \pm 0.8$ ) than to women in general ( $2.54 \pm 0.7$ ,  $t[80] = -2.00$ ,  $p \leq 0.05$ ). Age clusters showed remarkable differences in attitudes towards SOF ( $\chi^2 = 31.18$ ,  $p \leq 0.001$ ): Respondents aged between 30 and 45 years had the most positive attitudes compared to younger (< 30 years) respondents and even more compared to older participants (> 45 years). Participants with a university degree ( $\chi^2 = 4.09$ ,  $p \leq 0.05$ ) and participants who reported having fertility problems in their partnership ( $\chi^2 = 32.44$ ,  $p \leq 0.001$ ) reported a significantly higher acceptance of SOF.

Overall, family status, having children of one’s own, occupation, nationality, and sexual orientation were found not to be correlated with attitudes to SOF.

► **Table 2** shows the fertility attitudes in the three SOF attitude groups (positive/uncertain/negative). Individuals who reported wanting to have or already having children of their own had a more positive attitude towards SOF than respondents who reported that they did not want to have or did not have children of their own ( $\chi^2 = 30.04$ ,  $p \leq 0.001$ ). Women and men who had had or were planning to have their first child before the age of 30 years and their last child before the age of 40 were less accepting of SOF compared to respondents who had had or wished to have their first and last child after the above-mentioned age points

( $\chi^2 = 41.09$ ,  $p \leq 0.001$ ). Furthermore, there was a negative correlation between acceptance of SOF and the age at which participants indicated that having children would no longer be acceptable for women ( $r = -0.223$ ,  $p \leq 0.000$ ) and men ( $r = -0.200$ ,  $p \leq 0.000$ ). As expected, women who reported a positive attitude towards SOF were also more open to the idea of donating oocytes anonymously ( $r = 0.424$ ,  $p \leq 0.001$ ) or to a friend ( $r = 0.311$ ,  $p \leq 0.001$ ).

### Reasons to use SOF

► **Table 3** lists women’s responses to possible reasons for SOF, rated according to their subjective importance. All reasons were seen as more relevant by women who accepted oocyte cryopreservation for non-medical reasons than by women who were not in favor of SOF. Most women rated possible issues concerning the health of the baby and their own future fertility as the most important reason when giving their preference for or against SOF. More financial reimbursement, less organizational effort, and talks with women who had undergone oocyte cryopreservation were less important factors for SOF across all attitude groups (“positive”, “uncertain” and “negative”).

Interestingly, most of the participants used the opportunity (free text) to add additional reasons for or against SOF. In total, there were 107 free-text comments from women, of which 85 included other reasons for SOF (no current partner, illness) and 22 provided other reasons against SOF (evolutionarily and biologically absurd); 90 reasons for and against SOF were given by men, of which 27 reasons were in favor of SOF (autonomy, career) and 63 reasons were opposed to SOF (ethics, exploitation).

### Socio-cultural backgrounds

Participation rates of people belonging to distinct milieus were extremely heterogeneous, ranging from 0% (Disadvantaged, Tra-

► **Table 2** Attitudes to childbearing and attitudes towards social oocyte freezing.

|   | SOF Yes (n = 217) | SOF Uncertain (n = 91) | SOF No (n = 338) | $\chi^2$ |
|---|-------------------|------------------------|------------------|----------|
| Wish for a child                                  |                   |                        |                  | 37.04*** |
| ▪ actual wish <sup>1</sup>                        | 39.2%             | 31.9%                  | 23.8%            |          |
| ▪ generalized wish                                | 41.4%             | 40.6%                  | 32.9%            |          |
| ▪ no wish   | 19.4%             | 27.5%                  | 43.3%            |          |
| Age at first child's birth and last child's birth |                   |                        |                  | 41.09*** |
| ▪ first: < 30 years,<br>last: < 40 years          | 37.0%             | 50.0%                  | 61.1%            |          |
| ▪ first: > 30 years,<br>last: < 40 years          | 39.5%             | 40.8%                  | 32.9%            |          |
| ▪ first: > 30 years,<br>last: > 40 years          | 23.5%             | 9.2%                   | 6.0%             |          |
| Acceptable age at child's birth                   |                   |                        |                  | 25.01*** |
| ▪ women: < 40 years,<br>men: < 50 years           | 21.2%             | 14.4%                  | 64.4%            |          |
| ▪ women: < 40 years,<br>men: > 50 years           | 12.5%             | 37.5%                  | 50.0%            |          |
| ▪ women: > 40 years,<br>men: < 50 years           | 31.0%             | 14.8%                  | 54.1%            |          |
| ▪ women: > 40 years,<br>men: > 50 years           | 44.4%             | 12.8%                  | 42.8%            |          |

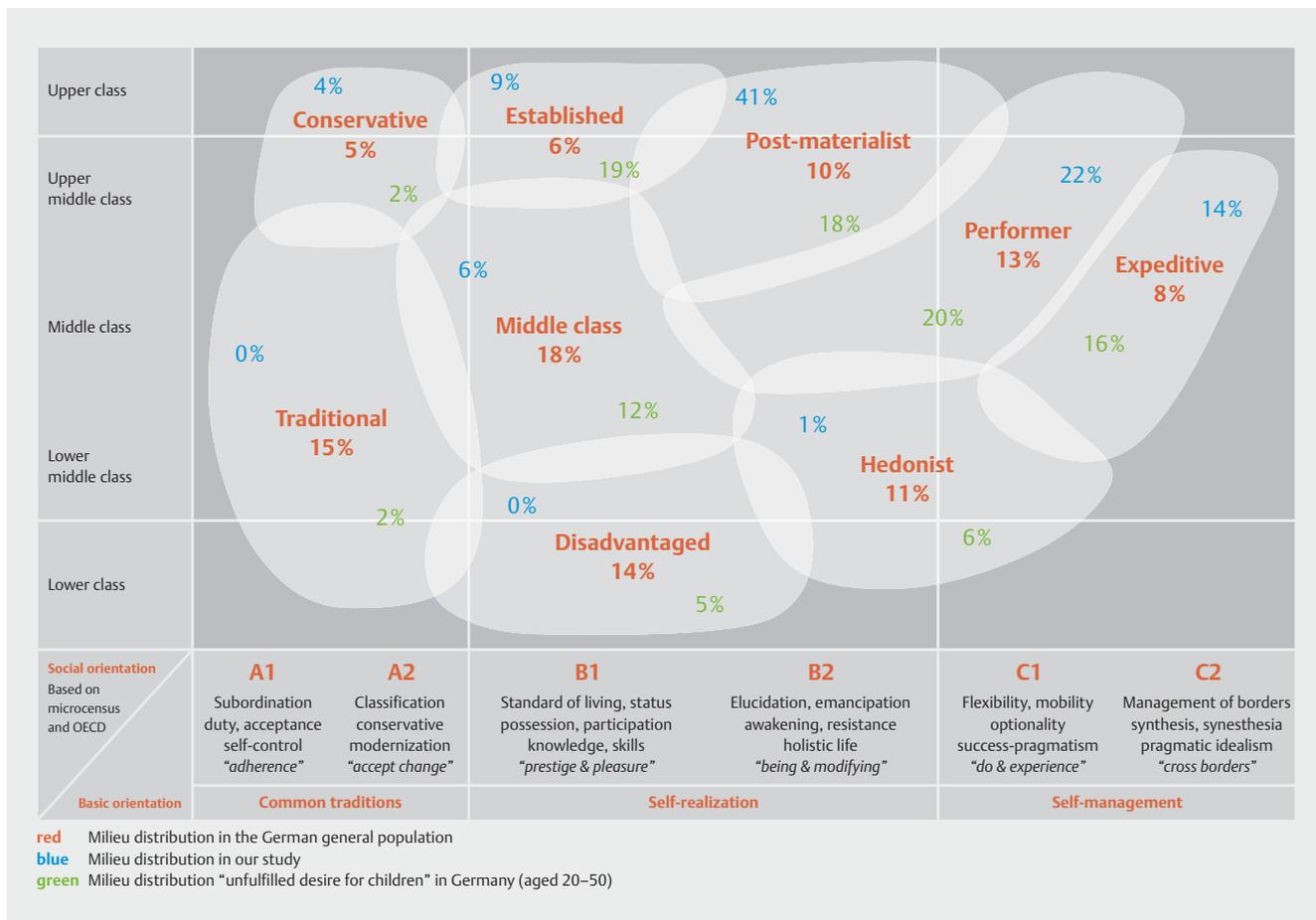
SOF = social oocyte freezing

<sup>1</sup> trying to conceive or currently pregnant

► **Table 3** Importance of reasons for using social oocyte freezing in women.

| SOF Yes   |       | SOF Uncertain                                     |       | SOF No  |       |
|---|-------|---|-------|---|-------|
| 1. Children are healthy                           | 90%   | 1. Children are healthy                           | 85.1% | 1. Children are healthy                           | 39.7% |
| 2. Doesn't affect future fertility                | 83.5% | 2. Doesn't affect future fertility                | 71.6% | 2. Doesn't affect future fertility                | 31.8% |
| 3. If I wanted a child                            | 81.5% | 3. Potential future ART would be less complicated | 67.6% | 3. Higher guarantee of success                    | 27.4% |
| 4. Potential future ART would be less complicated | 79.5% | 4. Higher guarantee of success                    | 64.9% | 4. Potential future ART would be less complicated | 23.4% |
| 5. If I didn't have any children                  | 76.5% | 5. If I wanted a child                            | 54.1% | 5. More financial reimbursement                   | 19.1% |
| 6. Higher guarantee of success                    | 74%   | 5. More financial reimbursement                   | 54.1% | 6. If I wanted a child                            | 17.7% |
| 7. More financial reimbursement                   | 62%   | 7. If I didn't have any children                  | 43.2% | 7. Less organizational effort                     | 17.3% |
| 8. Less organizational effort                     | 45%   | 8. Less organizational effort                     | 35.1% | 8. Talked to women who had undergone treatment    | 14.4% |
| 9. Talked with women who had undergone treatment  | 35%   | 9. Talked to women who had undergone treatment    | 31.1% | 9. If I didn't have any children                  | 14.1% |

SOF = social oocyte freezing



► **Fig. 1** Characteristics and distribution of Delta milieu clusters in Germany.

ditional) to 41% (Post-Materialist) (cf. ► **Fig. 1**). Participants from various milieus differed greatly from one another with regard to their attitudes towards SOF ( $\chi^2 = 27.396$ ,  $p \leq 0.01$ ), which were not mediated by age. ► **Fig. 2** presents the percentages for positive, uncertain and negative attitudes for specific milieu clusters. The more flexible, progressive and self-oriented the characteristics and values of the participants of a cluster were indicated to be, the more positive the attitude of the cluster members towards SOF (e.g., Performer), with the exception of the Expeditive cluster where people tended to have more negative attitudes to SOF.

The current wish to have a biological child varied between milieu ( $\chi^2 = 18.209$ ,  $p \leq 0.01$ ), with Conservatives, Hedonists and Post-Materialists reporting a high and Performers and Expeditives a low wish for a biological child at that point. However, these differences between groups were not found with regard to the general wish to have biological children.

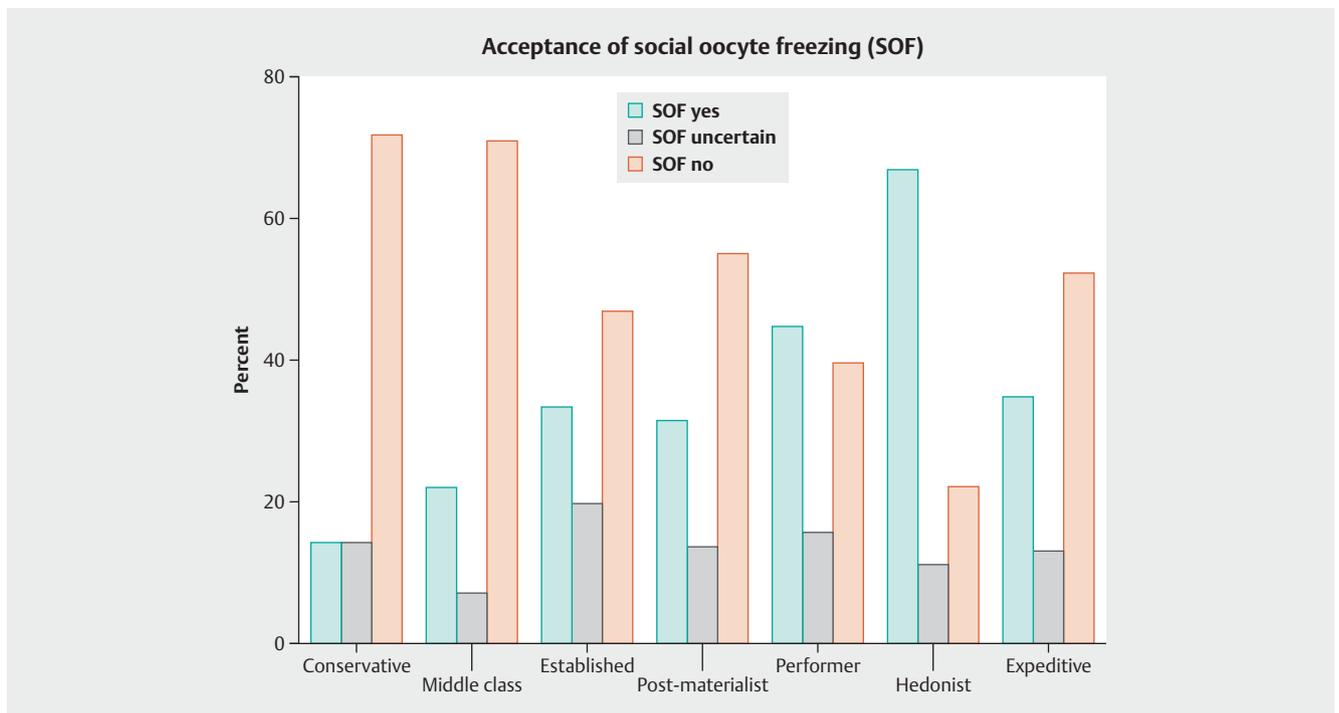
People from milieu clusters characterized as more flexible and self-managed rated reasons such as the health and safety of potential children ( $\chi^2 = 22.18$ ,  $p \leq 0.01$ ), future fertility ( $\chi^2 = 13.61$ ,  $p \leq 0.05$ ), and previous talks with women who had undergone oocyte cryopreservation ( $\chi^2 = 14.27$ ;  $p \leq 0.05$ ) as more important for their potential decision for or against SOF than participants from milieus with more traditional values. Conservatives were less likely

to agree with all reasons given for SOF compared with respondents from other milieu clusters, especially respondents from the Performer, Post-Materialist and Established clusters, irrespective of any stated acceptance of SOF and age.

## Discussion

Initially, fertility preservation technology was primarily developed and offered for medical reasons [26]. With the increasing availability of different reproductive techniques, nowadays fertility preservation is – technically – an option for all fertile women. However, research into whether SOF is considered an actual option for family planning is still limited. This study therefore aimed to investigate attitudes to SOF in a representative adult German population. In addition, we were interested in the relationship between attitudes towards SOF and different milieus as a way of investigating social structures in the general population [22, 23].

In line with previous research results (cf. [12, 14]), one third of the German cohort sample in our study had a positive attitude towards SOF, while more than half of the sample reported being opposed to SOF. This adds to existing research which has found that, even in individuals who generally support the method, oocyte cryopreservation for social reasons is still less acceptable than for



► Fig. 2 Acceptance of SOF in Delta milieu clusters.

medical reasons [15, 17]. An earlier study conducted with women who had used egg-freezing to preserve their fertility suggested that these women preferred natural conception over the use of cryopreserved eggs [16].

We also detected differences in attitudes towards SOF between different age clusters. Previous studies reported that the acceptance of oocyte cryopreservation for non-medical reasons peaked around the ages of 36–41 years [13, 27]. In line with these findings, the age group in our sample found to be most favorable to SOF consisted of women and men aged 30–45 years; neither older nor younger groups of participants were as open to SOF as this middle-aged cluster. This could potentially be due to the fact that younger people may not imagine that their fertility could be impaired and may also lack awareness of their future fertility decline and of factors which postpone childbearing (e.g. [13, 14]). For respondents of older age getting pregnant, and thus SOF is not of practical interest anymore. The larger acceptance rates reported for the group aged 30–45 years tallies with the fact that women who consider freezing their oocytes are around 35 years of age and the average age when they opt for the vitrification procedure is 36–38 years [16, 28].

Consistent with the findings of other internet-based studies on attitudes to medical treatment options, the level of education of the participants in our study was well above average (cf. also [16, 17, 29]). Moreover, participants with a university degree reported a more positive attitude towards SOF. This is understandable, since most people do not simultaneously invest in their education at the same time as starting a family [30–32], and the option to “extend fertility” is especially attractive for academics. However, since the understanding of fertility is still low in western societies

[25, 33, 34], even highly educated individuals may over-estimate their chances of success following reproductive treatment [19]. It is therefore important to highlight both the opportunities and the limits of SOF, especially for this cohort group.

Already having children was not found to be relevant for attitudes regarding oocyte cryopreservation for social reasons. However, a personal wish for a child – irrespective if it was a current or a generalized wish – was one of the strongest predictors for a positive attitude to SOF [12]. Respondents expressing the wish to have a child of their own (with or without a specific time frame in mind) might prefer SOF because it appears to offer some sort of security with regard to future fertility and the freedom to postpone the decision about planning to have a(nother) child(ren) [27, 28, 35]. Moreover, SOF also offers the option to have a biological child which is still valued more highly than adoption or donor conception [27].

The positive relationship between a history of fertility problems and the acceptance of SOF is understandable and has also been reported in other studies (cf. [12]). At the same time, SOF is not a “universal remedy”, and it should be remembered that it does not enable all women to have children. However, the large number of participants who reported having fertility problems points to the increased interest in and concern with fertility-related topics which should be investigated further.

For the majority of participants, the safety and health of the future child was the most important reason to evaluate SOF, followed by the fear of impaired fertility as a potential consequence of the treatment. Interestingly, reimbursement of financial costs was rated as one of the least important reasons in our study, compared to data from other studies (cf. [17]). This might be due to

the fact that few of the participants came from low socio-cultural backgrounds with limited financial resources. These data are also in line with an earlier study conducted in Germany, where most participants thought that SOF should not be entirely covered by health insurance [14]. The voluntary inclusion of numerous other reasons shows the huge interest in fertility treatment in our sample and the enormous differences in opinions, especially with regard to ethical views. Further analysis and investigations are required to identify and classify the specific topics connecting to social oocyte freezing.

Milieus differed markedly in terms of their attitudes towards SOF, with individuals from some milieus reporting a strongly negative attitude to fertility preservation, while others were in favor of SOF. With the exception of the Expeditive cluster, the trend was that the more flexible and self-managed the milieu members were, the more open they were to SOF. This finding adds to the existing research on socio-cultural backgrounds and their openness to reproductive medicine. Wippermann [20] found that there were differences between milieus in how they dealt with involuntary childlessness and their openness to infertility counseling and the use of reproductive medicine. Similar to our study, the Performer group in an earlier dataset was reported to be more open to reproductive medicine while the Conservative, Post-Materialist and Expeditive groups were more critical. The Expeditive group in particular was characterized as opposed to reproductive treatment techniques due to a fear of heteronomy and the potentially negative consequences of hormone therapy [24]. While specific attitudes to SOF were not assessed in that earlier study, the data are in line with the more negative attitude to SOF found in the Expeditive group in our sample.

The unequal distribution of different socio-cultural backgrounds in our study means that the cohort does not give an adequate representation of German society; thus, it is not possible to draw conclusions about German society as a whole. However, this lack of representativeness provides important information and valuable clues. The low participation by individuals from some milieus suggests that the men and women in those milieus were not interested in the issue or could not be adequately targeted by our recruitment methods or had no knowledge or concerns about the subject. Interestingly, our milieu distribution is similar to the milieu distribution reported in an earlier study on the unfulfilled wish to have children [24]. Based on this distribution of data, we cannot state whether individuals from specific milieus either do not experience impaired fertility or decide not to report it or do not participate in internet-based surveys. In support of the latter assumption, it is well known that online surveys tend to attract participants from more progressive milieus ("Digital Divide").

Making decisions about one's own fertility preservation requires some knowledge about fertility-related facts and opportunities and the potential problems of fertility preservation. With most of the literature reporting that general knowledge about fertility is very limited (cf. [25, 34, 36]), it is important to bear in mind that statements and intentions regarding fertility preservation may be formed based on inadequate knowledge. Since policies on healthcare and family planning concern all of society, it is important to obtain a comprehensive picture of social attitudes and opinions.

## Strengths and limitations

This is the first study to investigate attitudes and opinions towards SOF in both women and men from different socio-cultural classes and with differing values (milieus). The study gives a unique insight into fertility-related knowledge and attitudes as a function of socio-cultural background. It is not possible to generalize from our findings to non-users of the internet because of the nature of online surveys. Also it is not possible to verify the truth of statements given in anonymous online survey. Generalization is also limited by the above-average reports of fertility problems in our sample, the high level of education of the respondents and, as mentioned above, the unequal participation of respondents from lower socio-cultural backgrounds. Finally, it is not possible to show whether intending to use social oocyte freezing can be equated with actual utilization of this technique.

## Conclusions

The large numbers of university graduates, persons with fertility problems, and specific socio-cultural backgrounds point to distinct groups interested in reproductive medicine. Overall, the investigated differences attributed to socio-cultural backgrounds call for more future research to obtain a better understanding of the ideas and expectations linked to the wish to have children in German society.

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## Conflict of Interest

The authors declare that they have no conflict of interest.

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