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The Effect of Values and Secularism on Attitude towards Pre-Implantation Genetic Diagnosis of Embryos

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Abstract: In this study we tested the associations of four high-order values (openness to change, self-transcendence, conservation, and self-enhancement, devised according to Schwartz's model) and secularism of state with individuals' attitude towards pre-implantation genetic diagnosis of embryos. Moreover, we tested the mediating effects of secularism of state on the relationship between values and attitude towards this issue related to embryos. Participants were 289 Spaniards who completed a questionnaire. Results showed that attitude towards pre-implantation genetic diagnosis was negatively affected by conservation and positively by self-transcendence. Moreover, results indicated that attitude towards a secular state positively correlates with attitude towards pre-implantation genetic diagnosis. Finally, results showed that secularism mediated the effects of conservation and self-transcendence, but not the effect of openness to change and self-enhancement on attitude towards pre-implantation genetic diagnosis. Taken together, results of this study suggest that people adopting values emphasizing the defence of the tradition reject pre-implantation genetic diagnosis because they want state laws to represent religious traditional values; on the other hand, people endorsing values emphasising the welfare of all accept pre-implantation genetic diagnosis because they want state laws to be free from religious values.

Keywords: values; secularism; pre-implantation genetic diagnosis of embryos

1. Introduction

Pre-implantation genetic diagnosis (PGD) is a technique used to identify genetic defects in embryos and consists in the genetic profiling of embryos, prior to their implantation in the uterus. This technique is not allowed everywhere. Some countries, such as the United States and the United Kingdom, allow PGD in specific cases (e.g., where there is a family history of serious genetic diseases), but forbid it in others (e.g., sex selection). Like other technologies involving embryos (e.g., human embryonic stem cell research), this technique has raised several ethical debates, often stemming from considerations concerning whether embryos should be treated as human beings (Robertson 2003).

Several studies investigated the attitude towards PGD. Studies conducted in The Netherlands (Lammens et al. 2009) and in the United States (Rich et al. 2014) showed a general acceptance of PGD among people at high risk of hereditary cancer. Similar results were found by Olesen et al. (2016), in a study carried out in Malaysia with potential PGD users (they or their children had a genetic disease). Gourounti and Glentis (2012) reviewed the literature concerning patients' attitudes towards PGD and found, in general, high levels of approval of PGD in couples at high risk. With regard to the

determinants of favorable attitudes towards PGD, the most important predictor appears to be personal experience of genetic diseases (Wah Hui et al. 2002; Hershberger and Pierce 2010; Van Rij et al. 2012). Indeed, the majority of studies investigating attitude towards PGD were understandably conducted with people who might need this technique. However, it is also important to explore attitudes towards PGD in the general population, not least because it can influence its regulation. For example, in 2005 the general population in Italy was called to vote for a referendum aimed at abrogating a law forbidding PGD. The referendum, however, did not reach the necessary quorum and was subsequently nullified. The lack of support and engagement in the general public, therefore, had a significant impact on the regulation of this practice.

Few studies examined the role played by psychological or psychosocial variables in predicting attitudes towards PGD in the general population. For example, a study carried out in Germany showed how knowledge was a significant predictor of the general acceptance of PGD for medical reasons (Meister et al. 2005). Another study conducted in Italy showed that low identification with Catholics and high favor towards a secular state were significant predictors of Italians' endorsement of PGD (Hichy and Di Marco 2014).

1.1. Schwartz's Personal Values

While knowledge, social identity and endorsement of a secular state may contribute to understanding the general public's attitude towards PGD, we argue that the literature so far has ignored a key construct: values.

Schwartz and Bilsky (1987, 1990) defined values as concepts or beliefs that transcend specific situations and guide the selection or evaluation of behaviors. Schwartz (1992) infers 10 motivational types of values:

- Power, that strives for social status, prestige, and control over people and resources;
- Achievement, that focuses on personal success;
- Hedonism, that gives priority to pleasure or gratification for oneself;
- Stimulation, that strives for excitement, novelty, and challenge;
- Self-direction, that focuses on independence of thought and action;
- Universalism, that gives priority to understanding, appreciation, tolerance, and protection for the welfare of all people and for nature;
- Benevolence, that strives for the preservation and enhancement of welfare of people belonging to ingroup;
- Tradition, that gives priority to respect, commitment, and acceptance of the customs and ideas provided by culture or religion;
- Conformity, that leads to restraint of actions, inclinations, and impulses likely to upset others and violate social expectations or norms;
- Security, that focuses on safety, harmony, and the stability of society, relationships and self.

These values were derived from an analysis of universal requirements that all individuals and groups must cope with. Research in more than 60 nations confirms the near-universal definition of these 10 values (Schwartz 1992; Schwartz and Bardi 2001; Schwartz and Sagiv 1995).

The critical content aspect that stands out among values is the type of motivational goal they express. The theory proposed by Schwartz (1992) affirmed that actions taken in the pursuit of each value have psychological, practical and social consequences that may be compatible or may conflict with the pursuit of other values. For example, the pursuit of achievement values may conflict with the pursuit of benevolence values; indeed, looking for success for oneself is likely to obstruct actions aimed at enhancing the welfare of others. The overall pattern of relationships of value conflict and compatibility generate a circular structure of value systems. This circular arrangement of the values represents a motivational continuum: the closer any two values are in either direction around the circle, the more similar their fundamental motivations; the more distant any two values are, the more

opposed their fundamental motivations. In this circular structure, 10 values are represented in a bi-dimensional space, whose orthogonal dimensions, namely higher order values, are:

- Openness to change vs. conservation: reflects the contrast between values emphasizing the achievement of independent actions and thoughts (self-direction and stimulation values), and values emphasizing self-restriction, order, and resistance to change (security, conformity, and tradition values).
- Self-enhancement vs. self-transcendence: stresses the achievement of welfare and the satisfaction of needs. Individuals endorsing self-enhancement promote their own welfare and needs, while considering others merely instruments for satisfying power and achievement values. By contrast, self-transcendence points the person adopting it towards the search for welfare, prosperity and serenity for everyone (universalism and benevolence values).

Hedonism seem to have an ambiguous collocation within two dimensions; it shares elements of both openness and self-enhancement. Some studies indicate that it is associated with openness to change, others with self-enhancement (Schwartz 1992; Schwartz and Sagiv 1995). This structure received substantial support in cross-cultural research founding that the relationship among values is common to all human societies (Schwartz 1992; Schwartz and Sagiv 1995).

Regarding the relationship between values and attitudes towards PGD, we hypothesized that the values with the strongest association with this attitude should be self-transcendence and conservation. Indeed, if people do not have a personal interest in PGD, the social-focused values should be related to attitude towards PGD more than personal-focused values. In particular, conservation should negatively correlate with favor towards PGD, because PGD could violate social norms suggested by traditional culture and religion; however, self-transcendence should positively correlate with favor towards PGD because of the importance given to the welfare of all people. As for openness to change and self-enhancement, we expected that these values should have no or little relationship with attitudes towards PGD: indeed, these values tap into self-interest which people not directly involved in PGD do not have in this context.

1.2. Secularism of State

Secularism promotes the absence of involvement between church and state (Feldman 2005). Contemporary countries comprise both secular and religious states. An example of a religious state is the Islamic Republic of Iran, which embraces Islamic criteria to regulate its laws. With regard to secular states, Kosmin (2007) stated that they could be placed along a continuum ranging from soft to hard secularism. States that are positioned near the soft secular pole of the continuum consider religion as a private issue. An example of this kind of country is the United Kingdom, where the relationship between church and state is purely formal (Kosmin 2007). On the other hand, states that are positioned near the hard pole of the continuum are often atheistic and tend to consider religious principles epistemologically illegitimate. An example of this kind of state is the People's Republic of China, which is officially atheist, and for much of its history maintained a hostile attitude towards religion (Kosmin 2007). There are other states that fall somewhere in the middle of this continuum, such as the United States, France, and Italy whose constitutions affirm the separation between church and state and allow religious freedom.

Some studies showed that the attitude towards the secularism of state was related to attitudes towards both personal (e.g., religion and political orientation) and social issues (e.g., same-sex marriage—see Hichy et al. 2014, 2015a, 2015b). With regard to the relationship between values and attitude towards secularism we hypothesized that this should be stronger in the case of socially-relevant values as compared to person-focused ones. Specifically, conservation should be negatively related with the endorsement of a secular state, because secularism could violate traditional norms and religion. Self-transcendence on the other hand should have a positive relationship with the support

of state secularism, because welfare should be guaranteed regardless of the religious orientation. Person-focused values should have no or little relationship with attitude towards a secular state.

With regard to relationship between secularism and attitude towards PGD, a previous study found that the favor towards a secular state was associated with favor towards PGD (Hichy and Di Marco 2014). Therefore, we hypothesized that positive attitudes towards secularism should be related with positive attitudes to PGD. Indeed, people supporting secularism believe that religion should not influence a state's laws and, therefore, that the laws of the state should allow the adoption of new genetic technology, even if these collide with religious principles.

2. Context of the Study

This study was conducted in Spain, which is a secular state; indeed the separation between Church and State is ratified by Spanish constitution promulged in the 1978 ("No religion shall have a State character. The public authorities shall take into account the religious beliefs of Spanish society and shall consequently maintain appropriate cooperation relations with the Catholic Church and other confessions", Section 16). Moreover, the Spanish constitution affirms religious freedom ("Freedom of ideology, religion and worship of individuals and communities is guaranteed, with no other restriction on their expression than may be necessary to maintain public order as protected by law", Section 16). With regard to religion, the most widespread religion is Catholicism (69.8% of Spaniards define themselves as Catholics, despite the fact that only 26.4% manifest as practitioners (Centro de Investigaciones Sociológicas 2018). Finally, PGD is possible in Spain thanks to the approval of Law 14/2006, of 26 May on techniques of assisted human reproduction. This law began to regulate the application of scientifically proven and clinically indicated techniques of assisted human reproduction in the prevention and treatment of diseases of genetic origin. According to this law, pre-implantation genetic diagnosis is authorized for the detection of serious hereditary diseases, of early appearance and for which there is still no cure, in order to carry out the selection of embryos not affected by the disease, for their transfer. This option offers, in the case of diseases of incurable origin, the possibility of selecting among the fertilized ovules in assisted reproduction processes that embryo which does not have the disease gene, therefore giving rise to a healthy child.

3. Methods

3.1. Participants and Procedure

Participants were 289 Spanish university students (119 males and 170 females), enrolled in various courses (Educational Sciences = 86, Engineering = 20, Environmental Sciences = 24, Foreign Languages = 5, Juridical Sciences = 66, Physiotherapy = 24, and Psychology = 64). All participants were born and lived in Spain, and they were aged from 18 to 29 years (Mean = 21.26, standard deviation (SD) = 2.77). Participants were an opportunity sample of university students who were approached and volunteered to take part in the study. They were contacted in various university sites (e.g., study room) and asked to complete a questionnaire. All participants were informed that their responses would remain confidential. Ethical approval for the study was granted by the principal investigator's institution.

3.2. Measures

Secularism of State Scale. In order to measure attitudes towards secularism, the Secularism of State Scale (Hichy et al. 2012) was used. This scale consists of eight items such as: "The Church should remain in its place and avoid getting involved in political affairs" and "I think it is appropriate that the Church gives its opinion on State laws" (reverse coded). For each item, participants expressed their opinion on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree), with 4 meaning neither agree, nor disagree (alpha = 0.88).

Portrait Values Questionnaire. To measure personal values, we used the Spanish adaptation of the Portrait Values Questionnaire devised by Schwartz et al. (2001). The scale consists of 40 descriptions

of a hypothetical person and his/her goals, which represent 10 Schwartz values. Examples of items (and pertinent values) are: "He/She likes to be in charge and to tell others what to do. He/She wants people to do what he/she says" (power); "Being very successful is important to him/her. He/She likes to stand out and to impress other people" (achievement); "He/She really wants to enjoy life. Having a good time in very important to him/her" (hedonism); "He/She looks for adventures and likes to take risk. He/She wants to have an exciting life" (stimulation); "He/She thinks it is important to be interested in things. He/She is curious and tries to understand everything" (self-direction); "He/She thinks it is important that every person in the world should be treated equally. He/She wants justice for everybody, even for people he/she doesn't know" (universalism); "He/She always wants to help the people who are close to him/her. It is very important to him/her to care for the people he knows and likes" (benevolence); "He/She thinks it is important to do things the way he/she learned from his/her family. He/She wants to follow their customs and traditions" (tradition); "He/She believes that people should do what they are told. He/She thinks people should follow rules at all times, even when no one is watching" (conformity); "The safety of his/her country is very important to him/her. He/She wants his/her country to be safe from its enemies" (security). For each item participants indicated how much like him that person was on a 6-point scale ranging from 1 (not like me at all) to 6 (very much like me). The reliabilities of four high-order values were satisfactory (conservation = 0.76; self-transcendence = 0.79; openness to change = 0.77; self-enhancement = 0.85).

Attitudes towards Pre-Implantation Genetic Diagnosis (PGD). Four statements, already adopted in other studies, were used to measure attitudes towards PGD (e.g., "It is right to perform pre-implantation genetic diagnosis", see Hichy and Di Marco 2014). Participants answered on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree), with 4 meaning neither agree, nor disagree (alpha = 0.72).

4. Results

4.1. Preliminary Analyses

A confirmatory factor analysis implemented using LISREL 8 (Jöreskog and Sörbom 1993) was run to assess the factorial structure of the measures. To verify the adequacy of the models, the chi-square was used; a solution fits the data well when chi-square is non-significant ($p > 0.05$). Moreover, because this statistic depends on the sample size, the two-index strategy (Hu and Bentler 1999), proposing the combined use of the comparative fit index (CFI; Bentler 1990) and standardized root mean square residual (SRMR; Bentler 1995), was used. The model fits the data well if CFI is greater than or equal to 0.95, and SRMR is smaller than or equal to 0.08. A multidimensional scaling analysis was performed to assess the structure of Schwartz et al. (2001)'s value scale. The solution with two dimensions fitted the data well: stress = 0.07, RSQ = 0.98. As in previous studies carried on in different cultural contexts (Schwartz 1992; Schwartz and Sagiv 1995), the 10 values tended to assume a circular shape in the graph, and each of the quadrants represented the four higher order values hypothesized well. Finally, the value of hedonism was associated to openness to change. Moreover, a confirmatory factor analysis with four latent factors (the four higher order values: openness to change, self-enhancement, conservation, and self-transcendence) was performed (LISREL 8; Jöreskog and Sörbom 1993). For each higher order value, two aggregated indicators were obtained by randomly splitting the respective items (partial disaggregation model, Bagozzi and Heatherton 1994). As in previous studies (Sapienza et al. 2010), the results showed that the four factors model fit the data well: $\chi^2(14) = 43.41$, $p < 0.001$, CFI = 0.98, SRMR = 0.052; moreover, all factor loadings were significant and ranged between 0.53 and 0.87. With regard to secularism of state, results showed that the one-factor structure fit the data well: $\chi^2(14) = 110.17$, $p < 0.001$, CFI = 0.97, SRMR = 0.060; in addition, all factor loadings were significant and ranged from 0.62 to 0.78. Finally, with respect to attitudes towards the pre-implantation genetic diagnosis of embryos, a model with one factors was tested. Results showed

that this model fitted the data well: $\chi^2(2) = 5.71$, *ns*, CFI = 0.99, SRMR = 0.026. Also, in this case, all factor loadings were significant and comprised between 0.42 and 0.77.

The means, standard deviations, and inter-correlation of investigated constructs are reported in Table 1. The results showed that the most endorsed value was self-transcendence followed by openness to change and conservation; whereas the least endorsed value was self-enhancement. With regards to secularism, results showed that the attitudes towards a secular state was fairly positive as far as attitude towards PGD.

Table 1. Means, standard deviations, and correlations.

		Mean	S.D.	1	2	3	4	5	6
1	Conservation	3.92	0.64	1					
2	Self-transcendence	4.64	0.62	0.20 *	1				
3	Openness to change	4.50	0.63	0.10	0.49 *	1			
4	Self-enhancement	3.31	0.94	0.39 *	−0.17 *	0.20 *	1		
5	Secularism of state	5.35	1.28	−0.20 *	0.25 *	0.14 *	−0.08	1	
6	Attitude towards pre-implantation genetic diagnosis (PGD)	4.95	1.24	−0.14 *	0.24 *	0.15 *	−0.10	0.44 *	1

* $p < 0.01$.

With regards to correlation between measures, results showed a positive correlation between conservation and self-transcendence, conservation and self-enhancement, self-transcendence and openness to change, openness to change and self-enhancement; a negative correlation was found between self-transcendence and self-enhancement; no correlation was found between conservation and openness to change. Secularism of state correlated negatively with conservation and positively with self-transcendence and openness to change; no correlation was found between secularism of state and self-enhancement. Finally, attitude towards the pre-implantation genetic diagnosis of embryos positively correlated with self-transcendence, openness to change, and secularism of state, and negatively correlated with conservation; no correlation was found between attitude towards this issue and self-enhancement.

4.2. Association between Personal Values and Secularism of State

In order to test the mediating effects of secularism of state on the relationship between values and attitudes towards the pre-implantation genetic diagnosis of embryos, the bootstrapping procedure proposed by Hayes (2009, 2013) was used. As suggested by this method, three regression analyses for each dependent variable were carried out: (1) the mediator variable (secularism of state) was regressed on the independent variable (the four high-order values); (2) the dependent variable (attitude towards PGD) was regressed on the independent variables; and (3) the dependent variable was regressed simultaneously on both the mediator and the independent variables. The indirect effect (the mediating effect) is estimated by the first and third regression; the direct effect (the effect of independent variable on the dependent variable controlling for the effect of the mediator) is calculated by the third regression; and the total effect (the sum of direct and indirect effect) is obtained by the second regression. All regressions were carried on 5000 bootstrap samples randomly generated using random sampling with replacement, using the MEDIATE macro (Hayes 2009). Estimates and 95% bias-corrected confidence intervals are in Table 2 (the indirect effect is statistically significant, if zero is not found between the lower and upper bound of the confidence intervals; Hayes 2009; Preacher and Hayes 2008).

With regard to secularism of state, the results showed that it was negatively related to conservation and positively to self-transcendence: people adopting values emphasizing the stability of society, restraint of actions violating social norms, and respect of tradition were less likely to endorse a secular state. On the other hand, people adopting values emphasizing welfare and tolerance for all people were more likely to support a secular state.

Table 2. Mediating effects of secularism of state. Dependent variable: attitude towards pre-implantation genetic diagnosis (PGD).

	Secularism of State	Attitude towards Pre-Implantation Genetic Diagnosis		Indirect Effect	Bootstrapping Bias Correct 95% Confidence Interval	
	B (*SE*)	*B* (*SE*)	*B* (*SE*)	*B* (*SE*)	Lower	Upper
Conservation	−0.601 *** (0.127)	−0.406 ** (0.126)	−0.188 (0.122)	−0.218 (0.057)	−0.347	−0.122
Self-transcendence	0.685 *** (0.144)	0.542 *** (0.143)	0.294 * (0.139)	0.249 (0.068)	0.136	0.401
Openness to change	−0.015 (0.138)	0.065 (0.137)	0.071 (0.128)	−0.005 (0.048)	−0.100	0.092
Self-enhancement	0.126 (0.091)	0.029 (0.090)	−0.016 (0.085)	0.046 (0.032)	−0.012	0.116
Secularism of state			0.363 *** (0.055)			
R^2	0.136	0.099	0.219			
F	11.182 ***	7.760 ***	15.863 ***			
Df	4284	4284	5283			

Note. *B* = unstandardized coefficient; 5000 bootstrap samples. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Regarding the attitude towards pre-implantation genetic diagnosis results presented in Table 2, these showed that it was negatively affected by conservation and positively by self-transcendence. People striving for the stability of society and preservation for tradition and norms reject pre-implantation genetic diagnosis, while people striving for preservation of the welfare of others accept this procedure. Moreover, results indicated that attitude towards a secular state positively correlates with attitude towards pre-implantation genetic diagnosis: the more people were favourable to a secular state, the more they accepted this procedure. With regard to the indirect effect, the results showed that secularism mediated the effects of conservation and self-transcendence (the confidence interval does not include zero), but not the effect of openness to change and self-enhancement on attitude towards pre-implantation genetic diagnosis (the confidence interval includes zero). People adopting values emphasizing the defence of tradition reject pre-implantation genetic diagnosis because they want state laws to represent religious values; on the other hand, people endorsing values emphasising the welfare of all people accept this kind of diagnosis because they want state laws to be free from religious values.

5. Discussion

In this study we tested the relationship between attitudes towards the secularism of the state, personal values and attitudes towards PGD. Our results show that conservation, self-transcendence, and openness to change are associated with attitudes towards PGD, while no relationship was found with self-enhancement. As expected, the most influential values are social-focused. This is because our sample does not have a personal interest in PGD—therefore, personal-focused values should not be, and are not, related to PGD. These results indicated that people who conform with social norms and accept ideas provided by culture or religion tend to reject PGD. Indeed, PGD could violate norms that are widely endorsed in society such as those provided by religion. On the other hand, people that strive for the preservation and enhancement of welfare for others accept PGD; indeed, PGD could be useful to help people have healthy children.

Regarding attitudes towards a secular state, results showed that this variable is positively associated with attitudes towards PGD. People who are favorable to secularism suppose that state laws should not be influenced by religious dogmas, and tend to be favorable towards this genetic technology.

Another aim of this study was to test whether attitudes towards state secularism mediated the effects of high order values on attitudes towards PGD. Results suggested that secularism mediated the effects of two social-focused values: self-transcendence and conservation. These results indicate that those who pursue universal welfare may accept PGD because they believe that universal welfare can be guaranteed only if the state's laws are free from religious principles. By contrast, people pursuing conservation may refuse PGD because they believe that traditional religious norms should dictate the laws of the state. From this perspective, conservative people might see the governmental approval of PGD as a threat to traditional or religious values.

The correlational nature of this study does not allow us to test directly the direction of the relationships explored. Future studies may adopt a longitudinal design to assess the directionality of the associations we found. Moreover, the sample constituted university students. Although about 70% of personality and social psychology studies are carried out with university or college students (Kimmel 2007), this creates problems with the generalizability of the results. Future work should, therefore, assess the validity of these results in a representative sample.

Finally, in this study we do not consider the religious involvement of the participant, that various studies showed to be related to values (Saroglou 2008), secularism (Hichy et al. 2014), and attitude towards PGD (Hichy and Di Marco 2014). Further studies should consider also this aspect; indeed, it is possible that religion could moderate the relationships found in this study between values, secularism and attitude towards PGD. For example, it is possible that values such as conservation may have an effect (both direct and mediated by secularism) on the rejection of PGD only for religious people, whereas for non-religious people conservation may not have any effect.

The results in this study identify key processes underlying attitude formation and maintenance in the context of scientific findings and progress. In particular, we find that considerations concerning the role of religion in a state matters, as well as the importance people attribute to values of conservation and universalism which play a significant role in the way people will perceive and evaluate the regulation of medical interventions regulating conception. As in the case of abortion (see e.g., Tamney et al. 1992) and the other important issues discussed earlier in this paper, values and religion play an important role in decision making. It would, therefore, be helpful if policy makers explicitly addressed these when discussing the regulation of scientific interventions, thus making it clear where they are coming from in terms of values and reflections concerning the role of religion in lawmaking. For example, a study showed how it is possible to get conservatives to embrace liberal legislation when framed in terms of the values they hold most dear (Feinberg and Willer 2015). Likewise, it would be useful for educators and the media to raise the public's awareness of the role played by values—as well as beliefs concerning the role of religion in the public realm—in political decision making. Finally, doctors will benefit from these results as they might help frame or guide the discussion concerning PGD with their patients in the most appropriate way.

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