

Original Article

## Study of Views on Posthumous Reproduction, Focusing on Its Relation with Views on Family and Religion in Modern Japan

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Posthumous reproduction has been performed in Japan several times, without sufficient civic discussion on its appropriateness or legislative regulation. There have even been several lawsuits on posthumous acknowledgment (in which a baby born to a deceased father has the same birthright as a baby born to a living father), and some judgments have proposed the need to develop societal agreement on posthumous reproduction and suggested legislative settlement. With this background, this study aims to clarify the views of the Japanese people regarding posthumous reproduction. In December 2007, we distributed a questionnaire on posthumous reproduction in relation to beliefs about family and religion to 32 universities across the country, and received 3,719 replies. It was found that about 60% of respondents agreed with posthumous reproduction. Statistical analysis was applied to the relationship between this overall position on posthumous reproduction and views on assisted reproduction technologies, family, religion, and so on. The degree of support for posthumous reproduction was strongly correlated with the degree of affirmation of assisted reproduction technologies and a liberal worldview with emphasis on self-determination. On the other hand, there was also a strong correlation with having a traditional view of family, such as family succession. The degree of support for posthumous reproduction was also highly correlated with the intimacy among family members, underlying which was a strong connection to the traditional religious belief in Japan that deceased family members watch the living ones. The view on posthumous reproduction is culturally complex and cannot be explained by a simple dichotomy between traditional conservatives and liberals.

**Key words:** posthumous reproduction, consciousness, bioethics, religion, Japan

**I**n Japan there have been 5 cases of posthumous reproduction, where wives use freeze-pre-

served sperm obtained from their husbands to have babies by artificial insemination or *in vitro* fertilization after the husbands have died. Between 2001 and 2004, at least 4 babies were posthumously reproduced. However, there has been almost no public discussion on this issue, and no consensus has devel-

Received January 16, 2008; accepted February 29, 2008.

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oped among the Japanese people.

In 3 of the 5 cases, legal action was taken on posthumous acknowledgement, *i.e.*, whether or not a baby born to a deceased father has the same birthright as a baby born to a living father. In each of those 3 cases, the courts denied such acknowledgment. The Supreme Court decision (September 4, 2006) stated, "The relationship between the deceased father and the baby born after his death should be basically examined by a legislative process to judge whether or not the baby has the normal birthright and to set down the conditions for permission and its influences...after a thorough study on the bioethics of artificial reproduction using deceased men's preserved sperm and on the welfare of the born babies...from multilateral viewpoints" [1].

The Japan Society of Obstetrics and Gynecology banned posthumous reproduction with embryos and eggs in its notification "Remarks on the freeze preservation and transplantation of human embryos and eggs" (April 1988), but did not mention posthumous reproduction with frozen sperm. In its notification "Remarks on freeze-preserved sperm" published in April 2007, the Society also prohibited posthumous reproduction using freeze-preserved sperm because there was no way to confirm the agreement of deceased husband.

The medical establishment in Japan is thus opposed to posthumous reproduction technology itself, but has not yet engaged in multilateral discussions, which the Supreme Court decision on posthumous reproduction had requested.

The legality and regulation of posthumous reproduction vary from country to country. The United States allows it without any restriction. Britain allows it only if the deceased husband's agreement is documented. Both Germany and France prohibit it [2].

Since 1980, when the collection of sperm from deceased men was first reported [3], actual cases of posthumous reproduction—as well as lawsuits related to them—have been frequently reported around the world [4–9]. The ethical, legal, and social issues (ELSI) of posthumous reproduction were already recognized at that time, and various discussions and opinions were made on the rights and wrongs of sperm collection from deceased men and on the treatment of collected sperm [10–18]. Some academic societies

created protocols [19, 20]. In Japan, several associations also announced their positions, including the Japan Society for Reproductive Medicine, the Japan Federation of Bar Associations, and the Ministry of Health, Labor, and Welfare.

However, no survey has been conducted on people's view on posthumous reproduction, even in foreign countries. Statistical surveys of physicians at medical institutions have been conducted to identify treatment options and for posthumous reproduction, but these surveys have not involved the public [21–23]. In Japan, the rights and wrongs of posthumous reproduction were mentioned in only one survey, which concerned the entire range of assisted reproduction technologies [24].

Against this background, the present study surveys people's views on posthumous reproduction for the first time in the world. More specifically, we present the results of a statistical survey of opinions on the rights and wrongs of posthumous reproduction and related views on life and family.

To analyze the results, we provided a new viewpoint that is independent of the dichotomy presented by liberals and conservatives in traditional bioethics. Most conventional discussions on bioethics have been made in the face of opposition from both conservatives and liberals. The discussions on assisted reproduction technologies have been no exception. Liberals who emphasize self-determination generally support assisted reproduction technologies, while conservatives, who emphasize traditional religious ideas and traditional ways of community, have a cautious attitude about such technologies [25]. In reality, however, people do not take consistent ideological actions but behave according to their own ideas about the meaning of life, integrating various elements [26]. So we need to look past the strictly liberal vs. conservative viewpoints in favor of a more flexible, individualized view of posthumous reproduction.

In the present study, we discuss the relationship between views on posthumous reproduction and views on assisted reproduction technologies, and then clarify to what extent the difference between conservatives and liberals affects that relationship and what views on society, religion, and life are related to attitudes toward posthumous reproduction.

## Materials and Methods

In December 2007, questionnaires were sent to students at 32 universities in Japan. The self-administered questionnaire was prepared in bearer form, and the students were asked to participate in the research voluntarily and to drop the completed questionnaire into a collection box.

The questionnaire asked about general attributes such as sex, grade, and age in addition to questions about posthumous reproduction and assisted reproduction technologies. It also included questions in 5 categories about views on family, religion, and life: 1. Individualism and self-determination, 2. Family succession, 3. Familiarity with family, 4. Experience related to death, 5. Contact with the spirit world or afterlife. Answers were selected from 2 or 4 choices. Only actual answers were included in the analysis; questions without a response were not considered.

For statistical analysis, we used SPSS ver. 15 for Windows and the chi-square test, and regarded the data significant when the  $p$  value was less than 0.05. This study was conducted under the approval of the Ethics Committee of the Graduate School of Medicine, Dentistry and Pharmaceutical Sciences, Okayama University.

## Results

**Background of surveyed students.** We received replies from 3,719 undergraduate students, for a response rate of 72.9%. Of these, 1,386 (38.5%) were males and 2,210 (61.5%) were females; 2,103 (61.6%) of the respondents were majoring in the humanities and 1,312 (38.4%) in the sciences; 1,614 (43.4%) were in the first year of college, 1,025 (27.6%) in the second, 489 (13.1%) in the third, 309 (8.3%) in the fourth, and 11 (0.3%) in the fifth or higher year. About a third (1,142; 31.4%) of the respondents reported that their hometown was an urban area, with the rest (2,500; 68.6%) being from a rural area.

**Recognition of posthumous reproduction and support for it and for posthumous acknowledgment.** As for the recognition of posthumous reproduction, only 13.3% of the students knew what the term meant, and about half of them knew nothing

about it (Table 1). "The remainder had a partial understanding of the term. Nearly two-thirds (63.6%) of the respondents approved or somewhat approved of posthumous reproduction. To the question "Would you want to have a child by posthumous reproduction if you were involved as husband or wife?" 12.6% answered "Yes" and 53.9% answered "Yes in some cases". A total of 66.5% answered that they, themselves, would be willing to undertake posthumous reproduction in the future, and 89.8% of the students answered that posthumous acknowledgement should be legally accepted.

**Table 1** Attitudes toward posthumous reproduction and acknowledgment

Q1 Do you know about posthumous reproduction?	(n=3,663)
I know the content.	494 (13.3)
I've heard of it.	1,420 (38.2)
No, I don't.	1,749 (47.0)
Q2 Do you agree with posthumous reproduction?	(n=3,575)
I agree.	318 ( 8.9)
I somewhat agree.	1,910 (53.4)
I somewhat disagree.	1,128 (31.6)
I disagree.	219 ( 6.1)
Q3 If you were involved, would you want to have a child by posthumous reproduction?	(n=3,623)
Yes.	467 (12.6)
Yes, in some cases.	2,003 (53.9)
No.	1,153 (31.0)
Q4 Do you think that a baby born by posthumous reproduction should be legally acknowledged as the child of the deceased father?	(n=3,597)
Yes.	3,338 (89.8)
No.	259 ( 7.0)

### **Background of surveyed students and attitudes toward posthumous reproduction.**

Agreement and disagreement with posthumous reproduction did not significantly depend on sex, urban vs. rural hometown, or humanities vs. science major (Table 2). In 5 of the 7 items on posthumous reproduction, there was a significant difference in affirmation between males and females. Males were significantly more likely than females to agree with 2 items: "It is a misuse of a parent's right (self-determination right)" ( $p < 0.05$ ), and "Posthumous reproduction is unavoidable for continuing the family line" ( $p < 0.001$ ). On the other hand, females were significantly more likely to agree with the following items: "It is against natural providence" ( $p < 0.05$ ), "There is no problem if

**Table 2** Background of surveyed students and their attitude toward posthumous production

	Total number	Male	Sex Female	p value
Q1 Do you agree or disagree with posthumous reproduction?	(n=3,553)	(n=1,333)	(n=2,139)	
I agree.	2,228 (62.3)	839 (62.9)	1,332 (62.3)	
I disagree.	1,347 (37.7)	494 (37.1)	807 (37.7)	—
Q2 It is against natural providence.	(n=3,665)	(n=1,373)	(n=2,183)	
I think so.	2,395 (65.3)	871 (63.4)	1,449 (66.4)	
I don't think so.	1,270 (34.7)	502 (36.6)	734 (33.6)	*
Q3 There is no problem if the mother bears the responsibility for fostering.	(n=3,667)	(n=1,371)	(n=2,186)	
I think so.	2,399 (65.4)	864 (63.0)	1,464 (67.0)	
I don't think so.	1,268 (34.6)	507 (37.0)	722 (33.0)	**
Q4 It is a misuse of a parent's right (self-determination right).	(n=3,649)	(n=1,368)	(n=2,172)	
I think so.	1,462 (40.1)	575 (42.0)	842 (38.8)	
I don't think so.	2,187 (59.9)	793 (58.0)	1,330 (61.2)	*
Q5 The husband's antemortem will should be respected.	(n=3,660)	(n=1,369)	(n=2,182)	
I think so.	2,788 (76.2)	1,001 (73.1)	1,710 (78.4)	
I don't think so.	872 (23.8)	368 (26.9)	472 (21.6)	***
Q6 It is unacceptable since deceased man's will cannot be confirmed.	(n=3,652)	(n=1,367)	(n=2,177)	
I think so.	1,003 (27.5)	384 (28.1)	577 (26.5)	
I don't think so.	2,649 (72.5)	983 (71.9)	1,600 (73.5)	—
Q7 Without social agreement, it is problematic.	(n=3,647)	(n=1,368)	(n=2,170)	
I think so.	1,665 (45.7)	614 (44.9)	1,002 (46.2)	
I don't think so.	1,982 (54.3)	754 (55.1)	1,168 (53.8)	—
Q8 It is unavoidable for continuing the family line.	(n=3,653)	(n=1,369)	(n=2,175)	
I think so.	778 (21.3)	355 (25.9)	396 (18.2)	
I don't think so.	2,875 (78.7)	1,014 (74.1)	1,779 (81.8)	***

the mother bears the responsibility for fostering" ( $p < 0.01$ ), and "The husband's antemortem will should be respected" ( $p < 0.001$ ). The students from urban areas answered yes to "Posthumous reproduction is unavoidable for continuing the family line" at a significantly higher percentage than those from rural areas ( $p < 0.05$ ). Science majors answered yes to "Without social agreement, it is problematic" at a significantly higher percentage than humanities majors ( $p < 0.01$ ).

**Support for assisted reproduction technologies and attitude toward posthumous reproduction.** The 1,154 (29.2%) students who answered yes to the item "I feel reluctant to artificial insemination between a husband and wife" supported posthumous reproduction at a significantly lower rate ( $p < 0.001$ ) than the 2,529 (68.6%) students who were not reluctant to artificial insemination (Table 3). The students who answered yes to "I am opposed to artificial insemination" answered affirmatively to "There is no problem with posthumous reproduction if the mother bears the responsibility for fostering" ( $p < 0.001$ ) and "The husband's antemortem will should be respected" ( $p < 0.001$ ) at a significantly lower percent-

age, and were significantly more likely to agree with the following: "It is against natural providence" ( $p < 0.001$ ), "It is a misuse of a parent's right (self-determination right)" ( $p < 0.001$ ), "It is unacceptable since the deceased man's will cannot be confirmed" ( $p < 0.001$ ), "Without social agreement, it is problematic" ( $p < 0.001$ ), and "It is unavoidable for continuing the family line" ( $p < 0.01$ ).

The 2,292 (62.3%) students who answered yes to the item "I am reluctant to surrogate birth (reproductive technology to fertilize *in vitro* eggs and sperm of a wife and husband in another woman's uterus)" were significantly less likely ( $p < 0.001$ ) to support posthumous reproduction than the 1,390 (37.3%) students who answered no. The students who answered yes to "I am reluctant to surrogate birth" were significantly less likely to agree that "There is no problem if the mother bears the responsibility for fostering" ( $p < 0.001$ ) and that "The husband's antemortem will should be respected", whereas they were significantly more likely to agree that "It is against natural providence" ( $p < 0.001$ ), "It is a misuse of a parent's right (self-determination right)" ( $p < 0.001$ ), "It is unacceptable

Table 2 Continued from opposite page

Urban	From urban/rural area Rural	<i>p</i> value	Humanities	Humanities/Science course Science	<i>p</i> value
(n=1,101)	(n=2,414)		(n=2,018)	(n=1,272)	
686 (62.3)	1,509 (62.5)	—	1,260 (62.4)	800 (62.9)	—
415 (37.7)	905 (37.5)		758 (37.6)	472 (37.1)	
(n=1,129)	(n=2,468)		(n=2,067)	(n=1,301)	
744 (65.9)	1,602 (64.9)	—	1,358 (65.7)	826 (63.5)	—
385 (34.1)	866 (35.1)		709 (34.3)	475 (36.5)	
(n=1,127)	(n=2,472)		(n=2,072)	(n=1,300)	
733 (65.0)	1,620 (65.5)	—	1,359 (65.6)	841 (64.7)	—
394 (35.0)	852 (34.5)		713 (34.4)	459 (35.3)	
(n=1,121)	(n=2,461)		(n=2,055)	(n=1,301)	
460 (41.0)	972 (39.5)	—	815 (39.7)	520 (40.0)	—
661 (59.0)	1,489 (60.5)		1,240 (60.3)	781 (60.0)	
(n=1,125)	(n=2,467)		(n=2,065)	(n=1,301)	
843 (74.9)	1,895 (76.8)	—	1,593 (77.1)	975 (74.9)	—
282 (25.1)	572 (23.2)		472 (22.9)	326 (25.1)	
(n=1,124)	(n=2,460)		(n=2,059)	(n=1,302)	
296 (26.3)	679 (27.6)	—	560 (27.2)	358 (27.5)	—
828 (73.7)	1,781 (72.4)		1,499 (72.8)	944 (72.5)	
(n=1,122)	(n=2,457)		(n=2,053)	(n=1,301)	
511 (45.5)	1,124 (45.7)	—	903 (44.0)	633 (48.7)	***
611 (54.5)	1,333 (54.3)		1,150 (56.0)	668 (51.3)	
(n=1,123)	(n=2,464)		(n=2,059)	(n=1,299)	
260 (23.2)	497 (20.2)	*	442 (21.5)	281 (21.6)	—
863 (76.8)	1,967 (79.8)		1,617 (78.5)	1,018 (78.4)	

\**p*<0.05, \*\**p*<0.01, \*\*\**p*<0.001.

Table 3 Affirmation of reproduction technologies and attitude toward posthumous reproduction

	Reluctant to artificial insemination			Reluctant to surrogate birth		
	+	—	<i>p</i> value	+	—	<i>p</i> value
Q1 Do you agree or disagree with posthumous reproduction?	(n=1,110)	(n=2,453)		(n=2,223)	(n=1,342)	
I agree.	495 (44.6)	1,727 (70.4)	***	1,174 (52.8)	1,051 (78.3)	***
I disagree.	615 (55.4)	726 (29.6)		1,049 (47.2)	291 (21.7)	
Q2 It is against natural providence.	(n=1,141)	(n=2,510)		(n=2,272)	(n=1,378)	
I think so.	859 (75.3)	1,527 (60.8)	***	1,650 (72.6)	733 (53.2)	***
I don't think so.	282 (24.7)	983 (39.2)		622 (27.4)	645 (46.8)	
Q3 There is no problem if the mother bears the responsibility for fostering.	(n=1,141)	(n=2,511)		(n=2,275)	(n=1,376)	
I think so.	601 (52.7)	1,786 (71.1)	***	1,350 (59.3)	1,038 (75.4)	***
I don't think so.	540 (47.3)	725 (28.9)		925 (40.7)	338 (24.6)	
Q4 It is a misuse of a parent's right (self-determination right).	(n=1,135)	(n=2,500)		(n=2,267)	(n=1,368)	
I think so.	607 (53.5)	851 (34.0)	***	1,061 (46.8)	394 (28.8)	***
I don't think so.	528 (46.5)	1,649 (66.0)		1,206 (53.2)	974 (71.2)	
Q5 The husband's antemortem will should be respected.	(n=1,138)	(n=2,507)		(n=2,273)	(n=1,373)	
I think so.	820 (72.1)	1,959 (78.1)	***	1,678 (73.8)	1,103 (80.3)	***
I don't think so.	318 (27.9)	548 (21.9)		595 (26.2)	270 (19.7)	
Q6 It is unacceptable since deceased man's will cannot be confirmed.	(n=1,133)	(n=2,504)		(n=2,266)	(n=1,371)	
I think so.	439 (38.7)	560 (22.4)	***	753 (33.2)	245 (17.9)	***
I don't think so.	694 (61.3)	1,944 (77.6)		1,513 (66.8)	1,126 (82.1)	
Q7 Without social agreement, it is problematic.	(n=1,132)	(n=2,500)		(n=2,264)	(n=1,368)	
I think so.	665 (58.7)	994 (39.8)	***	1,193 (52.7)	467 (34.1)	***
I don't think so.	467 (41.3)	1,506 (60.2)		1,071 (47.3)	901 (65.9)	
Q8 It is unavoidable for continuing the family line.	(n=1,139)	(n=2,500)		(n=2,274)	(n=1,365)	
I think so.	277 (24.3)	497 (19.9)	**	472 (20.8)	303 (22.2)	—
I don't think so.	862 (75.7)	2,003 (80.1)		1,802 (79.2)	1,062 (77.8)	

\*\**p*<0.01, \*\*\**p*<0.001.

**Table 4** Individualism and self-determination, expectation of family succession, familiarity with family, and attitude toward posthumous reproduction

	Individualism and self-determination					
	It is free will to use or not use scientific technologies.			I want to leave a trace of my life after my death.		
	+	–	<i>p</i> value	+	–	<i>p</i> value
Q1 Do you agree or disagree with posthumous reproduction?	( <i>n</i> =2,595)	( <i>n</i> =963)		( <i>n</i> =2,600)	( <i>n</i> =962)	
I agree.	1,663 (64.1)	560 (58.2)	**	1,687 (64.9)	535 (55.6)	***
I disagree.	932 (35.9)	403 (41.8)		913 (35.1)	427 (44.4)	
Q2 It is against natural providence.	( <i>n</i> =2,657)	( <i>n</i> =988)		( <i>n</i> =2,661)	( <i>n</i> =990)	
I think so.	1,728 (65.0)	654 (66.2)	–	1,762 (66.2)	624 (63.0)	–
I don't think so.	929 (35.0)	334 (33.8)		899 (33.8)	366 (37.0)	
Q3 There is no problem if the mother bears the responsibility for fostering.	( <i>n</i> =2,656)	( <i>n</i> =990)		( <i>n</i> =2,661)	( <i>n</i> =991)	
I think so.	1,815 (68.3)	568 (57.4)	***	1,757 (66.0)	631 (63.7)	–
I don't think so.	841 (31.7)	422 (42.6)		904 (34.0)	360 (36.3)	
Q4 It is a misuse of a parent's right (self-determination right).	( <i>n</i> =2,651)	( <i>n</i> =979)		( <i>n</i> =2,651)	( <i>n</i> =985)	
I think so.	1,045 (39.4)	407 (41.6)	–	1,056 (39.8)	401 (40.7)	–
I don't think so.	1,606 (60.6)	572 (58.4)		1,595 (60.2)	584 (59.3)	
Q5 The husband's antemortem will should be respected.	( <i>n</i> =2,654)	( <i>n</i> =987)		( <i>n</i> =2,658)	( <i>n</i> =989)	
I think so.	2,059 (77.6)	715 (72.4)	**	2,119 (79.7)	662 (66.9)	***
I don't think so.	595 (22.4)	272 (27.6)		539 (20.3)	327 (33.1)	
Q6 It is unacceptable since deceased man's will cannot be confirmed.	( <i>n</i> =2,647)	( <i>n</i> =986)		( <i>n</i> =2,652)	( <i>n</i> =987)	
I think so.	718 (27.1)	279 (28.3)	–	682 (25.7)	315 (31.9)	***
I don't think so.	1,929 (72.9)	707 (71.7)		1,970 (74.3)	672 (68.1)	
Q7 Without social agreement, it is problematic.	( <i>n</i> =2,641)	( <i>n</i> =987)		( <i>n</i> =2,649)	( <i>n</i> =986)	
I think so.	1,166 (44.1)	491 (49.7)	**	1,220 (46.1)	439 (44.5)	–
I don't think so.	1,475 (55.9)	496 (50.3)		1,429 (53.9)	547 (55.5)	
Q8 It is unavoidable for continuing the family line.	( <i>n</i> =2,646)	( <i>n</i> =987)		( <i>n</i> =2,655)	( <i>n</i> =985)	
I think so.	585 (22.1)	188 (19.0)	*	610 (23.0)	164 (16.6)	***
I don't think so.	2,061 (77.9)	799 (81.0)		2,045 (77.0)	821 (83.4)	

since the deceased man's will cannot be confirmed" ( $p < 0.001$ ), and "Without social agreement, it is problematic" ( $p < 0.001$ ).

### ***Views on family, religion, and life-death and attitude toward posthumous reproduction.***

The relationships between the attitude toward posthumous reproduction and the views in the 5 categories (individualism and self-determination, family succession, familiarity with family, death-related experience, and views on the afterlife) were examined by asking two questions for each category (Tables 4 and 5).

#### **1. Individualism and self-determination**

The 2,681 (72.8%) students who agreed that the "Use of scientific technologies should be decided by individuals, and others should not object" were significantly more likely to support posthumous reproduction ( $p < 0.01$ ) than the 998 (27.2%) students who disagreed with the above item. The students who agreed with the above item also were significantly more likely to agree that "There is no problem if the mother bears the responsibility for fostering" ( $p < 0.001$ ), "The husband's antemortem will should be respected" ( $p <$

0.01), and "Posthumous reproduction is unavoidable for continuing the family line" ( $p < 0.001$ ), whereas they were significantly less likely to agree that "Without social agreement, it is problematic" ( $p < 0.01$ ).

The 2,685 (72.8%) students who agreed "I want to leave a trace of my life after my death" supported posthumous reproduction at a significantly higher percentage ( $p < 0.001$ ) than the 1,001 (27.2%) students who answered disagreed. The students who agreed with the above item were also significantly more likely to agree that "The husband's antemortem will should be respected" ( $p < 0.001$ ) and "Posthumous reproduction is unavoidable for continuing the family line" ( $p < 0.001$ ), whereas they were significantly less likely to agree that "It is unacceptable since the deceased man's will cannot be confirmed" ( $p < 0.001$ ).

#### **2. Family succession**

The 697 (18.9%) students who answered yes to the item "I am expected to continue the family line" were significantly more likely to agree that "The husband's antemortem will should be respected" ( $p < 0.05$ ) and "Posthumous reproduction is unavoidable for continu-

Table 4 Continued from opposite page

Family succession						Familiarity with family					
I am expected to continue the family line.			I will be mature only after having a child.			I like children.			I want to be married in future.		
+	–	p value	+	–	p value	+	–	p value	+	–	p value
(n=655)	(n=2,892)		(n=893)	(n=2,672)		(n=2,943)	(n=620)		(n=2,978)	(n=514)	
423 (64.6)	1,789 (61.9)	–	559 (62.6)	1,664 (62.3)	–	1,866 (63.4)	359 (57.9)	**	1,883 (63.2)	304 (59.1)	–
232 (35.4)	1,103 (38.1)		334 (37.4)	1,008 (37.7)		1,077 (36.6)	261 (42.1)		1,095 (36.8)	210 (40.9)	
(n=684)	(n=2,951)		(n=918)	(n=2,733)		(n=3,025)	(n=628)		(n=3,040)	(n=531)	
450 (65.8)	1,924 (65.2)	–	623 (67.9)	1,762 (64.5)	–	1,989 (65.8)	397 (63.2)	–	2,019 (66.4)	316 (59.5)	**
234 (34.2)	1,027 (34.8)		295 (32.1)	971 (35.5)		1,036 (34.2)	231 (36.8)		1,021 (33.6)	215 (40.5)	
(n=686)	(n=2,951)		(n=918)	(n=2,736)		(n=3,027)	(n=628)		(n=3,040)	(n=532)	
464 (67.6)	1,914 (64.9)	–	597 (65.0)	1,792 (65.5)	–	1,998 (66.0)	393 (62.6)	–	1,997 (65.7)	339 (63.7)	–
222 (32.4)	1,037 (35.1)		321 (35.0)	944 (34.5)		1,029 (34.0)	235 (37.4)		1,043 (34.3)	193 (36.3)	
(n=690)	(n=2,935)		(n=915)	(n=2,722)		(n=3,011)	(n=626)		(n=3,029)	(n=529)	
275 (40.1)	1,174 (40.0)	–	432 (47.2)	1,025 (37.7)	***	1,194 (39.7)	262 (41.9)	–	1,199 (39.6)	222 (42.0)	–
410 (59.9)	1,761 (60.0)		483 (52.8)	1,697 (62.3)		1,817 (60.3)	364 (58.1)		1,830 (60.4)	307 (58.0)	
(n=684)	(n=2,946)		(n=918)	(n=2,728)		(n=3,021)	(n=627)		(n=3,038)	(n=529)	
543 (79.4)	2,221 (75.4)	*	711 (77.5)	2,067 (75.8)	–	2,346 (77.7)	436 (69.5)	***	2,362 (77.7)	365 (69.0)	***
141 (20.6)	725 (24.6)		207 (22.5)	661 (24.2)		675 (22.3)	191 (30.5)		676 (22.3)	164 (31.0)	
(n=681)	(n=2,942)		(n=913)	(n=2,725)		(n=3,013)	(n=627)		(n=3,028)	(n=531)	
203 (29.8)	792 (26.9)	–	284 (31.1)	714 (26.2)	**	817 (27.1)	180 (28.7)	–	815 (26.9)	155 (29.2)	–
478 (70.2)	2,150 (73.1)		629 (68.9)	2,011 (73.8)		2,196 (72.9)	447 (71.3)		2,213 (73.1)	376 (70.8)	
(n=680)	(n=2,939)		(n=915)	(n=2,718)		(n=3,008)	(n=627)		(n=3,026)	(n=531)	
311 (45.7)	1,339 (45.6)	–	438 (47.9)	1,221 (44.9)	–	1,374 (45.7)	284 (45.3)	–	1,384 (45.7)	237 (44.8)	–
369 (54.3)	1,600 (54.4)		477 (52.1)	1,497 (55.1)		1,634 (54.3)	343 (54.7)		1,642 (54.3)	292 (55.2)	
(n=681)	(n=2,942)		(n=912)	(n=2,729)		(n=3,011)	(n=630)		(n=3,030)	(n=531)	
199 (29.2)	570 (19.4)	***	261 (28.6)	510 (18.7)	***	637 (21.2)	136 (21.6)	–	662 (21.8)	98 (18.5)	–
482 (70.8)	2,372 (80.6)		651 (71.4)	2,219 (81.3)		2,374 (78.8)	494 (78.4)		2,368 (78.2)	433 (81.5)	

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

ing the family line" ( $p < 0.001$ ) than the 2,982 (81.1%) students who answered no to the above item.

The 934 (25.3%) students who answered yes to the item "I will be mature only after having a child" were significantly more likely to agree that "It is a misuse of a parent's right (self-determination right)" ( $p < 0.001$ ), "It is unacceptable since the deceased man's will cannot be confirmed" ( $p < 0.01$ ), and "Posthumous reproduction is unavoidable for continuing the family line" ( $p < 0.001$ ) than the 2,756 (74.7%) students who answered no to the above item.

### 3. Familiarity with family

The 3,058 (82.8%) students who answered yes to the item "I like children" supported posthumous reproduction at a significantly higher percentage ( $p < 0.01$ ) than the 635 (17.2%) students who answered no. The students who answered yes to the above item also were significantly more likely to agree that "The husband's antemortem will should be respected" ( $p < 0.001$ ).

The 2,978 (85.3%) students who answered yes to the item "I want to be married in the future" were significantly more likely to agree that "It is against natural providence" ( $p < 0.01$ ) and "The husband's

antemortem will should be respected" ( $p < 0.001$ ) than the 514 (14.7%) students who said they did not want to get married.

### 4. Death-related experience

The 277 (7.5%) students who answered yes to the item "I have had experience with a life-threatening disease" were significantly more likely to agree that "It is unacceptable since the deceased man's will cannot be confirmed" ( $p < 0.05$ ) than the 3,417 (92.5%) students who said they had no such experience.

The 3,237 (87.8%) students who answered yes to the item "I have experienced the death, funeral, or cremation of someone close to me" supported posthumous reproduction at a significantly higher percentage ( $p < 0.05$ ) than the 448 (12.2%) students who answered that they had no such experience.

### 5. Views on the spirit world or afterlife

The 2,676 (72.8%) students who answered yes to the item "Deceased family members will stay around and watch me" supported posthumous reproduction at a significantly higher percentage ( $p < 0.01$ ) than the 998 (27.2%) students who answered no. The students who answered yes to the above item were also signifi-

**Table 5** Death-related experience, contact with the spirit world or afterlife, and attitude toward posthumous reproduction

	Death-related experience					
	Experience of life-threatening disease			Contact with death, a funeral, or cremation		
	+	–	<i>p</i> value	+	–	<i>p</i> value
Q1 Do you agree or disagree with posthumous reproduction?	(n=257)	(n=3,306)		(n=3,120)	(n=432)	
I agree.	157 (61.1)	2,066 (62.5)	–	1,967 (63.0)	248 (57.4)	*
I disagree.	100 (38.9)	1,240 (37.5)		1,153 (86.2)	184 (42.6)	
Q2 It is against natural providence.	(n=275)	(n=3,378)		(n=3,198)	(n=444)	
I think so.	186 (67.6)	2,201 (65.2)	–	2,085 (65.2)	293 (66.0)	–
I don't think so.	89 (32.4)	1,177 (34.8)		1,113 (34.8)	151 (34.0)	
Q3 There is no problem if mother bears the responsibility for fostering.	(n=275)	(n=3,379)		(n=3,200)	(n=444)	
I think so.	178 (64.7)	2,211 (65.4)	–	2,103 (65.7)	281 (63.3)	–
I don't think so.	97 (35.3)	1,168 (34.6)		1,097 (34.3)	163 (36.7)	
Q4 It is a misuse of a parent's right (self-determination right).	(n=274)	(n=3,363)		(n=3,183)	(n=443)	
I think so.	120 (43.8)	1,337 (39.8)	–	1,258 (39.5)	191 (43.1)	–
I don't think so.	154 (56.2)	2,026 (60.2)		1,925 (60.5)	252 (56.9)	
Q5 The husband's antemortem will should be respected.	(n=275)	(n=3,373)		(n=3,192)	(n=445)	
I think so.	209 (76.0)	2,570 (76.2)	–	2,444 (76.6)	326 (73.3)	–
I don't think so.	66 (24.0)	803 (23.8)		748 (23.4)	119 (26.7)	
Q6 It is unacceptable since deceased man's will cannot be confirmed.	(n=275)	(n=3,365)		(n=3,186)	(n=443)	
I think so.	94 (34.2)	905 (26.9)	*	859 (27.0)	137 (30.9)	–
I don't think so.	181 (65.8)	2,460 (73.1)		2,327 (73.0)	306 (69.1)	
Q7 Without social agreement, it is problematic.	(n=274)	(n=3,361)		(n=3,182)	(n=442)	
I think so.	138 (50.4)	1,520 (45.2)	–	1,447 (45.5)	204 (46.2)	–
I don't think so.	136 (49.6)	1,841 (54.8)		1,735 (54.5)	238 (53.8)	
Q8 It is unavoidable for continuing the family line.	(n=272)	(n=3,369)		(n=3,186)	(n=444)	
I think so.	66 (24.3)	709 (21.0)	–	685 (21.5)	89 (20.0)	–
I don't think so.	206 (75.7)	2,660 (79.0)		2,501 (87.6)	355 (80.0)	

cantly more likely to agree that “The husband's antemortem will should be respected” ( $p<0.001$ ) and “Posthumous reproduction is unavoidable for continuing the family line” ( $p<0.001$ ).

The 1,953 (53.6%) students who answered yes to the item “I am a part of the invisible world” were significantly more likely to agree that “It is against natural providence” ( $p<0.001$ ), “It is a misuse of a parent's right (self-determination right)” ( $p<0.001$ ), and “Posthumous reproduction is unavoidable for continuing the family line” ( $p<0.01$ ) than the 1,689 (46.4%) students who answered that they were not part of a invisible world.

## Discussion

**Support for posthumous reproduction and posthumous acknowledgment.** Nearly two-thirds (63.3%) of the students agreed or somewhat agreed with posthumous reproduction, while 37.7% disagreed or somewhat disagreed (Table 1). This is

almost the same ratio as that in the survey by the Ministry of Health, Labor, and Welfare, where nearly two-thirds (64.5%) of respondents agreed that “Posthumous reproduction should be allowed based on the wife's free will” and “Posthumous reproduction should be allowed if the husband's antemortem consent is documented”; 33.2% disagreed. The ministry's survey analyzed data by sex as well as by marital status, and found some differences: 75.6% of unmarried males and 59.7% of married males agreed with the above items, while 82.5% of unmarried females and 64.0% of married females agreed; on the other hand, our results show no difference between males and females [24]. A total of 89.8% of the students were for posthumous acknowledgment of a born child, which was higher than the percentage who supported posthumous reproduction. This indicates that many students considered it necessary to admit the parent-child relationship from the viewpoint of the born child even if they are opposed to posthumous reproduction.

**Background of surveyed students and atti-**

Table 5 Continued from opposite page

Contact with the spirit world or afterlife					
Deceased family members will stay around and watch me.			I am a part of the invisible world.		
+	—	p value	+	—	p value
(n=2,595)	(n=960)		(n=1,892)	(n=1,633)	
1,656 (63.8)	565 (58.9)	**	1,178 (62.3)	1,025 (62.8)	—
939 (36.2)	395 (41.1)		714 (37.7)	608 (37.2)	
(n=2,653)	(n=988)		(n=1,936)	(n=1,674)	
1,740 (65.6)	640 (64.8)	—	1,321 (68.2)	1,039 (62.1)	***
913 (34.4)	348 (35.2)		615 (31.8)	635 (37.9)	
(n=2,657)	(n=986)		(n=1,937)	(n=1,674)	
1,732 (65.2)	651 (66.0)	—	1,269 (65.5)	1,092 (65.2)	—
925 (34.8)	335 (34.0)		668 (34.5)	582 (34.8)	
(n=2,639)	(n=987)		(n=1,929)	(n=1,665)	
1,061 (40.2)	391 (39.6)	—	827 (42.9)	615 (36.9)	***
1,578 (59.8)	596 (60.4)		1,102 (57.1)	1,050 (63.1)	
(n=2,647)	(n=989)		(n=1,933)	(n=1,671)	
2,101 (79.4)	668 (67.5)	***	1,491 (77.1)	1,260 (75.4)	—
546 (20.6)	321 (32.5)		442 (22.9)	411 (24.6)	
(n=2,641)	(n=987)		(n=1,925)	(n=1,671)	
704 (26.7)	287 (29.1)	—	550 (28.6)	435 (26.0)	—
1,937 (73.3)	700 (70.9)		1,375 (71.4)	1,236 (74.0)	
(n=2,637)	(n=985)		(n=1,931)	(n=1,663)	
1,223 (46.4)	427 (43.4)	—	900 (46.6)	738 (44.4)	—
1,414 (53.6)	558 (56.6)		1,031 (53.4)	925 (55.6)	
(n=2,645)	(n=983)		(n=1,929)	(n=1,671)	
607 (22.9)	162 (16.5)	***	444 (23.0)	320 (19.2)	**
2,038 (77.1)	821 (83.5)		1,485 (77.0)	2,836 (80.8)	

\* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .**tudes toward posthumous reproduction.**

Attention should be paid to the difference in attitudes toward posthumous reproduction between male and female students. In particular, most males mostly agreed that “Posthumous reproduction is unavoidable for continuing the family line”, while most females agreed that “The husband’s antemortem will should be respected”. Also in the survey by the Ministry of Health, Labor, and Welfare, 62.4% of unmarried women and 49.3% of married women agreed that “Posthumous reproduction should be allowed if the husband’s antemortem consent is documented”, while 52.2% of unmarried men and 43.8% of married men answered agreed, indicating that women are more in favor of “respect for the husband’s antemortem will” than men [24]. We see from this result that “family succession” and “respect for the husband’s antemortem will” could have different logical backgrounds. Men are more concerned with the social aspect of family succession and women are more concerned with maintaining close relationships between family members.

We found that the answers did not considerably differ between students with urban hometowns and those from rural areas, or between science majors and humanities majors. For university students in the modern age, such background differences were not relevant to their views on the issue of posthumous reproduction.

**Support for assisted reproduction technologies and attitude toward posthumous reproduction.**

It is not surprising that students who supported assisted reproduction technologies were more likely to support posthumous reproduction, since the latter depends on the former.

More students were reluctant to surrogate birth (62.3%) than to artificial insemination (31.3%). However, resistance to both technologies had a similar correlation with the attitude toward posthumous reproduction. In other words, those who were not reluctant to either technology were more likely to support posthumous reproduction, the parent’s self-determination right, and respect for the antemortem

will of the husband. This indicates that the same tendency can be found for posthumous reproduction technologies and in the previous result [27] that those who have a liberal view on family or gender roles with emphasis on self-determination were more likely to support assisted reproduction technologies.

However, in the responses to "Posthumous reproduction is unavoidable for continuing the family line", there was a difference between those who were positive towards artificial insemination and those who were positive towards surrogate birth. The students who are not reluctant to artificial insemination were less likely to agree that "Posthumous reproduction is unavoidable for continuing the family line", showing their rejection of the idea that posthumous reproduction is used for the traditional purpose of family succession. On the other hand, the students who are not reluctant to surrogate birth did not reject using posthumous reproduction for family succession. This means that the minority of students who were positive towards surrogate birth (more than 60% of the students were reluctant or somewhat reluctant to it) were not necessarily more liberal than those who were positive towards artificial insemination, and were less reluctant to the traditional factor "For the succession of family". This strongly indicates that support for posthumous reproduction depends not only on a liberal way of thinking but also on other factors, which need to be examined further.

***Individualism, self-determination, and attitude toward posthumous reproduction.*** The result overall also supports the deep relationship noted above, between a liberal attitude with emphasis on individualism and support for assisted reproduction technologies. But here again, attention should be paid to the relationship between individualism and the traditional factor of family succession in the item "Posthumous reproduction is unavoidable for continuing the family line".

It should also be noted that the idea "I want to leave a trace of my life after my death" was strongly connected to support for posthumous reproduction. A belief in life after death leads to a student's support for the idea of having child after death. It is not correct to consider that "respect for the husband's antemortem will" comes only from the self-determination idea that liberals emphasize. The existential viewpoint starting from the "meaning of life", i.e., "I want to

leave a trace of my life after my death", is also important.

***Twofold aspects of the Japanese family—family succession and familiarity to family—and attitude toward posthumous reproduction.***

The Japanese family has 2 aspects, "family continuity" and "family tied by intimacy". Even today, there still remains the traditional form of family succession, in which the eldest son takes over the family.

There were strong correlations between the attitude that "Posthumous reproduction is unavoidable for continuing the family line" and the 2 items in the category "Family succession": "I am expected to continue the family line" and "I will be mature only after having a child". The male students were more positive towards "Posthumous reproduction is unavoidable for continuing the family line" than the female students. The students who agreed with "I am expected to continue the family line", those who agreed with "I will be mature only after having a child", and male students all had similar opinions on posthumous reproduction, with no significant difference. This shows that family succession is quite serious for those who are supposed to continue the family line and that this situation greatly affected their judgment on posthumous reproduction. On the other hand, the fact that there was no correlation between the responses to the 2 items in the category "Familiarity with family" and the responses to "Posthumous reproduction is unavoidable" clearly indicates that "Familiarity with family" is a different aspect from "Family succession".

The responses to "The husband's antemortem will to have a child should be respected even with posthumous reproduction" had little correlation with the responses to the items in the category "Family succession" but were strongly correlated with the responses to the 2 items in the category "Familiarity with family". This indicates that whether or not a deceased husband's antemortem will is respected depends on the familiarity and relationship between the living family and the deceased husband. The result that the students who responded yes to "I like children" were more likely to support posthumous reproduction shows that the factor "Familiarity with family" considerably affects a person's judgment on the entire issue of posthumous reproduction.

However, "Familiarity with family" in posthumous reproduction is not that among the living family but

that between the living family and the deceased husband, *i.e.*, intimacy across the border between life and death. In order to clarify the familiarity, it is therefore crucial to study the people's views on life and death, as well as on the relationship between the living and the dead.

***Death-related experience, views on spirit world or afterlife, and attitude toward posthumous reproduction.*** We did not find strong correlations between the responses to "Death-related experience" and the views on posthumous reproduction. This could be due to the respondents' very young age, at which they may find it difficult to have a realistic consciousness of death.

The 2 items in the category "Views on spirit world or afterlife" asked about 2 different aspects of the student's religious consciousness. It is to be noted that a clear difference can be found between the answers to these 2. The first one, "Deceased family members will stay around and watch me" is a question of interpersonal relationships between living and deceased persons. The other item, "I am a part of the non-physical (spirit) world", asks about views on life beyond death, *i.e.*, about the relationship between the physical world and the self that exists beyond it.

The students who answered yes to "I am a part of the invisible world" were critical of posthumous reproduction, answering yes to "It is against natural providence" and "It is a misuse of a parent's right (self-determination right)". This is a typical criticism from a conservative viewpoint against assisted reproduction technologies. However, these students were also sympathetic to the traditional consciousness of "Family succession" and agreed that "Posthumous reproduction is unavoidable for continuing the family line" at a high percentage. As a result, they did not exhibit a significant difference in the pros and cons of posthumous reproduction.

Agreement with the item "Deceased family members will stay around and watch me" had no strong correlation with the above-mentioned conservative logic, such as "It is against natural providence" or "It is a misuse of a parent's right (self-determination right)", but was strongly correlated with agreement that "The husband's antemortem will should be respected". The aforementioned strong correlation between "Familiarity with family" and "Respect for the husband's antemortem will" could be deeply con-

nected to the belief that "Deceased family members will stay around and watch me". The deep correlation between this belief and support for posthumous reproduction is also extremely important in considering the Japanese consciousness regarding posthumous reproduction.

The belief that "Deceased family members will stay around and watch me" is a Japanese Buddhist view of deceased people and ancestors, connected to commemoration of the ancestors. In fact, the present survey also asked "How often do you pray at the family altar?" There was a deep correlation between the belief that "Deceased family members will stay around and watch me" and the frequency of praying at the family altar. Support for posthumous reproduction is thus strongly correlated with traditional religious beliefs in Japan.

***Conclusion.*** In the present survey, a majority of respondents supported posthumous reproduction. Such support correlated strongly with support for assisted reproduction technologies and a liberal worldview with emphasis on self-determination, although it was also affected by traditional views such as family succession. Also, support for posthumous reproduction was deeply correlated with the familiarity view and with the traditional Japanese belief that deceased family members watch the living ones. Thus, views on posthumous reproduction in Japan are culturally complex and cannot be explained by the dichotomy that conservatives and liberals represent.

**Acknowledgments.** The cooperation of the faculty members and students at the 32 universities across the country is greatly appreciated.

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