Knowledge of theory of evolution and beliefs as determinants of dualism in health science students

María Alejandra Petino Zappala, PhD [1]*, Pablo Luis López, MD, PhD[2], Felipe Aguirre[3], Pablo Richly, MD[3,4].

1. Facultad de Ciencias Exactas y Naturales, Universidad de Buenos Aires, Argentina

2. Instituto de Neurociencia Cognitiva y Traslacional (INCyT): Conicet, Fundación INECO, Universidad Favaloro, Buenos Aires, Argentina

3. Universidad Favaloro, Buenos Aires, Argentina

4. Instituto De Neurología Cognitiva, Buenos Aires, Argentina

* Corresponding author: mapz@ege.fcen.uba.ar. Postal address: Intendente Güiraldes 2160, Pabellón II. Zipcode: C1428EGA, CABA, Argentina. Phone number: 00 54 (011) 5285-8623

https://orcid.org/0000-0003-3168-5025

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Competing interests

The authors have no competing interests to disclose.

Abstract

It has been proposed that dualistic conceptions on the mind and the body can affect the practice of health professionals. Religious beliefs have already been described as affecting mind-body dualistic thinking. Another factor that may play a role is knowledge of evolutionary theory, but this relationship has not been explored. In this work, data on knowledge of evolutionary theory and supernatural and dualistic beliefs of 287 Psychology and Medicine university students from Argentina were collected through a cross-sectional online survey. Information was analyzed to determine whether an association exists between knowledge of evolutionary theory, supernatural beliefs and dualism. We found significant statistical associations between supernatural beliefs and dualism (positive) and between both and knowledge of evolutionary theory (negative). Also, some heterogeneity was found within dualistic questions between theoretical ones and a hypothetical case. Our results are consistent with the hypothesis that knowledge of evolutionary theory could undermine mind-body dualistic conceptions.

KEYWORDS: Evolution – Beliefs – Mind-body dualism – Education

Introduction

The question of the correspondence between the mind and the body has accompanied humanity for centuries and has been a core subject of discussion for religion, philosophy and the sciences. In this work, we will focus on mind-body dualism, a theory or system of thought that interprets reality in terms of two independent principles, in this case mind and matter. According to this stance, physical and mental properties are thought to be relatively distinct in their nature and ontology, which holds implications for the understanding of thoughts, consciousness, identity, free will, embodiment, and more practically in the approach to the relationship between mental and physical states, including health problems (see below).

A vast amount of empirical findings from research in neuroscience showing mensurable correlates to thought processes contrasts with these dualistic beliefs; however, they are frequently observed in the general population, including scientists and health professionals (Moreira-Almeida & Araujo, 2015; Strejilevich et al., 2014). According to (Mehta, 2011), the persistence of such mindset in health professionals can be explained because mind and body dualism is a convenient philosophy that uses the “divide and conquer” strategy to cope with prevalent religious thinking, and is, therefore, well fitted to deal with the complexity of human nature. But in the case of those who are dedicated to mental health, particularly, determining the extent and the effects of this belief is critical, since the conceptions we have about the mind can affect professional practice (Fahrenberg & Cheetham, 2000). Believing that the mind and the body do not correspond to each other can become, for example, an obstacle to the diagnosis of psychiatric symptoms secondary to physical disorders, can result in the underestimation of physical

interventions on mental health, or may lead to consider the patients as responsible or blameworthy for their ailments (Glannon, 2020; Miresco & Kirmayer, 2006). Moreover, a dualistic stance may predispose these professionals to ignore or downplay the importance of material conditions of existence, the effects that cultural practices can have in the shaping of the body and subjectivity, among other problems that have been raised by critical scholars (Karmakar, 2021; Lee, 2014). That is why it is vital to be able to improve the understanding of the factors affecting or determining this philosophical stance in order to design strategies aimed at reducing or at least questioning dualistic conceptions during the formative period of future health practitioners.

While traditionally regarded as a western, classical or modern system of thought, mind-body dualistic conceptions seem to occur transculturally in our species, as some level of intuitive dualistic thinking has been found in people of different societies (Chudek et al., 2018; Slingerland & Chudek, 2011). However, some factors have been described as important in determining the likelihood that a person adheres to this system of thought. Religiousness has been proposed as such; while the idea of afterlife and an immortal soul, prevalent in theists, does not necessarily imply a mind-body dualistic stance (Cottingham, 1992), a stronger religiousness is frequently associated with this position, even among health professionals (Demertzi et al., 2009).

Historically, it has also been proposed that the emergence of the field of evolutionary biology, and particularly the ideas of adaptation and natural selection, have undermined the basis of mind-body dualistic thought in the natural sciences (Costall, 2004; Searle, 2013). The

relationship between evolutionary theory and religiousness has been thoroughly studied: a certain correlation between knowledge about the theory of evolution and religious beliefs in students entering university has already been described (Moore et al., 2011) as well as a small effect of religiousness in the acceptance of evolutionary theory for students of different majors (Gefaell et al., 2020), but we do not know for sure if this variation in evolutionary knowledge has any effect on the likelihood that a person holds a mind-body dualistic perspective independently of their religiousness. It has been argued that evolutionary theory encompasses a materialist theory of the mind, in the sense that it is seen as an emergent of the physical world and subject to similar laws or principles as other bodily functions or properties, including of course natural selection (Callinicos, 1996), and in this regard evolutionary theory would be incompatible with a strong mind-body dualistic stance. Moreover, by considering humanity as part of a continuum of life forms, darwinian theory presents the human mind as a not qualitatively distinct from that of non-human animals. This conception also runs counter to strict cartesian mind-body dualism (Allen & Trestman, 2020). In this sense, presenting students with the concepts and problems concerning evolutionary biology could, in principle, serve to call into question the dualistic perspective. Indeed, in the case of a prevalent philosophical stance such as mind-body dualism, making assumptions explicit and offering challenging views can be critical to “unblind” future health professionals to possible biases that may, unbeknownst to them, profoundly affect their conceptions and practices (Mehta, 2011). In this sense, it can be argued that knowledge about the theory of evolution could serve to destabilize mind-body dualistic conceptions in future health professionals in a crucial period of their training. It has been indeed suggested that, when

presented with theories contradicting intuitive concepts, students must “un-learn” those previous ideas in order to grasp the new information (Shtulman & Harrington, 2016), or at least can learn to “circumvent” those intuitions through metacognitive reflection (González Galli, 2019a), and to this end, presenting them with concepts and problems pertaining to evolutionary theory could make them question, or at least recognize, their dualistic assumptions.

To our knowledge, although it would be reasonable to hypothesize that evolutionary knowledge could undermine mind-body dualistic thinking, no studies have been carried out to evaluate if an association exists. In the present work we tried to answer this question by investigating the relationship between dualistic conceptions, religious or supernatural beliefs and knowledge of the theory of evolution (general and applied to human evolution) in Argentinian students of health-related majors.

Method

In order to gather the information for this study, we conducted a cross-sectional online survey using an incidental sampling technique.

Study and questionnaire design

Questions about supernatural beliefs (in God, the soul, energies, afterlife), specific religious affiliation and practices were designed following previous surveys performed in Argentina (CEIL - CONICET, 2019).

Three questions to rate dualistic thinking were included, two of them theoretical, to account for the agreement of the interviewees with dualistic statements, and a hypothetical case scenario to rate their responses to a practical problem (Richly, in press).

Knowledge of Evolution Exam (KEE) questions were translated to Spanish from the original questionnaire (Cotner et al., 2010) and an extra question was added regarding evolutionary mechanisms besides natural selection. As a strong dualistic stance may imply the belief that humans and non-human animals are qualitatively different in their properties (Allen & Trestman, 2020), additional questions were designed for a Knowledge of Human Evolution Exam (KEEH) to account for knowledge of evolutionary theory pertinent to the human species.

All questions were previously validated in a preliminary study using an independent sample not included in the present analysis. The questions added to the original questionnaire by Cotner et al. (2010) are provided in Additional File 1.

Data collection and ratings

Online surveys were performed by means of a Google Forms file sent to students of Psychology and Medicine from different Argentinian Universities, either through public social media posts or by means of direct contact (email) with university teachers. The data were collected during November 2020 (Figure 1). The questionnaire included personal data (age, gender, major and university) in addition to Supernatural beliefs, Dualism, KEE and KEEH questions. A target sample size of at least 250 people was established, based on the preliminary studies, to reach adequate statistical power.

(FIGURE 1)

Correct KEE and KEEH answers were rated with a score of 1, with 0 points added for incorrect answers. Only KEE question #11 had three possible outcomes, depending on the interviewee's selection of all (2 points) or only one of the correct answers (1 point).

Questions on religion and supernatural beliefs were rated from 0 (does not believe in God / does not have any relationship to God) to 2 points (does believe in God / takes part in religious activities or institutions), except the binary question about the religion (where "no religion" amounted to 0 points and the rest of the answers were rated 1).

A similar criterion was followed for questions on dualism, from 0 points (disagree / Juan's family) to 2 (agree / María's family).

Overall ratings for KEE, KEEH, Supernatural beliefs and Dualism were obtained by summing all scores for each set of questions.

Statistical analyses

All statistical analyses were performed in Rstudio (Allaire, 2012) using R version 3.6.3 (R core team, 2020).

First, we wanted to explore whether there were any differences between majors for the answers to the survey, as homogeneity would be an important assumption when pooling the answers for Psychology and Med students. Mann Whitney Wilcoxon Tests were performed for each of the primary outcome scores to evaluate whether students for both majors differed in their

religious or dualistic beliefs or in the performance for both Evolutionary Biology knowledge tests. Chi squared tests were also performed for the individual questions to test if the proportions obtained for each possible answer depended on the major.

To inspect the statistical relationship between knowledge of evolutionary theory, supernatural or religious beliefs and dualistic thinking, bivariate Spearman correlations were calculated for KEE, KEEH, Supernatural beliefs and Dualism scores using the rcorr function from the Hmisc R package (Harrell, 2019).

To further study the relationship between variables, in this case in the multivariate space, a Principal Component Analysis (PCA) was performed with the standardized scores for KEE, KEEH, Supernatural beliefs and Dualism using R prcomp function. The data on interviewee's age and major were later superimposed on biplots but were not included on the PCA analysis as active variables.

The PCA scores were used to test whether individuals studying different subjects occupied distinct sectors of the multivariate space. The scores for individuals in all PCA components were subjected to a permutational multivariate analysis of variance (PERMANOVA, (Anderson, 2001)) using the adonis function of the vegan R package (Oksanen et al., 2020), having previously checked the assumption of multivariate homogeneity of variances (using functions betadisper and permutest from the same package).

Finally, in order to model the probability of answering correctly or incorrectly based on major, supernatural beliefs and gender, logistic regressions were performed for the score on each of the KEE and KEEH questions using the glm function for the binomial family from the R

package nlme (Pinheiro et al., 2021). To test the relationship between major, religion and gender and dualistic thinking, logistic regressions were also run for questions on Dualism. In these cases, the multinom function for the nnet package (Ripley & Venables, 2021) was used, as these questions had multiple possible answers.

Transparency and openness

We provide information on the determination of sample size, exclusion of cases and data analyses (see above). The complete set of data is provided as supplementary information and analysis code for this study is available by emailing the corresponding author. Information on software and packages used is provided above. This study's design and its analysis were not pre-registered.

Results

A total of 287 subjects meeting the inclusion criteria answered the survey completely (of which 133 were Med students and 154 were Psychology students; Additional File 2). The study sample included students from 18 different Argentinian universities from various provinces; public and private institutions were represented in the sample. 68% of the respondents were female, 31% male and 1% other, and the mean age was (24.16 ± 5.27) years (mean ± SD).

There were no significant differences between Medicine and Psychology students regarding the primary outcomes (Tables 1 and Additional File 3). Of all the items in the questionnaire, only the answers to 2 questions from the KEE differed statistically for both majors

in a Chi squared test, and for only one of them (KEE #6) the test was strongly significant, with $p < 0.01$ (Additional File 3).

(TABLE 1)

Beliefs in the existence of a supernatural energy and on a soul were more prevalent than beliefs in God or in afterlife (Figure 2), but all items were less frequently reported in our sample than in the general population from Argentina (CEIL - CONICET, 2019). The soul-body dualistic conception was the most prevalent dualist answer, and the only one where those who openly disagreed with it were a minority (Figure 2).

(FIGURE 2)

Regarding the correlations between the primary outcomes (Table 2) we found a positive linear relationship for Dualism and Supernatural beliefs, as described in previous reports (Demertzi et al., 2009), and a negative correlation of both with KEE score. However, only Supernatural beliefs showed a significant negative association with KEEH score. Unsurprisingly, both Knowledge of Evolutionary Theory scores presented a positive correlation with each other, although it was weaker than expected.

(TABLE 2)

To better understand the multivariate relationships of the measured scores we performed a Principal Component Analysis. The first two components explained 61% of the total variance (Additional File 4); the relationships between KEE, KEEH, Supernatural beliefs and Dualism reflect what was found in previous analyses and no apparent pattern was found regarding age or major of the interviewees (Figure 3).

(FIGURE 3)

However, to further confirm our previous findings that students for both majors do not differ significantly in their responses, but in this case in the multivariate space, the scores for all individuals in all PCA components were used for a permutational analysis of variance (PERMANOVA), after confirming no significant departures from homogeneity of multivariate dispersion in this space. Multivariate scores for both majors did not differ ($p>0.05$).

As we assessed the answers to Dualism questions separately, we found some degree of heterogeneity, given that the responses to theoretical questions appeared to be independent from the hypothetical case scenario (Figure 4). Extracting this item from the analysis, however, did not

significantly modify the main correlations, so this finding would not be relevant for the present analysis, although we find it interesting and worthy of further study.

(FIGURE 4)

Finally, logistic regressions were performed in order to model the probability of answering correctly or incorrectly to KEE and KEEH questions, based on major, religion and gender (Additional File 5). In most cases, only religion showed a significant effect on the likelihood of a correct answer for KEE questions (where nonreligious participants performed better than religious people). No effects of either religion, gender or major were found for KEEH answers.

On the other hand, on the Dualism question regarding the relationship between body and spirit, nonreligious people were more likely to answer agnostically ("I don’t know") or to deny the existence of such relationship. They also tended to answer against the dualist option in the hypothetical case scenario. In the question regarding mind and brain, men were less likely to answer "I don’t know" than women.

Discussion

Mind-body dualism is a widely shared system of thought that, as we mentioned, might profoundly impact the understanding not only of human nature but also of our interactions with

other species and the environment (Le Grange, 2004). While it may have been useful to deal with some degree of complexity in understanding natural phenomena, including health, it can be argued that today this dualistic stance represents an obstacle for those working in these areas (Mehta, 2011). This philosophy may entail the neglect of material conditions of existence and of the body itself as affecting the psychological state and well-being, and therefore preclude a holistic understanding of health issues. Consequently, it can be argued that dualism can exert negative influences on the practice of health professionals, especially (but not limited to) those observing mental health. Also, as has been established before, this stance has been criticized and questioned because it may obscure how gender, race and class issues shape our body and health (Karmakar, 2021; Lee, 2014).

In fact, the relevance of dualism as a problematic philosophy in future health professionals gets stronger when considering the evidence that the more a behavioral problem is seen as originating in psychological (i.e. “not physical”) processes, the more a patient tends to be viewed as blameworthy for their symptoms; conversely, the more behaviors are attributed to physical or biological causes, the less likely patients are viewed as responsible (Miresco & Kirmayer, 2006). Therefore, a dualistic approach might lead to a voluntaristic view regarding mental and other health issues that would make patients accountable of their own suffering, while simultaneously neglecting the critical aspect of the social and material conditions affecting health. Moreover, this conception might be an obstacle not only to practice, but also to health research. Mehta (2011) argues that cartesianism is usually associated to methodological

implications such as reductionism and a rigid positivism, ignoring subjectivity and leading to a crisis of the field. (Bunge, 2008) also contended that a dualist approach defined a separation of the biological and the psychological and precluded the understanding of mental evolution. For these reasons, understanding the factors affecting or determining dualistic thinking in future health workers, as well as identifying devices to foster their conscious reexamining, is of great interest.

The present study has the peculiarity of analyzing the association of both supernatural beliefs and knowledge of the theory of evolution with dualism in undergraduate students from health-related majors, something that, to our knowledge, has not been assessed before.

Our most relevant findings show that supernatural beliefs have a positive correlation with dualism, while knowledge of the theory of evolution shows a negative relationship. However, although they are significant, the magnitude of these correlations seems to be weak, probably owing to the heterogeneity present in the sample. Although no significant differences were found between majors for most of the answers, the composition of Psychology and Medicine programs is, as expected, different. Particularly, Argentinian universities show a strong bias towards psychoanalytic content and no mandatory training in Neurology for Psychology degrees (CONEAU (Comisión Nacional de Evaluación y Acreditación Universitaria), 2009; Fierro & Menéndez, 2020). However, contents on evolutionary theory are marginal in the programs for both majors (CONEAU (Comisión Nacional de Evaluación y Acreditación Universitaria), 1999, 2009).

We are aware of the limitations of our study. First of all, no information was collected regarding the degree of career advance for each participant. Biases inherent to voluntary surveys could exist, although the most obvious factors (gender, age) are already biased for students from both majors with respect to the general population (Ministerio de Educación de la Nación Argentina, 2019), showing a composition similar to that of our sample. We also found a bias towards monistic conceptions and a lower prevalence of supernatural beliefs that in the general population, a finding that could actually accurately reflect the situation of undergraduate students (Guest & Sharma, 2011; Hayes, 2000), and could generally be regarded as a common occurrence for health-related majors (Gross & Simmons, 2009), but that could cause correlation analyses related to dualism to be underpowered.

On the other hand, our sample included students from both majors from different universities in the country, covering several provinces. It encompassed a wide range of scores for all primary outcomes, and both subsamples, obtained by two different methodologies (formal email recruitment by university teachers and through public social media posts) showed similar results. These facts, and the information stated in the previous paragraph, led us to believe that the sample here analyzed adequately represents the population of Argentinian undergraduate students for these health-related majors.

Finally, the design of the study does not allow us to shed light on the causal nature of the associations found, although the results support the hypothesis that both religious beliefs and knowledge of evolutionary theory could affect mind-body dualistic thinking.

Other studies have found religiousness and supernatural beliefs as positively associated to dualism (Dawkins, 2008; Demertzi et al., 2009; Tayeb et al., 2017), although the causality of the relationship is not clear. It is important to note that freedom of thought, conscience and religion constitutes an inalienable human right (United Nations, 1949), and of course no intervention should be considered in such direction. However, given the similarly significant negative correlation we found between knowledge of evolutionary theory and dualistic beliefs, it may be considered a potentially important factor. Although a correlation does not imply causation, the core assumptions of evolutionary theory and the biological sciences in general, at least in their present form, imply a continuum between the human species and the rest of the living beings, with a strong focus on the material conditions of existence and with the mind considered as an emergent property of either the central nervous system (CNS) or the body as a whole. As such, it has been argued that there is a certain degree of incompatibility between mind-body dualism and knowledge of evolutionary theory (González Galli, 2019b). Although our work does not clarify how the negative association arises, it is likely that both affect each other. Intuitive mind-body dualism, when not challenged, may pose an obstacle to the understanding or acceptance of evolutionary theory, but it is also possible that the reflection on the nature of evolutionary change provides the students with the challenge needed to question dualistic assumptions. Indeed, learning often entails a restructuring of knowledge and concepts, particularly when new information challenges previously held notions (Blancke et al., 2012). A conscious examination of the assumptions behind different epistemological obstacles is a requisite to reach conceptual change (Shtulman & McCallum, 2014), and this reflection may be triggered by exposing the

students to data that contradict their cognitive biases (González Galli, 2019a). While in fact the incompatibility does not preclude the coexistence of evolutionary biology knowledge and dualistic and/or supernatural beliefs in separate domains of the mind, providing explanations to different sets of phenomena (Short & Hawley, 2015; Shtulman & Lombrozo, 2016), reflection on evolutionary theory could imply the questioning of dualistic assumptions affecting future medical practice of undergraduate students and, at least, promote a conscious examination of such assumptions. Indeed, as Mehta (2011) argued, it is crucial that health professionals are aware of the philosophical framework within which they operate and how it affects their understanding of health issues and their practices; the high prevalence of mind-body dualism and the fact that it is not usually made explicit imply that these cognitive biases are never challenged nor made conscious.

It has been argued that intuitive concepts, even when presumably abandoned, can still resurge and cause cognitive conflicts, something that happens even to expert scientists (Shtulman & Harrington, 2016), but this problem occurs in certain conditions such as during quick reactions. This information suggests that intuitive patterns may not be completely eliminated, but it has been proposed that they can be circumvented through cognitive reflection (i.e. deliberate reasoning) (González Galli, 2019a; Shtulman & McCallum, 2014). The formative period may, indeed, be critical to the challenging of such prevalent notions as mind-body dualism (Mehta, 2011). Therefore, we can consider our findings as the rationale to propose the inclusion of evolutionary biology in the study plan of those fields of study related to the care of patients

suffering from both physical and mental health conditions, although the efficacy of this intervention in professional practice should be confirmed in prospective trials.

Acknowledgments

We thank all survey participants and all people who shared the request for volunteers.

Data availability

All relevant data used are available as Supplementary Files.

Ethical considerations

This research was conducted following the pertaining ethical guidelines. All survey participants were informed regarding its objectives and declared they agreed to participate. No data were collected that could reveal the interviewees' identities, therefore the study was not submitted for approval to institutional review boards.

This manuscript follows the Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals, including sections II A, II B, I E, III B. Section III K is not applicable.

References

Allaire, J. (2012). *RStudio: Integrated development environment for R* (p. 770). http://www.rstudio.com/

Allen, C., & Trestman, M. (2020). Animal Consciousness. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy* (Winter 2020). Metaphysics Research Lab, Stanford University. https://plato.stanford.edu/archives/win2020/entries/consciousness-animal/

Anderson, M. J. (2001). A new method for non-parametric multivariate analysis of variance: NON-PARAMETRIC MANOVA FOR ECOLOGY. *Austral Ecology*, *26*(1), 32–46. https://doi.org/10.1111/j.1442-9993.2001.01070.pp.x

Blancke, S., De Smedt, J., De Cruz, H., Boudry, M., & Braeckman, J. (2012). The Implications of the Cognitive Sciences for the Relation Between Religion and Science Education: The Case of Evolutionary Theory. *Science & Education*, *21*(8), 1167–1184. https://doi.org/10.1007/s11191-011-9402-z

Bunge, M. (2008). The Mind-Body Problem in an Evolutionary Perspective. In G. E. W. Wolstenholme & M. O'Connor (Eds.), *Novartis Foundation Symposia* (pp. 53–77). John Wiley & Sons, Ltd. https://doi.org/10.1002/9780470720523.ch4

Callinicos, A. (1996). Darwin, Materialism and Evolution: A review of D C Dennett, Darwin's Dangerous Idea (London, 1995). *International Socialism*, *71*. http://pubs.socialistreviewindex.org.uk/isj71/darwin.htm

CEIL - CONICET. (2019). *Segunda Encuesta sobre Creencias y Actitudes Religiosas en Argentina [Second Survey on Religious Beliefs and Attitudes in Argentina]*. http://www.ceil-conicet.gov.ar/wp-content/uploads/2019/11/ii25-2encuestacreencias.pdf

Chudek, M., McNamara, R. A., Birch, S., Bloom, P., & Henrich, J. (2018). Do minds switch bodies? Dualist interpretations across ages and societies. *Religion, Brain & Behavior*, *8*(4), 354–368. https://doi.org/10.1080/2153599X.2017.1377757

CONEAU (Comisión Nacional de Evaluación y Acreditación Universitaria). (1999). *Contenidos básicos y carga horaria mínima total de las carreras de medicina [Basic contents and*

total minimum workload for Medicine majors]. https://www.coneau.gob.ar/archivos/539.pdf

CONEAU (Comisión Nacional de Evaluación y Acreditación Universitaria). (2009). *Resolución 343/09 Estándares de acreditación del título de Licenciado en Psicología [Resolution 343/09, Standards for the accreditation of the Psychology degree]*. https://www.coneau.gob.ar/archivos/form11psico/RM034309.pdf

Costall, A. (2004). From Darwin to Watson (and Cognitivism) and Back Again: The Principle of Animal-Environment Mutuality. *Behavior and Philosophy*, *32*(1), 179–195.

Cotner, S., Brooks, D. C., & Moore, R. (2010). Is the age of the Earth one of our "sorest troubles"? Student´s perceptions about Deep time affect their acceptance of evolutionary theory. *Evolution*, *64*(3), 858–864. https://doi.org/10.1111/j.1558-5646.2009.00911.x

Cottingham, J. (1992). Cartesian dualism: Theology, metaphysics, and science. In J. Cottingham (Ed.), *The Cambridge Companion to Descartes* (pp. 236–257). Cambridge University Press. https://doi.org/10.1017/CCOL0521366232.009

Dawkins, R. (2008). *The God delusion* (1st Mariner Books ed). Houghton Mifflin Co.

Demertzi, A., Liew, C., Ledoux, D., Bruno, M.-A., Sharpe, M., Laureys, S., & Zeman, A. (2009). Dualism Persists in the Science of Mind. *Annals of the New York Academy of Sciences*, *1157*(1), 1–9. https://doi.org/10.1111/j.1749-6632.2008.04117.x

Fahrenberg, J., & Cheetham, M. (2000). The mind-body problem as seen by students of different disciplines. *Journal of Consciousness Studies*, *7*, 47–59.

Fierro, C., & Menéndez, A. (2020). *Análisis socio-bibliométrico de las principales carreras de psicología de la República Argentina. Estado actual y comparación histórica (1998-2018) [Socio-bibliometrical analysis of the primary Psychology majors of the Argentine*

Republic. Present state and historical comparison (1998-2018)]. GitHub. https://github.com/joaquinmenendez/analisis-bibliometrico-psiologia-Argentina

Gefaell, J., Prieto, T., Abdelaziz, M., Álvarez, I., Antón, J., Arroyo, J., Bella, J. L., Botella, M., Bugallo, A., Claramonte, V., Gijón, J., Lizarte, E., Maroto, R. M., Megías, M., Milá, B., Ramón, C., Vila, M., & Rolán-Alvarez, E. (2020). Acceptance and knowledge of evolutionary theory among third-year university students in Spain. *PLOS ONE*, *15*(9), e0238345. https://doi.org/10.1371/journal.pone.0238345

Glannon, W. (2020). Mind-Brain Dualism in Psychiatry: Ethical Implications. *Frontiers in Psychiatry*, *11*, 85. https://doi.org/10.3389/fpsyt.2020.00085

González Galli, L. (2019a). Enseñanza de la Biología y pensamiento crítico: La importancia de la metacognición. *Revista de Educación en Biología*, *22*(2), 4–24.

González Galli, L. (2019b). Darwinian perspectives on the human mind and behavior: Scope, limitations and educational implications. *Revista de Humanidades de Valparaíso*, *14*, 187–222. https://doi.org/10.22370/rhv2019iss14pp187-222

Gross, N., & Simmons, S. (2009). The Religiosity of American College and University Professors. *Sociology of Religion*, *70*(2), 101–129. https://doi.org/10.1093/socrel/srp026

Guest, M., & Sharma, S. (2011). *Religion and university students*. King's College London, London, United Kingdom.

Harrell, F. (2019). *Package 'hmisc.'* CRAN2018. https://CRAN.R-project.org/

Hayes, B. C. (2000). Religious Independents within Western Industrialized Nations: A Socio-Demographic Profile. *Sociology of Religion*, *61*(2), 191. https://doi.org/10.2307/3712285

Karmakar, G. (2021). The body and sexuality in cultural representation: An interview with Susan Bordo. *Journal of Gender Studies*, *30*(7), 855–863. https://doi.org/10.1080/09589236.2020.1860740

Le Grange, L. (2004). Embodiment, social praxis and environmental education: Some thoughts. *Environmental Education Research - ENVIRON EDUC RES*, *10*, 387–399. https://doi.org/10.1080/1350462042000258206

Lee, E. S. (Ed.). (2014). *Living alterities: Phenomenology, embodiment, and race*. State University of New York Press.

Mehta, N. (2011). Mind-body dualism: A critique from a health perspective. *Mens Sana Monographs*, *9*(1), 202. https://doi.org/10.4103/0973-1229.77436

Ministerio de Educación de la Nación Argentina. (2019). *Mujeres en el Sistema Universitario Argentino [Women in the Argentinian university system]*. https://www.argentina.gob.ar/noticias/la-participacion-de-las-mujeres-en-el-sistema-universitario

Miresco, M. J., & Kirmayer, L. J. (2006). The Persistence of Mind-Brain Dualism in Psychiatric Reasoning About Clinical Scenarios. *American Journal of Psychiatry*, *163*(5), 913–918. https://doi.org/10.1176/ajp.2006.163.5.913

Moore, R., Brooks, C., & Cotner, S. (2011). The Relation of High School Biology Courses & Students' Religious Beliefs to College Students' Knowledge of Evolution. *The American Biology Teacher*, *73*(4), 222–226. https://doi.org/10.1525/abt.2011.73.4.7

Moreira-Almeida, A., & Araujo, S. de F. (2015). Does the brain produce the mind? A survey of psychiatrists’ opinions. *Archives of Clinical Psychiatry (São Paulo)*, *42*(3), 74–75. https://doi.org/10.1590/0101-60830000000051

Oksanen, J., Blanchet, F. G., Friendly, M., Kindt, R., Legendre, P., McGlinn, D., Minchin, P. R., O'Hara, R. B., Simpson, G. L., Solymos, P., Stevens, M. H. H., Szoecs, E., & Wagner, H. (2020). *vegan: Community Ecology Package* (2.5-7) [Computer software]. https://CRAN.R-project.org/package=vegan

Pinheiro, J., Bates, D., DebRoy, S., Sarkar, D., EISPACK, E., Heisterkamp, S., Van Willigen, B., & Ranke, J. (2021). *nlme: Linear and Nonlinear Mixed Effects Models* (3.1-152) [Computer software]. https://CRAN.R-project.org/package=nlme

R core team. (2020). *R: A language and environment for statistical computing*. ttps://www.R-project.org/

Richly, P. (in press). ¿Dónde creen los profesionales de la salud mental que está la mente? [Where do mental health professionals believe the mind is?]. *Revista Sinopsis*.

Ripley, B., & Venables, W. (2021). *nnet: Feed-Forward Neural Networks and Multinomial Log-Linear Models* (7.3-16) [Computer software]. https://CRAN.R-project.org/package=nnet

Searle, J. (2013). Theory of mind and Darwin's legacy. *Proceedings of the National Academy of Sciences*, *110*(Supplement_2), 10343–10348. https://doi.org/10.1073/pnas.1301214110

Short, S. D., & Hawley, P. H. (2015). The Effects of Evolution Education: Examining Attitudes toward and Knowledge of Evolution in College Courses. *Evolutionary Psychology*, *13*(1), 147470491501300100. https://doi.org/10.1177/147470491501300105

Shtulman, A., & Harrington, K. (2016). Tensions Between Science and Intuition Across the Lifespan. *Topics in Cognitive Science*, *8*(1), 118–137. https://doi.org/10.1111/tops.12174

Shtulman, A., & Lombrozo, T. (2016). Bundles of contradiction: A coexistence view of conceptual change. In D. Barner & A. S. Baron (Eds.), *Core Knowledge and Conceptual Change*. Oxford University Press. https://scholar.google.com/citations?view_op=view_citation&hl=en&user=Cz8bTrkAAAAJ&citation_for_view=Cz8bTrkAAAAJ:65Yg0jNCQDAC

Shtulman, A., & McCallum, K. (2014). Cognitive Reflection Predicts Science Understanding. *Proceedings of the Annual Meeting of the Cognitive Science Society*, *36*(36). https://escholarship.org/uc/item/4t79p8pj

Slingerland, E., & Chudek, M. (2011). The Prevalence of Mind–Body Dualism in Early China. *Cognitive Science*, *35*(5), 997–1007. https://doi.org/10.1111/j.1551-6709.2011.01186.x

Strejilevich, S., Flichtentrei, D., Urtueta, L., Prats, D., & Mastandueno, R. (2014). Dualismo y Monismo en la concepcion filosófica de los médicos. *IntraMed Journal*, *3*(3), 1–10.

Tayeb, H., Alsawwaf, Y., Zaki, S., Alwasiah, R., Kafi, S., Badawood, L., Baduwilan, A., & Koeing, H. (2017). Prevelance and determinants of mind-brain dualism among Saudi medical students. *Journal of the Neurological Sciences*, *381*, 194. https://doi.org/10.1016/j.jns.2017.08.555

United Nations. (1949). *Universal Declaration of Human Rights*. United Nations; United Nations. https://www.un.org/en/about-us/universal-declaration-of-human-rights

Figures

Figure 1. *Flowchart corresponding to the survey questionnaire process.*

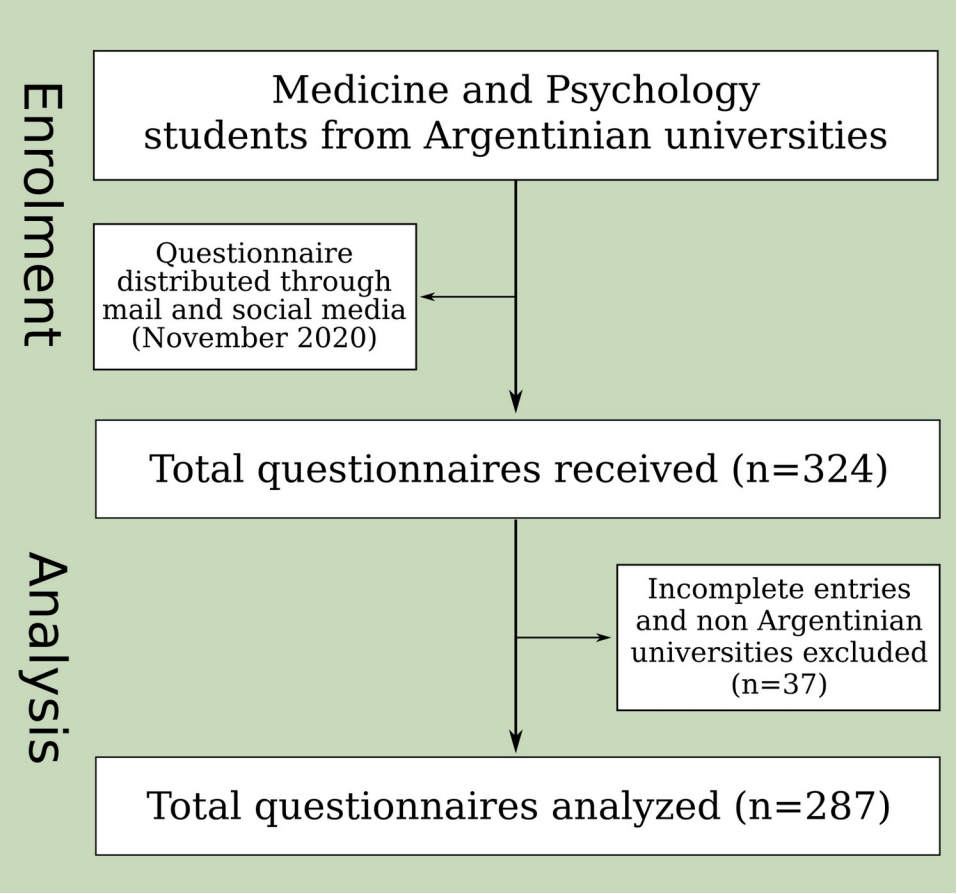


Figure 2. *Responses about supernatural beliefs and dualism. Percentages for each answer are depicted.*

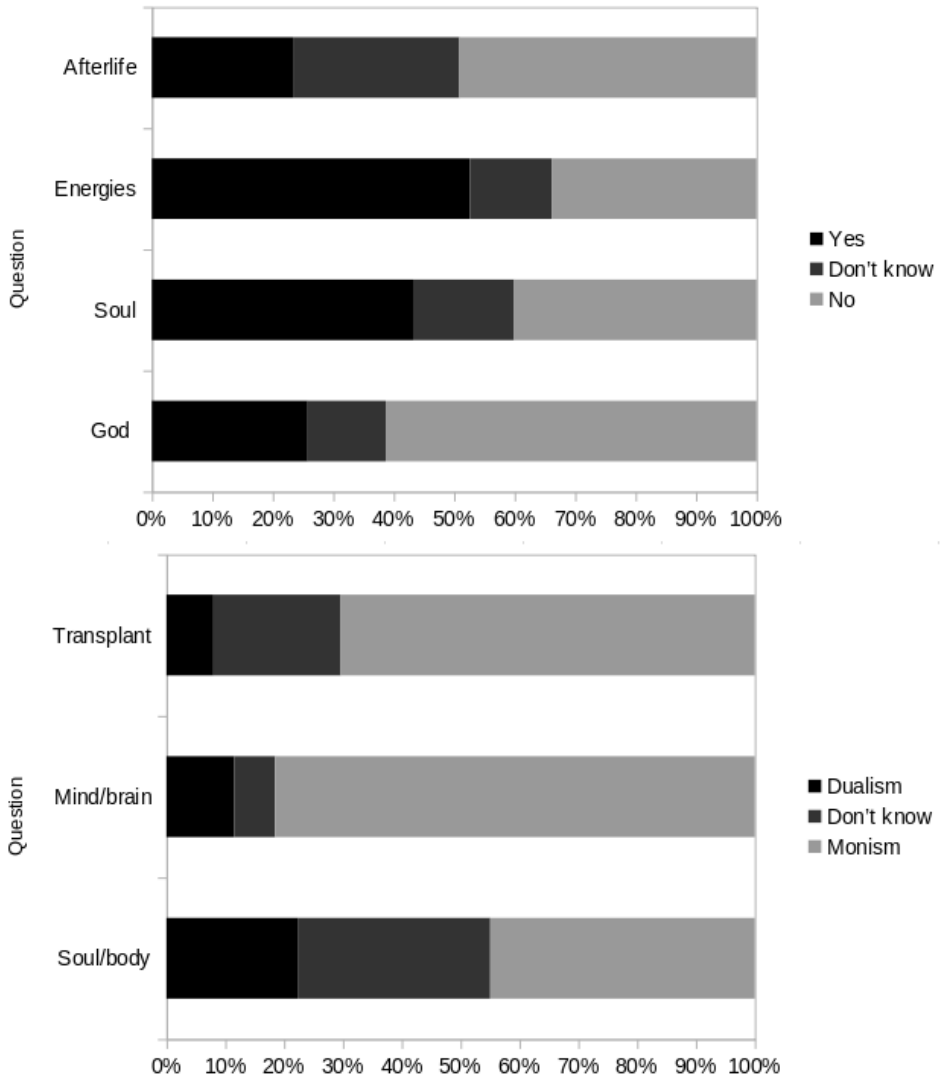


Figure 3. *Results for the first two components of the PCA for Dualism questions. The shape of each data point represents the major and the color scale indicates participant's age*

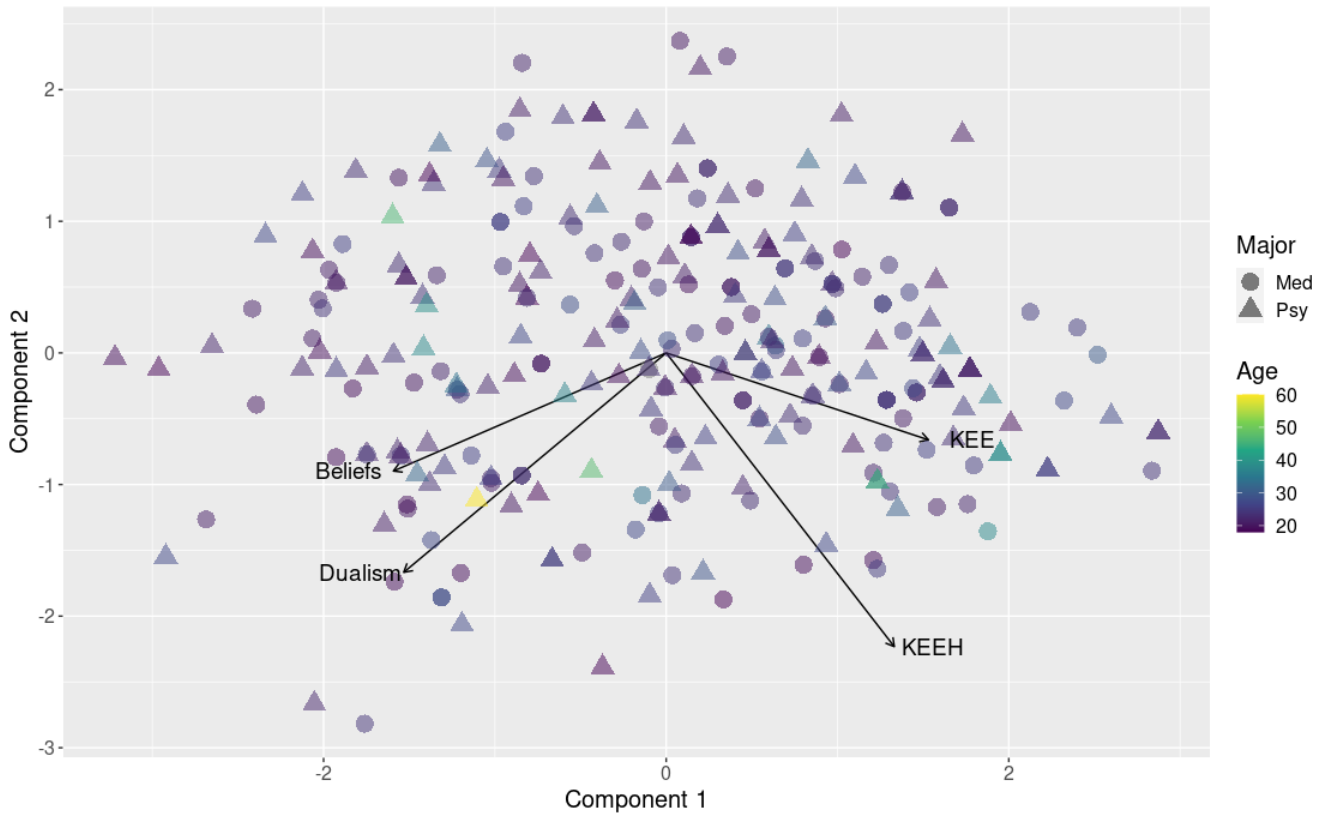
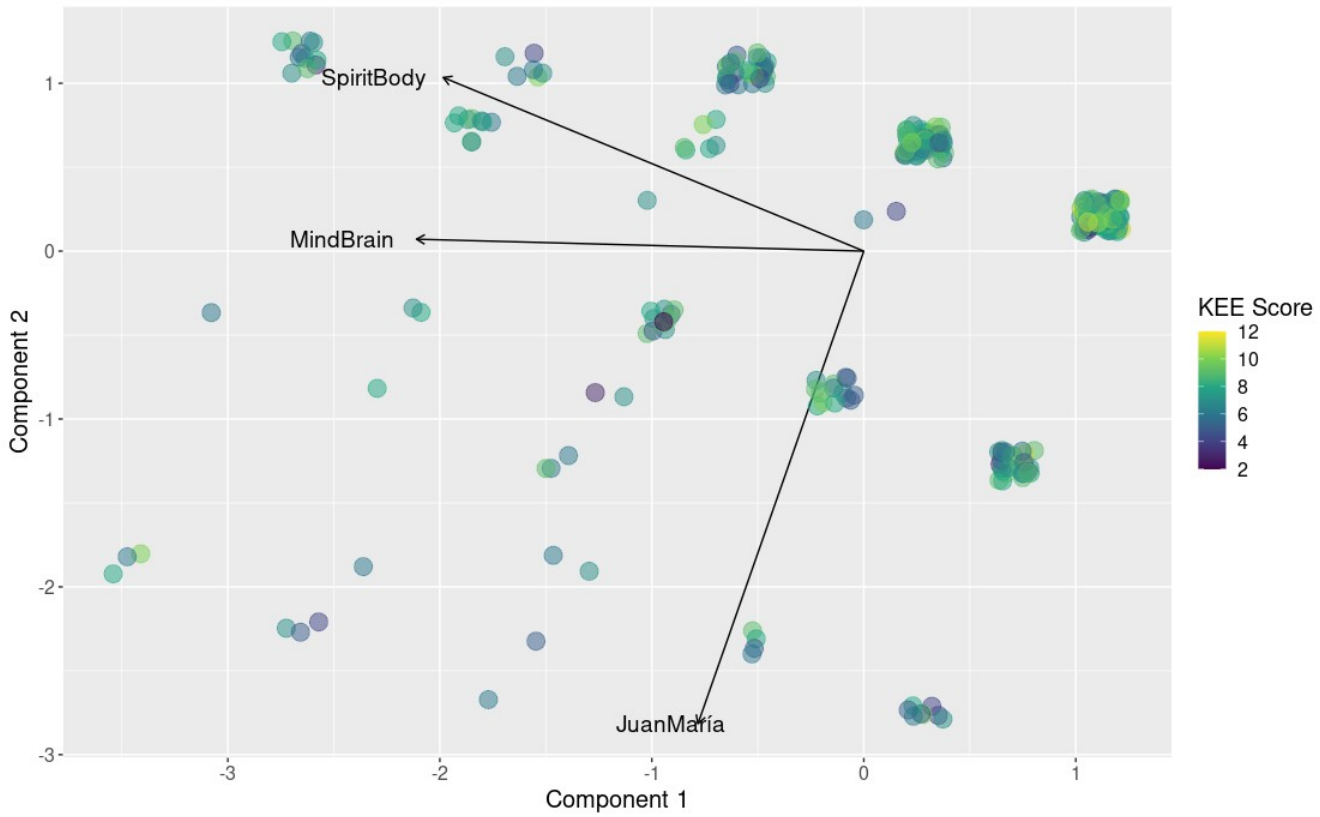


Figure 4. *Results for the first two components of the PCA for Dualism questions. The color scale indicates participant's performance on the KEE questionnaire.*



TABLES

Table 1. *Primary outcomes for the measured scores (mean score and n for each major)*

	Supernatural beliefs	**Dualism**	**KEE**	**KEEH**	**n**
Medicine	4.33	1.44	7.48	1.65	133
Psychology	4.18	1.45	7.25	1.52	154

Table 2. *Spearman correlations for the primary outcomes scores (above the diagonal); p-values below the diagonal*

	KEE	***KEEH***	***Supernatural beliefs***	***Dualism***
KEE	-	*-0.22*	*-0.15*	*-0.21*
KEEH	*<0.001*	-	*-0.18*	*-0.11*
Supernatural beliefs	*0.009*	*0.002*	-	*0.26*
Dualism	*<0.001*	*0.054*	*<0.001*	-