JOURNAL OF SOCIAL, BEHAVIORAL, & HEALTH SCIENCES

Journal of Social, Behavioral, and Health Sciences
2024, Volume 18, Issue 1, Pages 273–282
https://doi.org/10.5590/JSBHS.2024.18.1.18

Brief Empirical Article WALDEN UNIVERSITY

Pro-Vaccine and Anti-Vaccine Groups: Social Distance and Self-Assessment of Scientific Skills

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Abstract

The social distance scale developed by Bogardus decades ago, which allows us to measure levels of acceptance among members of diverse social, ethnic, or racial groups, has been widely used in different contexts. The objective of this study is to evaluate the social distance accepted by pro-vaccine and anti-vaccine groups. Following the principle of the Bogardus scale, a questionnaire was created regarding different degrees of closeness. Respondents also completed a scientific skills self-assessment. The population consisted of 193 people who declared themselves in favor of vaccination and 41 people who declared themselves against it. Statistical tests show significant differences regarding the acceptance of the out-group; the anti-vaccine group expressed less prejudice toward the pro-vaccine group than the pro group did toward the anti group. No difference is noted in the self-assessment of scientific skills. The results are discussed with regard to elements of the literature.

Keywords: *pro-vaccine and anti-vaccine groups, social distance, self-assessment of scientific skills, intergroup relations*

Date Submitted: April 18, 2024 | **Date Published:** September 9, 2024

Recommended Citation

Gaymard, S. (2024). Pro-vaccine and anti-vaccine groups: Social distance and self-assessment of scientific skills*, 18*, 273–282. https://doi.org/10.5590/JSBHS.2024.18.1.18

Introduction

Vaccination is a public health issue, and it is often the subject of resistance, as we witnessed during the COVID-19 health crisis. In a survey conducted in 33 different countries, the highest COVID-19 acceptance rates were observed in Ecuador, Malaysia, Indonesia, and China, while the lowest acceptance rates were observed in Kuwait, Jordan, Italy, Russia, Poland, the United States, and France (Sallam, 2021). In a 2016 study conducted in 67 countries (Larson et al., 2016), the French came out on top in terms of vaccine resistance, with 41% of respondents not agreeing with the safety of vaccines. France would be “the first country in the world for pro ‘antivax’ ideas” (Ahmed, 2019). While we note that opinions regarding vaccination in France are generally positive (Baudier & Léon, 2006), there is a significant gap between

Acknowledgement: We would like to thank reviewers for their reading and their comments. We would like to thank a master’s student who, as part of his training, participated in the implementation of this study.

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opinions and actual vaccination practices. Several studies highlight the problem of lack of trust in science or scientists. For example, Tippins et al. (2023) showed that vaccine hesitancy was associated with religiosity and an accompanying lack of trust in science. Gaymard (2022) compared the discourse of two groups whose members declared themselves in favor of (pro group) or opposed to vaccination (anti group). The most representative theme of the pro group is "scientific evidence" (e.g., I have read enough studies and data to be sure that vaccines are effective and safe) the prevalent theme for the anti group is "lack of trust" (e.g., The body is capable of creating antibodies, and we are little informed about what these vaccines contain; other viruses surely, it is very probable) Algan et al. (2021) conducted a survey among 12 countries and found that trust in scientists was "the key driving force" for positive attitudes toward vaccination.

A psychosocial approach to the issue of vaccination among pro- and anti-vaccine groups has already been applied, through the concept of "social representations." While the representation of the pro-vaccines group is organized around the central elements "disease," "protection," "health," and "safety," the representation of the anti-vaccines group is structured around the central element "poison." Thus, vaccines are positively connoted in the social representation of the pro-vaccines group and negatively connoted in that of the anti-vaccines group (Gaymard, 2022, 24–25).

Working in the field of racial and ethnic relations, Bogardus developed the first edition of his social distance scale in 1924 to assess prejudice; it measures different degrees of closeness between members of diverse social, ethnic, or racial groups (Bogardus, 1933). It has been translated into many languages and applied to different contexts (e.g., Cano et al., 2020; Mather et al., 2017; Owen et al., 1981; Parrillo & Donoghue, 2013). Statements (usually five to seven) on the social distance scale depict relationships that range from intimacy (e.g., to marry a member of the out-group) to maximally distant (e.g., to accept a member of the out-group as a citizen of the country). Wark and Galliher (2007) traced the scale's historical context, drawing on archives and testimonies to show the impact of Bogardus's social environment on the scale's creation.

Opposition to vaccination is not a new phenomenon, and several studies highlight links to lack of trust in science or scientists (e.g., Algan et al., 2021; Tippins et al., 2023), links to political issues (e.g., Baumgaertner et al., 2018; Bilewicz & Soral, 2022), or links to religious issues (e.g., Kuru et al., 2022; Larson et al., 2016). Understanding health behaviors is important and yet, despite many studies published in the medical field, the use of the psychosocial approach in attempting to understand health-related behavior is not widespread (e.g., Gaymard, 2022, 2023; Klein & Yzerbyt, 2024). One objective of this study was to assess the acceptance of social distance between groups that identify themselves as for and against vaccination. We are also interested in this issue: even when we know that groups opposed to vaccination express less confidence in science or in scientists, we do not know how they define themselves in relation to scientific skills. The following hypotheses were thus developed.

Hypotheses

H1: We hypothesized that there would be a significant difference between what groups would accept in terms of social distance.

H2: We hypothesized that there would be no significant difference between groups in participants' self-assessment of scientific skills.

Methods

Tools

Social Distance Questionnaire

Respondents were first asked whether they were for or against vaccination. Depending on their answer, the person they were asked about as a member of the out-group in the questionnaire was their opposite.

A questionnaire made up of five statements regarding social distance was created, following the usual formulation and construct based on a unidimensional nature (Guttman scale) and cumulative scale effect (Van der Veer & Higler, 2013). The wording was: (1, nearest degree of distance) Are you willing to engage in a couple relationship with a pro- (or anti-) vaccine person? The other statements concerned increasing degrees of distance: (2) an inner circle of friends; (3) a work team; (4) staying in the same hotel; (5, greatest degree of distance) living in the same city. Participants responded to each question on a 10-point Likert scale from 1, strongly disagree, to 10, strongly agree.

Self-Assessment of Scientific Skills

Four scientific attitudes were selected from the literature about scientific education (e.g., Gauld & Hukins, 1980; Mulhall, 2016; Piper & Hough, 1979; Putri & Prodjosantoso, 2020). These attitudes, identified as characteristics, are objectivity, open-mindedness, critical thinking, and respect for evidence.

The instruction was: Please express, using the cursor, the degree to which you believe you possess the characteristics presented below. (The more you move the cursor to the right, the more you believe you possess these characteristics.) The range of the cursor was from 0 to 100. For greater clarity, each characteristic was accompanied by a definition.

Sample

The objective was to have French respondents who identified as either for or against vaccination (without other inclusive criteria). A total of 234 French individuals, with an average age of 37.4 years (SD = 15.4), responded to the questionnaire and self-assessment of scientific skills.

Procedure

In the interest of the ethical and deontological aspects of research, the first page of the questionnaire included a section informing the participants of the main objective of the study, guaranteeing confidentiality and anonymity, and reminding the reader of their right to withdraw from the study at any time. All participants signed a free-and-informed consent form.

In the questionnaire, the respondents were first asked whether they were for or against vaccination. Then they had to complete the questionnaire regarding social distance, which was made up of five statements. This was followed by the self-assessment of scientific skills, which measured four scientific attitudes (see above). At the end, respondents were asked to provide some sociodemographic data. The questionnaire was published on the social network Facebook, specifically on the page for groups of people concerned with this study.

Data Analysis

Descriptive and statistical analyses were carried out. As the objective was to compare the answers of respondents in favor of vaccination with those of respondents against vaccination, we used parametric and non-parametric tests of comparison: Student, Mann-Whitney, and Welch tests.

Results

Sociodemographic Data

Most respondents stated that they were in favor of vaccination in the introductory question (Table 1). The mean age for the anti-vaccine group was 41.171 (*SD* = 16.799); for the pro-vaccine group, it was 36.560 (*SD* = 15.057). The anti-vaccine group was composed of 20 women (47.78%) and 21 men (51.22%); the pro-vaccine group was composed of 123 women (63.73%) and 70 men (36.27%).

Table 1. *Attitudes Toward Vaccination*

Attitude	*N*	%
For	193	82.48
Against	41	17.52
Total	234	100

Social Distance Questionnaire

The descriptive statistics (Table 2) showed that overall, the means of the anti-vaccine group were higher than those of the pro-vaccine group. This means that the anti-vaccine group had higher levels of acceptance of the pro-vaccine group, or that the pro-vaccine group appeared more prejudiced against the anti-vaccine group.

We also saw that acceptance rates were progressive for each group. The more distant the relationship, the higher the level of acceptance of the out-group.

Table 2. *Descriptive Statistics of the Social Distance Questionnaire (1 = Strongly disagree; 10 = Strongly agree)*

	Couple Relationship		Inner Circle of Friends		Work Team		Stay in the Same Hotel		Live In The Same Country	
Vaccin.	Against	For	Against	For	Against	For	Against	For	Against	For
Valid	41	193	41	193	41	193	41	193	41	193
Mean	6.415	4.694	7.878	6.461	8.317	6.870	8.732	7.788	8.780	8.394
Median	8.000	4.000	10.000	7.000	10.000	8.000	10.000	9.000	10.000	10.000
Std. Dev.	3.647	3.349	3.280	2.983	3.037	2.989	2.721	2.689	2.651	2.437
Min.	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
Max.	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000	10.000

The pro-vaccine group appears to be more homogeneous. The Shapiro-Wilk test showed that the dataset was not normally distributed, but parametric tests can perform well when the spread of each group is not the same. Considering the size of the samples and the fact that parametric tests usually have more statistical power than nonparametric tests, Student, Mann-Whitney, and Welch tests were carried out (Table 3).

Table 3. *Student, Mann-Whitney, and Welch Tests for the Social Distance Questionnaire*

Statement	Test	Statistic	*df*	*p*	Effect size
Couple relationship	Student	2.941	232.000	0.004	0.506
	Mann-Whitney	4958.500		0.010	0.253
	Welch	2.782	55.244	0.007	0.491
Inner circle of friends	Student	2.714	232.000	0.007	0.467
	Mann-Whitney	5103.500		0.003	0.290
	Welch	2.551	54.931	0.014	0.452
Work team	Student	2.806	232.000	0.005	0.483
	Mann-Whitney	5208.000		< .001	0.316
	Welch	2.778	57.654	0.007	0.480
Stay in the same hotel	Student	2.038	232.000	0.043	0.350
	Mann-Whitney	5035.000		0.003	0.273
	Welch	2.022	57.807	0.048	0.349
Live in the same country	Student	0.909	232.000	0.365	0.156
	Mann-Whitney	4600.500		0.061	0.163
	Welch	0.860	55.282	0.393	0.152

Note. For the Student *t*-test and Welch *t*-test, effect size is given by Cohen's *d*. For the Mann-Whitney test, effect size is given by the rank biserial correlation.

Self-Assessment of Scientific Skills

The descriptive statistics (Table 4), as well as the Student, Mann-Whitney, and Welch tests (Table 5) show no difference between the two groups in self-assessment of scientific skills.

Table 4. *Descriptive Statistics for the Self-Assessment of Scientific Skills (0-100)*

	Objectivity		Open-mindedness		Critical thinking		Respect for evidence	
Vaccin.	Against	For	Against	For	Against	For	Against	For
Valid	41	193	41	193	41	193	41	193
Mean	74.659	75.990	82.805	80.508	78.732	78.606	82.878	79.870
Median	80.000	79.000	85.000	82.000	83.000	80.000	86.000	83.000
Std. Dev.	22.379	16.511	19.562	15.114	24.380	16.692	20.151	17.325
Minimum	0.000	11.000	0.000	0.000	1.000	22.000	15.000	10.000
Maximum	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000

Table 5. *Student, Mann-Whitney, and Welch Tests for the Self-Assessment of Scientific Skills*

Scientific attitude	Test	Statistic	*df*	*p*	Effect Size
Objectivity	Student	-0.438	232.000	0.662	-0.075
	Mann-Whitney	4091.000		0.733	0.034
	Welch	-0.361	49.647	0.720	-0.068
Open-mindedness	Student	0.836	232.000	0.404	0.144
	Mann-Whitney	4601.000		0.101	0.163
	Welch	0.708	50.619	0.482	0.131
Critical thinking	Student	0.040	232.000	0.968	0.007
	Mann-Whitney	4411.500		0.247	0.115
	Welch	0.031	48.263	0.975	0.006
Respect for evidence	Student	0.980	232.000	0.328	0.169
	Mann-Whitney	4579.000		0.113	0.157
	Welch	0.888	53.275	0.378	0.160

Note: For the Student *t*-test and Welch *t*-test, effect size is given by Cohen's *d*. For the Mann-Whitney test, effect size is given by the rank biserial correlation.

Discussion

In March 2019, a survey carried out among around 30,000 members of the European Union assessed attitudes regarding vaccination. The report notes: "A majority of the respondents in all countries think that vaccines are effective, but the extent of agreement varies considerably" (European Commission, 2019, p. 4). France appears to be one of the countries most opposed to vaccination (Larson et al., 2016; Sallam, 2021).

To combat vaccination opposition, several studies sought specifically to study the behavior of anti-vaxxers. For example, Hornsey et al. (2018) showed that anti-vaccination attitudes are highest among those who are high in conspiratorial thinking, while Miyazaki et al. (2022) noted the toxic and negative language of anti-vaxxers in tweets. Focusing on intergroup relations between those who are pro-vaccine and those who are anti-vaccine provides another perspective.

Social psychology research is essential for understanding mechanisms and measurement of prejudices (e.g., Crandall & Schaller, 2004; Gaymard et al., in press; Larsen et al., 2013). Applied to the problem of vaccination, it contributes to the understanding of thought systems and behavioral attitudes at the intra-group and inter-groups levels (e.g., Baeza-Rivera et al., 2021; Gaymard, 2023; Klein & Yzerbyt, 2024). The objectives of this study were to assess the acceptance of social distance between the pro- and anti-vaccine groups and to measure their self-assessment of scientific skills. The hypotheses focused on significant differences between these groups on the social distance questionnaire and self-assessment of scientific skills.

Bogardus began developing his social distance scale in the 1920s (Wark & Galliher, 2007). The simplicity of its design explains why this tool "became a widely used and powerful instrument study of intergroup relations" (Parrillo & Donoghue, 2013, p. 597). The principle is to identify prejudice via social distance. Participants must express their feelings of acceptance for members of the out-group. The Bogardus study was extrapolated to measure Americans' level of acceptance for members of ethnic groups other than their own in the United States, and there were several replications (Parrillo & Donoghue, 2013). This scale has also been used in other contexts, such as the study of prejudice toward psychiatric groups (e.g., Lester, 1991). The relationship between pro- and anti-vaccine groups previously has not been studied with this approach. While conflict or competition between these groups can be observed on social networks (e.g., Johnson et al., 2020), this does not give us information about the social distance between these groups.

Our results on the social distance questionnaire showed that out-group acceptance was higher among the anti-vaccine group. Significant differences were observed in acceptance of the following relationships: couple relationships, intimate circle of friends, work team, and staying in the same hotel. Given that the measure varied from 1 (strongest rejection) to 10 (strongest acceptance), it is interesting to note that for the most intimate distance (couple relationship), the median of the anti-vaccine group is twice as high as that of the pro-vaccine group (8 to 4). Decreasing differences were observed across the first four relationships: in other words, the greater the social distance, the higher the out-group acceptance rate for the pro-vaccine group. Apart from the most intimate distance, a median of 10 (maximum acceptance) was observed on the other relationships for the anti-vaccine group. These results provide answers to recent questions. Bor et al. (2023) showed that vaccinated people expressed discriminatory attitudes toward unvaccinated people but added that there was no evidence that unvaccinated individuals had discriminatory attitudes towards vaccinated individuals. Our study showed that the anti-vaccine group expressed less prejudice toward the pro-vaccine group.

The acceptance rate of the anti-vaccine group for the pro-vaccine group can also be explained in relation to work in the field of social representations; this theoretical framework has fueled several studies linked to the COVID-19 pandemic (e.g. Gaymard et al., 2022; Páez & Pérez, 2020a, 2020b). The theory of social representations is based on the concept according to which the individual is, above all, a social being (Moscovici, 1961). Social representations play an essential role in interactions; they are guides for the action (Moscovici, 1961). It has been shown that the thought structures of the pro- and anti-vaccine groups were not completely "airtight." This illustrates the proposals of Moscovici, who spoke of cognitive polyphasia, the existence of different modalities of thought cohabiting within the same group: In other words, systems of thought are more complex than a simple categorization between pro-vaccine [individuals] on one side, and anti-vaccine [individuals] on the other; for example, even those opposed to vaccination had barely mobilized to respond to the online questionnaire, even though they are very present on social networks (Gaymard, 2022, p. 25).

Concerning the self-assessment of scientific skills, the hypothesis was confirmed. We observed no difference between the two groups in terms of their perceptions about possessing the four scientific attitudes. A quick look at the descriptive statistics shows that anti-vaccine scores are slightly higher than pro-vaccine scores. In the cursor range from 0 (I don't have this characteristic) to 100, the medians of the two groups range from 79 to 85. The highest median refers to the characteristic of open-mindedness for the anti-vaccine group. This self-assessment is consistent with their reported acceptance rate of the pro-vaccine group. The lowest median refers to the characteristic of objectivity for the pro-vaccine group. Being anti-vaccine or pro-vaccine has no impact on the self-assessment of scientific skills. Generally speaking, the relationship with science appears complex. Some studies have made links between opposition to vaccination and lack of confidence in science or scientists (e.g., Algan et al., 2021; Tippins et al., 2023). Other studies have tended to show that both pro-vaccine and anti-vaccine individuals have a positive attitude towards science (e.g., Maciuszek et al., 2021). Moreover, scientists or health professionals may also lack confidence in vaccines (Callagan et al., 2022; Huang et al., 2022). Thus, during the pandemic, France suspended 3,000 unvaccinated health workers.

The study had certain limitations. For one thing, the size of the anti-vaccine group was smaller than expected. Additionally, their activity on social networks is significant (Chiou & Tucker, 2018). We also cannot exclude the general problem of social desirability. The objective of this study was not to validate a scale (which would have required other measures) but to assess the social distance between groups for and against vaccination and their self-assessment of scientific skills. Our results show the relevance of a social distance measure to highlight discriminatory attitudes.

To conclude, our results show that the anti-vaccine group expresses less prejudice toward the pro-vaccine group than the pro group does toward the anti group. Furthermore, both groups believe they possess the four scientific attitudes (objectivity, open-mindedness, critical thinking, and respect for evidence) to the same degree.

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