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Scientific Appearance and Homeopathy. Determinants of Trust in complementary and alternative medicine

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Abstract

Several studies have investigated the motivations driving the use of complementary and alternative medicines (CAM). Nevertheless, the general public view of these therapies remains relatively unexplored. Our study identifies the social factors that determine a person's trust in alternative therapies, like homeopathy or acupuncture, drawing conclusions from the results of the Spanish National Survey on the Social Perception of Science and Technology (N=6,357). We show that trust in the effectiveness of CAM therapies is not mutually exclusive with a belief in science for the general public, pointing to a certain level of disinformation. The comparison with superstitions confirms a clear differentiation with the drivers of trust in analyzed CAM therapies. We argue that scientific appearance of these alternative therapies, in terms of prescription, communication and marketing, may play an important role in determining trust in them for a large part of the population. Furthermore, we confirm that women and those with higher socio-economic status are more likely to express trust in the effectiveness of CAM therapies. Additionally, distrust of the influence of big pharma on health policies seems to have an effect on viewing CAM therapies as more effective. Finally, we argue that media and pharmacies may have an effect on the scientific-like perception of CAM therapies, contributing to the social construction of trust in its effectiveness. Therefore, widespread confusion about the scientific validation of homeopathy may be among the main factors driving its successful extension as a practice.

Keywords: public understanding of science, alternative medicine, big pharma, religion, health behaviors

Introduction

The use of complementary and alternative medicine (CAM) has steadily increased in the U.S. and Europe over the last 20 years. Common examples of CAM treatments include homeopathy, acupuncture, herbal therapy, high dose vitamins, message therapy, and relaxation techniques (Grodén et al., 2017). A large part of these therapies have been categorized as pseudoscience, as they cannot be validated by the scientific method.

The regulation of these therapies is the subject of a strong social debate in several countries. Scientists and physicians have voiced frustration and alarm that controversial CAM therapies such as homeopathy appear to be enjoying growing popularity as skepticism about the producers and suppliers of evidence-based medicine raises (Stoneman et al., 2013). Such concerns include not only the quality and robustness of the subjacent science, but also the negative effects on patients trusting on demonstrably ineffective treatments when conventional treatments have, or should have been prescribed (Goldacre, 2007).

An estimated 200 million people worldwide use homeopathic treatments in their day-to-day healthcare. Homeopathic treatments are so popular that some are covered under national healthcare systems in countries like India, Switzerland, Chile, Mexico, Brazil, and Pakistan (Senel, 2019), becoming one of the more used CAM across the world. Several studies have discussed the motivations and perspectives of CAM users but, in spite of the growing presence of CAM in many countries, few investigations have analyzed the public perceptions of CAM.

Our study aims to better understand the building of trust in controversial CAM treatments, such homeopathy and acupuncture, among the lay public. With a focus on these controversial cases, we seek to determine whether individuals' trust in CAM is compatible to higher levels of trust in science, and citizens are combining seemingly contradictory convictions and practices; or whether, on the contrary, trust in CAM is related to superstitious beliefs, and strongly oppositional to trust in science.

Trust in Complementary or Alternative Medicine

CAMs are increasingly accessible. In many countries, consumers can purchase several treatments in pharmacies (e.g. homeopathy), and some media outlets report on these practices from a favorable perspective (Arendt, 2016). Moreover, Internet has progressively become a common source of health information. Many individuals access to online information seeking self-care solutions before going to the doctor, since they perceive this information as reliable.

However, patients surfing the Internet access a multitude of low-quality sites before retrieving high quality information (Krishna & Thompson, 2019).

Several studies have attempted to shed light on the popularization of the CAM, showing that these practices cannot be explained only in terms of the effectiveness of the health system or its coverage, but they can be considered as a partial aspect of a much broader phenomenon, linked to a constellation of attitudes and health behaviors. According to MacArtney and Wahlberg (2014), the users of CAM show more interest in understanding the meaning of the illness, rather than the treatment itself. Their profile of CAM users is that of a patient who seeks to know and experience, to make sense of what is happening currently in their body, to re-categorize themselves and to reformulate traditional concepts like life, sickness, body, etc. To this end, CAM users perform an individualized search for medicine or 'therapeutic itineraries' that work for them (MacArtney and Wahlberg, 2014: 120).

From this point of view, the autonomy issue is a central driver of CAM use. The person seeks to cease being a traditional passive patient, on whose body the conventional physician acts, and would become an active subject that participates in the healing process (e.g. Attwell et al., 2018). From a postmodern approach to politicization and re-appropriation of the body, CAM would be a response from the people to the biopolitical control exercised by conventional medicine, in order to achieve less invasive and controlling treatments.

Is trust in the effectiveness of CAM therapies mutually exclusive with a positive assessment of science? The literature on this issue is split: some studies have found CAM use driven by a rejection of science and conventional medicine, whereas others have found that the two can coexist. Beyerstein (2001) and Conboy et al (2007) argue that CAM use is driven by a rejection of conventional treatments and, what we could call in some simple manner, anti-science attitudes. Similarly, Shmueli et al. (2010) show that CAM users do so, to some extent, as a reaction to the limitations and side effects of conventional medicine.

However, the use of CAM is usually seen as complementary practices to conventional medicine, more than an alternative. One proof that CAM users do not observe a contradiction between conventional medical practice and CAM is that a significant portion of them inform their primary care physician of their decision to turn to alternative medicine (Thomas and Coleman, 2004). Additionally, Stoneman et al (2013: 5) identified a large group of the British public characterized by a 'dissonant' orientation, supporting conventional medicine and science alongside belief in the efficacy of homeopathy. Given these contrasting interpretations, we offer the following research question:

RQ1: Does trust in the effectiveness of CAM therapies vary by a positive or negative assessment of science?

Additionally, CAM users tend to consider that conventional health treatments are unduly reliant on the synthetic remedies of 'big pharma', and see these therapies as a 'natural' and effective alternative (Lamberty & Imhoff, 2018). Furthermore, a review of 23 studies examining the relationship between CAM use and childhood vaccination found that higher CAM use is generally associated with lower vaccination uptake (Wardle et al., 2016), while D'Andrea et al. (2019) show an association between vaccination hesitancy and distrust of the influence of big pharma on health policy. Therefore, we offer the following hypothesis:

H1: Those respondents who express that scientific decisions are often influenced by those who fund them will view CAM therapies as more effective than those who do not.

Common explanations relate the use of non-evidence-based therapies with superstitious attitudes. Studies in psychology show that superstitious behaviors allow subjects to maintain an illusion of control of an objectively uncontrollable situation or subject to uncertainty, which allows them to reduce their insecurity, fear, and anxiety in the associated situations. These types of behaviors are performed to prevent unwanted or unpleasant events. Franzel et al. (2013) found that many use homeopathic treatments as a way to gain some sort of control over serious illnesses after being made to feel helpless and isolated by traditional health care providers. However, Shmueli et al. (2010) show that users do not conceive CAM either as esoteric activities or beliefs, but rather as a set of more specific skills that are useful in remedying a large array of particular health problems.

Since this area remains relatively unexplored as it relates to opinions about homeopathy and acupuncture, we offer the following research question:

RQ2: Does trust in these therapies have similar drivers to trust in superstitious beliefs (such as lucky numbers)?

Despite widespread interest in the relationship between religion and health behaviors, the effect of religiosity and spiritual identities in the use of CAM therapies has been largely overlooked (Ellison et al. 2012). In United States, most of the studies point to a positive association between religiosity and CAM use -e.g. Lee et al. (2016) show that attending religious services less than monthly, and self-reported high or moderate spirituality show significant correlations with the likelihood of personal CAM use, as well as recommending any CAM. Thus, we offer the following hypothesis:

H2: Those respondents with higher levels of religiosity will be more likely to express trust in the effectiveness of CAM therapies.

Finally, some studies have identified sociodemographic factors that influence confidence in CAM. Most of these studies have found a greater use of CAM among people of high socioeconomic status, liberal non-manual professionals and higher education levels -see Groden et al., (2017) and Barnes et al. (2008) in the U.S.; Thomas and Coleman (2004) in the United Kingdom; Barbadoro et al. (2011) in Italy; Shmueli et al. (2010) in Israel. Also, children with private health insurance were also more likely to use CAM than those with public insurance or without any insurance at all, and children were found to be more likely to use CAM as their parents' education level increased (Barnes et al. 2008).

These characteristics have been explained by the economic capacity to access these treatments (not covered by the public system) and users with a greater knowledge information about this type of treatments. In this vein, we propose the following hypothesis:

H3: Those respondents with higher high socio-economic status will be more likely to express trust in the effectiveness of CAM therapies.

Additionally, women have been found to have consistently higher rates of CAM use than men (Groden et al., 2017; Barbadoro et al., 2011). This is true also of conventional medical services (Conboy et al, 2007). These differences can be explained in terms of gender socialization in a way similar to the consistent differences expressed in other health beliefs and behaviors. Therefore, we offer the following hypothesis:

H4: Female respondents will be more inclined to express trust in the effectiveness of CAM therapies than male respondents.

Method

For the first time in Spain, the 8th Survey on the Social Perception of Science and Technology 2016 offers data that allows us to relate the attitudes towards the pseudosciences and superstitions with individual and contextual sociodemographic variables, as well as with factors related to knowledge and opinions about science and technology.

The dependent variables have been extracted from the 26th question of the questionnaire, which asks about the degree of identification, utilizing different phrases from a scale of 1 to 5. The analyzed phrases are the following: "Homeopathic products are effective", "acupuncture works", "horoscopes predict what happens", "I believe in paranormal phenomena", "I trust in healers", and "there are numbers and things that are lucky".

The independent variables of sociodemographic character, chosen from a review of the literature, were the following: sex, age (15-24, 25-34, 35-44, 45-54, 55-64, 65 and older), level of education (primary or less, secondary, and tertiary), population size of residence (1-10,000; 10,001-20,000; 20,001-50,000; 50,001-100,000; 100,001-500,000; and more than 500,000 residents), religious orientation (practicing catholic, non-practicing catholic, believes in another religion, indifferent or agnostic or atheist) and household income (0-900€; 901-1,200€; 1,201-1,800€; 1,801-2,400€; and more than 2,400€). Also, factors aiming to relate attitudes toward technoscience with acceptance of pseudoscience and superstition were introduced:

-Degree of interest in science and technology. Through question 2.2, which asks the respondent to indicate whether they are very little, little, a bit interested, interested, or very interested in science and technology.

-Level of scientific knowledge. This variable was built from the items of question 23 in the survey, in which it asks the respondent to choose the correct phrase for six pairs of statements: (1) the sun revolves around the earth/the earth revolves around the sun, (2) antibiotics cure infections caused by both viruses and bacteria/antibiotics cure infections caused by bacteria, (3) the continents have always been and always will be moving/the continents remain in the same place, (4) laser beams work through the concentration of sound waves/laser beams work through the concentration of light waves, (5) the first humans lived at the same as the dinosaurs/humans have never lived with dinosaurs, (6) When someone eats genetically modified fruit, their genes also change/eating genetically modified fruit does not influence the genes of the person who eats the fruit. The resulting variable is continuous and takes six values, from 0 to 6 successful answers.

-Confidence that scientists do not let themselves be influenced by those who finance them. Degree of agreement, from 1 “strongly disagree” to 5 “strongly agree”, with question 18.2. “Scientists do not let those who finance them to influence the results of their work”. In order to assure the reliability of the responses, incongruous cases have been purged: some in the interview chose the same category of response in question 18.1. “We cannot trust that scientists tell the truth if they rely on private funding.”

-Degree in which one associates science and technology with threats. From question 17, which asks the respondent to indicate if they associate completely, enough, little or not at all science and technology with different concepts.

-Degree of confidence in the others. Coming from question 25: on a scale of 0 to 10, “Would you say that most people can generally be trusted or that one is never prudent enough

when dealing with others?” Trust in others is a variable that has been connected with related social processes such as health and consumption, among others (Putnam, 2000).

First, the relationship between the degree of identification with the phrases and the categorical independent variables through the contingency tables was analyzed, using the Chi-Square of Pearson for contrast. The results were extracted taking only those who answered the question, that is to say, eliminating the analysis of who did not want to answer or responded “I don’t know”. Second, bivariate correlations were carried out between the dependent variables and those related with the attitudes towards technoscience and scientific knowledge. Finally, and thirdly, six binary logistic regression models were constructed, one for each dependent variable.

Results

Table 1 shows the percentage of people that identify (a little, enough, or a lot) with pseudoscientific practices and superstitions. The results show two clearly different groups of practices: on the one hand, acupuncture and homeopathy, whose identification reaches 68.6% and 59% of the Spanish population of 15 years or more, respectively; and on the other hand, a group of practices and beliefs that receive little trust, such as horoscopes (14.9%), lucky numbers and things (27.9%), healers (23%), and paranormal phenomena (22.7%).

The results show the grand differences according to social groups (Table 1). If we separate the superstitious pseudoscientific practices, clear identification patterns are observed according to some variables. Those who trust more in homeopathy and acupuncture are women (65.9% and 73.9% respectively), those who are between 45 and 54 years (65.5% and 75.7%), those who have a household income of less than 901 euros (53.5% and 65%), those who live in towns of less than 10.000 inhabitants (51.5% and 61.4%), those who have primary or less education (51.6% and 58.2%), and those who are older than 64 years (52.9% and 57.5%).

For their part, superstitious practices find a more favorable opinion among practicing Catholics, those who have a lower level of education, and those who live in a household with little income. Thus, 35.1% of Catholics trust in healers, 30.60% of those who have primary or less education identify with lucky numbers, and 21.7% of homes with little income think that horoscopes predict what happens. It is remarkable the high level of trust that those under 25 have towards paranormal phenomena (29%), horoscopes (20.3%), and lucky numbers and

things (32.4%), in contrast with the low confidence towards these questions among those older than 64 years (13.9%, 11.9%, and 24.1% respectively).

Table 1. Percentage of people who identify a little, enough, or a lot with the following phrases.

	Acupuncture works	Homeopathic products are effective	Numbers and things are lucky	Trust in healers	I believe in paranormal phenomena	Horoscopes predict what happens
Total	68.6	59.0	27.9	23.0	22.7	14.9
Man	62.5	50.9	21.5	19.4	19.8	11.3
Women	73.9	65.9	33.7	26.3	25.2	18.0
From 15 to 24 years	60.7	54.2	32.4	21.8	29.0	20.3
From 25 to 34	69.5	60.8	32.0	21.7	24.5	17.2
From 35 to 44	73.8	60.4	26.1	19.0	23.3	11.8
From 45 to 54	75.7	65.5	27.4	25.5	24.0	13.8
From 55 to 64	71.5	58.6	23.8	25.6	19.5	13.9
65 and older	57.5	52.9	24.1	26.7	13.9	11.9
Primary or less education	58.2	51.6	30.6	29.4	21.4	17.3
Secondary education	70.1	61.4	30.1	23.4	23.8	16.4
University education	74.3	59.8	19.5	15.6	21.1	8.3
Practicing catholic	65.0	62.8	35.8	35.1	23.4	22.0
Non-practicing catholic	71.9	63.0	30.2	23.6	22.2	13.9
Believer in another religion	77.7	70.8	25.2	20.7	39.6	20.8
Indifferent or agnostic	65.7	52.2	21.8	16.7	19.8	11.9
Atheist	67.3	50.8	21.3	16.9	24.5	12.2
0-900€	65.0	53.5	36.0	32.9	28.9	21.7
901-1,200	70.4	59.8	29.7	28.2	22.4	17.6
1,201-1,800	68.2	57.2	27.2	22.4	19.7	14.3
1,801-2,400	70.9	62.2	24.2	19.9	25.0	12.2
More than 2,400	70.0	57.1	23.9	18.0	18.2	12.4
Less than 10,000 residents	61.4	51.5	23.4	20.8	17.0	9.2
From 10,001 to 20,000	70.5	63.8	24.7	23.6	23.7	16.1
From 20,001 to 50,000	67.1	60.4	25.0	22.3	21.4	15.7
From 50,001 to 100,000	74.7	65.3	24.5	18.8	16.8	11.7
From 100,001 to 500,000	68.0	54.8	30.2	24.3	25.7	14.2
More than 500,000 residents	73.9	64.8	38.2	27.8	30.8	24.2

Note: Percentages regarding the total interviewed that responded. The Chi-Square analysis indicates significant differences at level $P < 0$, in all variables, except in homeopathy and income ($P < 0.01$), paranormal phenomena, level of education ($P < 0.1$) and acupuncture and income ($P < 0.1$).

Source: EPSCYT 2016, FECYT. Own elaboration.

The correlation between the degree of identification with different practices shows, on the one hand, a high agreement between those who trust horoscopes and those who believe that numbers and things are lucky ($R^2=.619$) and, on the other hand, between those who agree that homeopathic products are efficient and those who believe acupuncture works ($R^2=.612$). Both homeopathy and acupuncture do not show any correlation with the rest of the practices analyzed ($R^2<.366$).¹

Table 2 shows the correlation between the degree of identification with different practices and different variables about knowledge and attitudes towards science and technology. Interest in technoscience correlates with all practices subject to analysis: as interest increases, so does the belief in paranormal phenomena and trust in acupuncture and homeopathy, while it reduces the belief in horoscopes and that numbers and things are lucky. On the other hand, as the level of scientific knowledge increases, it reduces the belief in paranormal phenomena, in lucky numbers and things, in horoscopes and healers, and increases confidence in acupuncture. Trust in the independence of scientists with respect to who finances them correlates positively with confidence in horoscopes, healers, and lucky numbers, and negatively with trust in acupuncture. Finally, the degree in which people, in general, trust in others correlates positively with various pseudoscience and superstitious practices, although the relationship is more intense with the former.

Table 2. Correlation between the degree of identification with different phrases and variables of knowledge and attitude towards technoscience

	Acupuncture works	Homeopathic products are efficient	Numbers and things are lucky	Trust in healers	I believe in paranormal phenomena	Horoscopes predict what happens
Interest in science and technology	.199**	.119**	-.040**	-.052**	.088**	-.034**
Level of scientific knowledge	.064**	-.001	-.144**	-.155**	-.057**	-.176**
Trust that scientists are not influenced by those who finance them	-.079**	-.006	.113**	.083**	.030	.089**
Degree of trust in others	.111**	.076**	.026*	-.005	.016	.026*

** The correlation is significant at level 0.01. * The correlation is significant at level 0.05.

¹ Data are available from the corresponding author upon request.

Source: EPSCYT 2016, FECYT. Own elaboration.

Table 3 shows the logistic regression models of factors relating to identification with different practices. The R^2 of Nagelkerke of the models reflect an acceptable fit of the models, which oscillates between 0.103 in the model about trust in healers and 0.208 in trust in horoscopes. The reasons for advantage indicate that the belief in paranormal phenomena is greater among women, those younger than 55, those who have a primary or less education (in relation with those who have a university education), Catholics (in comparison to non-practicing Catholics, agnostics or indifferent), those who live in households with less than 901€ a month, and those who live in big cities. As interest in technoscience increases, so does belief in paranormal phenomena, while the relationship with the level of scientific knowledge is the opposite.

Table 3. Logistic regression models about the degree of identification with the following phrases (0 'little or very little', 1 'a little, quite, or very'), odds ratio.

	Acupuncture works	Homeopathic products are effective	Numbers are lucky	I trust in healers	I believe in paranormal phenomena	Horoscopes predict what happens
Sex (male)	***1.574	***1.799	***1.785	***1.612	***1.440	***2.016
Age (ref: 45-54 years)						
15-24	*0.688	0.816	1.372	0.931	1.280	*1.615
25-34	*0.675	*0.742	*1.432	0.919	1.048	1.432
35-44	1.059	*0.743	1.241	0.824	0.905	1.111
55-64	0.870	0.737	*0.646	0.817	*0.635	0.868
65 or more	*0.669	1.029	***0.478	**0.625	***0.341	**0.511
Level of scientific knowledge	1.073	0.950	***0.823	***0.849	***0.817	***0.673
Level of education (ref: university)						
Primary or less	0.939	0.749	***2.378	1.348	**1.690	***2.625
Secondary	1.132	*1.327	***2.194	***1.702	1.274	***2.410
Interest in science and technology	***1.293	***1.175	1.009	0.920	**1.158	0.953
Association of science and technology with threats	0.979	0.989	*1.123	1.049	1.054	***1.312
Confidence that scientists are not influenced by those who fund them	***0.845	*0.926	**1.132	1.071	0.956	**1.139
Religion (ref: practicing Catholic)						
Non-practicing Catholic	1.117	0.937	0.808	***0.550	*0.734	**0.603
Believer in another religion	1.020	1.774	**0.428	**0.367	1.249	0.889
Indifferent or agnostic	0.742	0.817	***0.487	***0.411	**0.535	**0.568
Atheist	*0.657	***0.511	***0.480	***0.437	0.781	*0.609
Household income (ref: 0-900)						
901-1200	1.315	**1.656	0.948	0.911	*0.692	0.970
1201-1800	0.984	*1.328	*0.704	**0.594	***0.500	**0.600
1801-2400	1.004	*1.338	***0.572	***0.564	**0.673	***0.455
More than 2400	1.185	*1.359	*0.694	***0.538	**0.583	**0.563
Habitat size (More than 500,000 inhabitants)						
Less than 10,000	***0.547	***0.542	***0.266	**0.606	***0.379	0.172
From 10,001 to 20,000	1.002	1.039	***0.450	0.805	0.765	**0.491
From 20,001 to 50,000	0.723	0.800	***0.497	0.902	**0.616	*0.658
From 50,001 to 100,000	1.048	1.110	***0.504	*0.626	***0.475	**0.559
From 100,001 to 500,000	**0.607	***0.537	***0.565	1.013	0.866	0.735
Degree of trust in others	***1.080	**1.051	*1.052	1.024	0.991	0.995
Constant	1.101	1.009	0.509	0.986	1.171	0.448
R2 Nagelkerke	0.107	0.115	0.164	0.103	0.112	0.208
N	2.287	2.323	2.494	2.497	2.498	2.496

* p < 0.05, ** p < 0.01, *** p < 0.001

Source: EPSCYT 2016, FECYT. Own elaboration.

Confidence in healers, horoscopes, and lucky numbers are related to similar variables: it is less among those older than 64 and university educated, and it is greater among women, practicing Catholics, households with lower incomes, and people that live in big cities. As scientific knowledge decreases, the probability of identifying with these practices increases and those in particular that trust in horoscopes and lucky numbers also believe that scientists are not influenced by those who finance them, although they do seem to associate science and technology with threats.

Although there are differences, those who trust in homeopathy and acupuncture present a similar pattern (Table 3): they are middle-aged women who live in big cities, have a higher level of interest in technoscience, and trust less in the independence of scientists with respect to those who finance them, even though their degree of confidence in others is greater. Those who consider themselves atheists show significantly lower confidence in pseudoscientific practices than the rest. For their part, those who live in households with incomes lower than 901€ identify significantly less with the efficacy of homeopathy than households with larger incomes, a relationship that is not seen in the case of acupuncture. Those who trust pseudosciences do not seem to associate technoscience with threats to a greater extent than the rest of the interviewees.

Discussion

Our results corroborate some of our hypotheses and provide important information about our research questions. Firstly, we observe that interest in science is positive associated with trust in the effectiveness of both, homeopathy and acupuncture. Furthermore, scientific knowledge does not show any effect on trusting CAM effectiveness, neither does perceiving science and technology as threats. These results point to the dissonant orientation suggested by Stoneman et al. (2013) and contradicts common interpretations of trust in CAM based in anti-science attitudes (Beyerstein, 2001).

Thus, we show that trust in CAM is not contradictory with favorable attitudes towards science (**RQ1**). This points to a possible unawareness of the contradiction between this type of therapy and the scientific results that show its lack of effectiveness. Arguably, there is an issue of public interpretation of the demarcation of medical science. For those who trust in these treatments, homeopathy would be situated in a space close to science, as it seems like a science. In this sense, the fact that homeopathic treatments are presented under the guise of

medicines, that they are sold in pharmacies and that some physicians recommend them as complements to conventional medicine suggests, to many people, a tacit acceptance on the part of conventional medicine that they are effective.

This implies the scientific appearance of some CAM can be contributing to the social construction of confidence in its effectiveness. Eventually, a widespread confusion in the scientific validation of homeopathy may be among the main factors of its successful extension as a practice. These results warrant further research in order to introduce the 'appearance issue' to the current debates about laypersons' demarcation of science (Keren, 2018).

Our study reveals two main groups of mechanism according to the different items that were analyzed; trust in homeopathy and acupuncture respond to similar drivers and, at the same time, differ to the rest of analyzed items (**RQ2**). The modeling suggests an *ex post* grouping: on the one hand, superstitious practices, whose foundations would be perceived far away from the scientific method; on the other hand, homeopathy and acupuncture.² Thus, we confirm that homeopathy and acupuncture are not superstition-oriented practices (Shmueli et al., 2010), but pseudoscience practices, whose foundation would be perceived in a scientific-looking logic. Superstitious beliefs (horoscopes and lucky numbers) are significantly associated with lower levels of education and scarce scientific knowledge, while the same is not the case with trust in CAM.

Furthermore, the results support the **H1** hypothesis. Those respondents who express that scientific decisions are often influenced by those who fund them will view CAM therapies as more effective than those who do not. This point is in line with several observations suggesting that users of CAM therapies are more likely to distrust of the influence of big pharma on health policies (e.g. Lamberty & Imhoff, 2018).

The **H2** hypothesis is also supported by the results. Those respondents with higher levels of religiosity will be more likely to express trust in the effectiveness of CAM therapies. Religious beliefs can not only coexist with trust in CAM therapies, but also with superstitious beliefs such as horoscopes and lucky numbers and things, in line with previous literature (e.g. Ellison et al., 2012).

Also, the **H3** hypothesis is confirmed. Those respondents with higher high socio-economic status will be more likely to express trust in the effectiveness of CAM therapies, in

² This distinction refers to the social perception of the analyzed practices, it does not refer to relative criteria towards its nature.

line with observations on CAM users (e.g. Groden et al., 2017; Barbadoro et al., 2011). Literature has shown that people with more economic capacity often access to these therapies more, but these results would confirm that there is a process of diffusion of trust in these therapies among acquaintances or relatives who have not necessarily used them.

Finally, the **H4** hypothesis is also supported by the results. Female respondents are more inclined to express trust in the effectiveness of CAM therapies than male respondents, as shown in previous studies (Groden et al., 2017; Barbadoro et al., 2011). As noted above, this is true also for conventional medical services (Conboy et al, 2007). In respect to homeopathy, women are also greater consumers: according to the European Survey of Health in Spain (2014), 8.4% of women had used some type of homeopathic or naturist product in the two weeks before the survey, and 3.9% of men.

Women's greater trust and use of CAM products can be explained by the differential gender socialization around health and care. Traditionally, women have been socially mandated to meet the health needs of the family (Tobío, 2012) and are more likely to know remedies and plants with curative purposes transmitted in the familiar or nearby feminine sphere. Masculine socialization, in contrast, has been traditionally directed to other areas and away from health and care (Connell, 1995). This differential socialization in regard to health and care would, in large part, explain the greater contact of women with the health sector in general, and therefore with CAM as well.

Those who use homeopathic products probably consider themselves active explorers in search of better health (MacArtney and Wahlberg, 2014). This search, in advance, does not present a clear opportunity cost, since it does not imply the rejection or abandonment of conventional medicine. Another appeal of homeopathic products would be the absence of side effects. Users, moreover, would have the perception that they are effective, due to the observed existence of the placebo effect.

More than half a century ago, Th. W. Adorno established the first hypothesis about the influence of the media as an enhancer of superstitions. His conclusions indicated that mass media plays a key role in the dissemination of pseudo-rational logic that helps to calm the anguish and anxiety of the consumer society (Adorno, 1994). For CAM cases this approach may be equally interesting. On the one hand, the functional fit of soothing anxiety in the health field, beyond rationalizing medical practices; on the other hand, the key role that mass media plays in its dissemination.

Thus, the widespread favorable attitude towards CAM can be also related to its treatment by mass media. In the Spanish case, it has been observed that the media report on homeopathy with insufficient scientific/sanitary rigor and comparatively less than in other countries, such as the United Kingdom (Escribà-Sales et al., 2015), and the media often lacks specific editorial guidelines on this issue (Cortiñas-Rovira et al., 2015). However, in other countries, such as in Germany, a favorable attitude towards homeopathy has been observed by most journalists, and in an even greater proportion among those specialized in health (Arendt, 2016).

Beyond mass media, other agents of the complex health communication system are involved in the widespread misperception of the scientific character of some CAM therapies. Pharmacies and libraries are perceived by the general public as places linked to scientific rationality. The recommendation of homeopathic treatments by a pharmacist may involve the misinterpretation that these are evidence-based treatments (Rogero & Lobera, 2017). Likewise, books on homeopathy outnumber those regarding chemotherapy in a 1/20 ratio in Spanish libraries, and less than 1.8% of the total titles dealing with pseudosciences are critical works (Cortiñas-Rovira and Darriba, 2018). Arguably, these situations are related to the construction of trust in pseudosciences.

Conclusions

Our results show that there is no contradiction between trusting homeopathy and trusting science. Contrary to superstition, trust in CAM does not seem to arise from ignorance or rejection of science and/or conventional medicine. For those who trust in them, CAM seems to also have a scientific character, which probably emanates from similar social production to conventional medicine in terms of prescription and marketing. On the other hand, it is possible that its expansion is also due to the growing sectors of the population that feel the need to seek health improvements outside of public health that offers little patient care time. In this sense, both attending a private health system and a homeopathic system would serve as an escape from the limitations of the public system perceived by some sections of the population. Alternative therapies would also add attractiveness of a greater subjective appropriation of the healing process, as they are usually presented as personalized and exclusive.

Our study highlights a problem of social demarcation of science and pseudoscience. The limits of science are subject to debates among academics. In society, this demarcation is even more diffuse. An unawareness of the limits of the may be influencing the spread of false

health information, as well decision making in patients. It is important to continue this discussion with better public information about the non-scientific character of CAM, as our data points to a certain level of disinformation.

The media and pharmacies stand out as principal elements in this informative work. However, the expansion of these practices points to more profound problems in the relationship of growing sectors of the population with the public health system. Increased patient time during medical consultations, as well as a greater integration of evidence-based and patient-centered medicine approaches would reduce some of the discontentment that seems to lead to the increased use of pseudoscience. Finally, it is advisable to advance the research on the social factors of the use of pseudoscience to deepen the results and assumptions prescribed here.

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