Does a science-oriented worldview entail unbelief? Meaning, morality, and continuity from scientific research in self-reports of Finnish unbelievers and believers

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Citation: Haimila, Roosa. 2020. "Does a science-oriented worldview entail unbelief? Meaning, morality, and continuity from scientific research in self-reports of Finnish unbelievers and believers," *Secular Studies* 2(2) (in press).

Abstract

Endorsement of science is often associated with non-religiosity and lack of supernatural belief. However, the relevance of science for worldviews might also relate to the cultural context and/or personal investment in science. This study investigates the following question: Is endorsement of worldview components of science associated with unbelief among science-oriented respondents? Here, worldview components refer to science providing 1) a sense of meaning, 2) moral standards, and 3) literal or symbolic continuity after death. 387 Finnish adults recruited via pro-research organizations were included in the analysis. The results suggest that self-reported worldview functions of science are associated with unbelief also among science-oriented individuals. These findings lend support to the belief replacement hypothesis, which suggests that secular worldviews such as belief in science are of particular importance for unbelievers. However, the effect sizes are small and also other God belief groups endorse the significance of science for e.g., meaning in life.

Keywords

science and religion; belief in science; nonreligion; secular worldviews; unbelief; atheism; belief replacement

1 Introduction

Science and religion are often discussed as competing explanatory frameworks that are inherently in conflict (Evans and Evans 2008; see Dawkins 2006) or as complementary, yet separate stances. Perhaps the most prominent suggestion on science and religion as complementary is that they are “non-overlapping magisteria” that provide answers to different questions and needs. Science informs us how events occur in the natural world, whereas religion can provide us with ultimate meaning, moral values, and deeper insight on why things happen (Gould 1997; 1999, 6). According to palaeontologist Stephen J. Gould,

... these two magisteria do not overlap, nor do they encompass all inquiry (consider, for starters, the magisterium of art and the meaning of beauty). To cite the arch clichés, we [scientists] get the age of rocks, and religion retains the rock of ages. (Gould 1997, 18)

On the other hand, one example of the recent competition-based accounts of science and religion is the belief replacement hypothesis, which suggests that secular worldviews may serve similar psychological functions as religiosity for atheists (Farias 2013). Much of the relevant research has focused on belief in science and other science-related views (Rutjens et al. 2016; Rutjens, van Harreveld, and van der Pligt 2013). Several studies seem to support the belief replacement hypothesis, since trust in science can provide existential meaning and mitigate death anxiety, as God belief does for theists (Farias et al. 2013; Lifshin et al. 2018; Norenzayan and Hansen 2006).¹

¹ Farias et al. (2013) found that reminders of mortality bolstered belief in science in academic respondents, but they were unable to explore the possible effect of God belief and/or religiosity, due to an overall secular sample. However, in a study by Lifshin et al. (2018), reminders of mortality decreased afterlife belief and increased support for indefinite life extension (ILE) mainly for psychology students who scored low on religiosity. Religious participants, instead, found ILE less appealing. The results of Lifshin et al. suggest that striving for immortality via scientific innovation can “replace” religious afterlife belief – but mainly for people that are less religious. Rutjens et al. (2016), on the other hand, found null effects of mortality salience on belief in scientific-technological progress. In their study, however, the sample was non-academic (representative of the general Dutch population).

However, it might not be meaningful to focus mainly on atheists in studies of secular worldviews. Stavrova, Ehlebracht, and Fetchenhauer, for instance, found that in more than 60 countries, belief in scientific-technological progress predicted a higher sense of control and increased life satisfaction – an effect that was robust to religiosity. The effect was enhanced in countries where belief in science was more common. Studies also suggest that trust in science might be relevant for moral reasoning (Ma-Kellams and Blascovich 2013) regardless of religiosity (Yilmaz and Bahçekapili 2015). Additionally, Tracy, Hart, and Martens (2011) found that both nonreligious and religious individuals rely on scientific knowledge to relieve death anxiety if they are personally invested in science. To summarize, the importance of science for an individual's worldview might relate more to the cultural context and/or personal investment in science than religious affiliation or belief (Stavrova et al. 2016; McPhetres, Jong, and Zuckerman 2020).

So far, studies on the significance of science for worldviews have mainly been experimental (Farias et al. 2013; Tracy et al. 2011; Rutjens et al. 2016). Therefore, we know little about how people *themselves* evaluate how their confidence in science is meaningful for them. The few studies that have shed light on the meaning of science for worldviews from people's own perspective have focused on atheists (van Mulukom et al., manuscript; Coleman and Arrowood 2015). Additionally, studies have at times measured attitudes towards science with items that posit science and religion as conflicting (see Farias et al. 2013; Rutjens, Sutton, and van der Lee 2018; Hayes and Tariq 2000), as high endorsement of science is often associated with non-religiosity and lack of God belief.² This assumption seems empirically solid, as there has long been a reported link between science-orientation and atheism (e.g., Beit-Hallahmi 2006; Stirrat and Cornwell 2013). However, prior studies on the relationship between science attitudes and

² For instance, several studies have applied the Belief in Science Scale (Farias et al. 2013) and reported negative correlations between belief in science and religious or paranormal belief (Farias et al. 2013; Aghababaei 2016; Irwin et al. 2015) – some have suggested that the relationship might be due to e.g., the effect of science education on critical thinking skills (Irwin et al. 2015). However, the scale posits science and religion as competing (Farias et al., 2013).

religious belief have mostly been conducted in the United States, and recent work suggests that the correlations between religiosity and attitudes towards science show inconsistent patterns when the scope of research is extended beyond the Anglo-American context (McPhetres et al. 2020, see also Ecklund et al. 2016). Additionally, across studies conducted in different cultures, people often rely on natural and scientific explanations, but many also endorse supernatural causality for phenomena such as human origins and death in a context-dependent manner (Legare et al. 2012; Busch, Watson-Jones, and Legare 2017). In scientific contexts, people often apply more scientific explanations and less religious beliefs, and vice versa (Astuti and Harris 2008; Legare and Shtulman 2018; Preston and Epley 2009). These findings suggest that although scientific and supernatural explanations may “compete”, people might still utilize both in their everyday thinking and even integrate supernatural causality with scientific content (see Evans et al. 2009).

The present study explores self-reported attitudes towards science in the Nordic context. The study investigates the following question: Is endorsement of worldview components of science associated with unbelief among science-oriented respondents? The study was conducted in Finland among science-oriented respondents who were both believers and non-believers. This allowed assessing how the participants' self-reported views of science answered to existential questions as well as investigating whether the believers and unbelievers systematically differed in their views. It was expected that both unbelievers and believers might self-report that science answers existential questions, and there might not be significant differences in self-reported endorsement of the worldview components of science.

In this study, worldview refers to a theory of reality that provides an individual with 1) a sense of meaning, 2) standards assessing human behaviour, and 3) hope of literal or symbolic immortality (Pyszczynski, Solomon, and Greenberg 2015). This definition draws from terror

management theory literature and bears similarities to recent suggestions in the study of religion, such as worldviews as answers to “big questions” integrated into a meaning systems framework. Both emphasize the human need to experience meaning through connection, hold values on right and wrong, and form theories on what is true, where we come from, and where we are going (Greenberg, Pyszczynski, and Solomon 1986; Taves, Asprem, and Ihm 2018; Taves 2018; Droogers 2014).

What is a science-oriented worldview?

Studies in the field of science-and-religion have at times been criticized for not specifying what is meant by science (Johnson, Scheitle, and Ecklund 2015). The current study investigates the significance respondents give to the concepts of “science” (in Finnish, *tiede*) and “scientific research”. Therefore, science is applied as an emic concept (see also Qadir and Syväterä 2017; cf. Johnson, Scheitle, and Ecklund 2015). However, it is necessary to note that in Finnish (as in many Nordic and Western European languages), the common meaning of science is wider in scope than in the Anglo-American context: the Finnish word for science often includes the social sciences and humanities, and at times, all research conducted at universities and other research institutions. The Finnish word for “science” therefore resembles the German term *wissenschaft* and equivalent terms in the Nordic languages, such as *vetenskap* in Swedish and *videnskab* in Danish (Hansson 2015, 15; Kiikeri and Ylikoski 2004, 16). Like prior research in the Nordic and Western European context (e.g., Lindeman et al. 2019), this study applies the nationally widespread word for science.

In prior academic and popular discussions, the importance of science for worldviews has often been discussed with the term “scientific worldview” (e.g. Enqvist 2014; National Church Council 2019; Irwin, Drinkwater, and Dagnall 2015). This expression implies that worldviews that

hold science in high regard are also in accordance with science in their content, in the sense that they are “scientific” (see also Niiniluoto 1984). However, it seems plausible that many people who identify with science still hold versatile everyday beliefs, including misconceptions about scientific theories (see e.g., Knobe and Samuels 2013). Since religious and supernatural content are often perceived in contrast with science, some also assume that scientific worldviews are non-religious (see e.g., Science Barometer 2019). Although atheism is often more common among researchers than the general population, there are many God believers among scientists (Ecklund et al. 2016) and also scientists may be prone to certain kinds of supernatural thinking, such as perceiving purpose in nature (Kelemen, Rottman, and Seston 2013). Since it is expected that not all the worldview content of respondents aligns with current scientific theories (and it is not the aim of my study to evaluate this), the current article does not discuss scientific worldviews but instead applies the term science-oriented worldview (cf. Johnson, Scheitle, and Ecklund 2015). Here, science-oriented worldview refers to meaning-making systems that rely on science – regardless of other possible beliefs of the respondents.

What is unbelief?

Although belief replacement literature defines an atheist as an “individual who denies or lacks beliefs in gods”, it is also implied that atheists more generally lack supernatural belief (which belief in science and other secular worldviews replace) (Farias 2013, 2). But what is supernatural? In prior literature, supernatural has often been defined e.g., as phenomena outside the realm of natural laws and scientific inquiry and/or beliefs that have culturally been considered supernatural, such as religious concepts and witchcraft (Flanagan 2008, 3; Legare et al. 2012; Watts et al. 2020). However, some studies suggest that most beliefs deemed as religious,

paranormal or supernatural often share a cognitive structure that violates panhuman expectations concerning ontological properties of beings (e.g., Lindeman and Svedholm 2012; Pyysiäinen, Lindeman, and Honkela 2003; see also Boyer 2001). For instance, the belief in intelligent design in nature contains intentional agency without a physical body – which humans readily expect intentional agents such as themselves to have. Studies suggest that beliefs such as mind-body dualism and perceiving purposeful design in nature might be intuitively appealing and occur in different cultural contexts (Järnefelt, Canfield, and Kelemen 2015; Järnefelt et al. 2018; Chudek et al. 2018). Therefore, it is possible that some hold beliefs that bear similarities to religious supernatural belief but operate with secular terminology.

In this article, unbelief is discussed as 1) unbelief in God, and 2) unbelief in other supernatural agency or purpose, when supernatural refers to beliefs that mix ontological core knowledge (cf. Lindeman and Svedholm 2012).

2 Method and participants

The data were collected with an online questionnaire, implemented on the GDPR compliant LimeSurvey platform. The respondents were recruited via Finnish research institutions and organizations that promote research. The invitation was first sent via email to research-affiliated organizations, followed by social media recruiting in Facebook, Twitter and selected discussion boards (for details of the recruitment procedure, see [Supplementary online material A](#)). As an incentive, the respondents could participate in a raffle for an Amazon gift card (60 €). Participants could also request a report on the study results. The participants first answered open-ended questions on human origins, suffering, and death (to be reported in another article). After the open-ended questions, the respondents completed items for the science-oriented worldview

measure. These were followed by questions on beliefs that mix core knowledge, a control question (see [Supplementary online material B](#)), and the Belief in Science Scale. Lastly, the participants answered demographic questions and were debriefed. The respondents had the opportunity to comment on the questions in open-ended text fields throughout the survey.

Altogether, 683 respondents completed the questionnaire. After excluding the respondents that answered control items incorrectly, 387 participants remained for analysis. The participants were of multiple genders (202 women; 170 men; 15 other / I don't want to say). To protect anonymity of participants, age was explored with ordinal groups (18–30, 31–40, 41–50, 51–65, and over 65 years; range all age groups, Mdn = 31–40 years). Most respondents were aged 40 years or less (54%). The participants were highly educated (years of education $M = 19.63$, $SD = 4.59$), and half of the respondents had worked in research institutions (194; natural sciences 93, humanities 54, social sciences 33, other 14 participants). The majority did not belong to any religious community (269, religiously affiliated 118). Similarly, most respondents did not believe in God (268, 69%), or felt unsure of their God belief (66, 17%). Fifty-three respondents stated that they believed in God (14%). Next, the measures and open-ended questions applied in the study are described.

Supernatural agency and purpose

To investigate respondents' belief in supernatural agency and purpose, the participants were asked to rate statements on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The items contained statements often associated with religion (e.g., "God created the Earth and living things (animals, plants)") and statements that do not contain religious terminology (e.g., "The

world is a fair place”, “It is most likely that we live in a reality created by an agent (such as AI)”).³

The items were collected from several prior measures, and some of the items were based on prior qualitative data (Davis, Juhl, and Routledge 2011; Stanovich 1989; Lipkus 1991; Haimila 2016).⁴

The source most relied upon was Järnefelt et al.’s (2018) culturally sensitive supernatural beliefs survey, originally designed for Chinese respondents. Some items were modified to better suit the contemporary Finnish context (for all items and modifications, see [Supplementary online material C](#)). The questions also contained filler items, such as “Humans have evolved from other, prior species of animals” and “People mostly have good intentions”. The internal consistency of the belief items as Cronbach’s alpha was high ($\alpha = .89$). The God belief of the participants was investigated in the final section of the survey with the question “Do you believe in God?” The respondent could choose one of the following options: Yes, No, and I cannot say (or “I do not know”).

Science-oriented worldview

To explore the significance of science for one’s worldview, the respondents answered items on 1) a sense of meaning, 2) standards for assessing human behaviour, 3) literal immortality, and 4) symbolic continuity from scientific research (see Tables 1–4). The items were rated on a Likert scale 1–5 (1 = strongly disagree to 5 = strongly agree). Reversed items were recoded so that higher scores reflect higher endorsement of the worldview components. The internal validity of

³ To exclude the possibility of respondents perceiving the purposeful/agentive items as mere metaphors, the items that according to the pilot study could be read as metaphorical were preceded by an item that did not contain agency or purpose but was otherwise identical to the belief item (e.g., the item “All humans are made of the same material (for instance, matter/energy, stardust)” was preceded by the item “All humans consist of the same matter (for instance, [a synonym for matter]/energy, stardust”).

⁴ There are several scales for measurement of supernatural and paranormal belief – however, these mainly explore beliefs that are culturally perceived as religious, New Age or “superstitious” (Jong et al. 2013; Tobacyk 2004; Irwin and Marks 2013) or are formed for a specific topic, such as magical beliefs about nutrition (Lindeman et al. 2000; however, see Lindeman et al. 2019).

each subscale was investigated with principal component analysis, and items that were the least related to the extracted component(s) (loading < .35) or other items of the subscale (all correlations $r < 0.35$) were deleted (see [Supplementary online material D](#)). This procedure was followed by internal consistency analysis utilizing the Cronbach's alpha.⁵

The structure of the remaining items was explored. Principal component analysis with Varimax rotation yielded six components with eigenvalues > 1.0 that accounted for 65% of the variance. The first component contained the meaning subscale (loadings .60–.79), and the second component encompassed the symbolic continuity subscale (loadings .54–.85). The third and fourth components comprised the standards for assessing human behaviour subscale: component 3 contained the items that focused on science as a tool for moral evaluations (with loadings .53–.83), and component 4 mainly comprised the items that also described science as a *source* of moral evaluations (loadings .60–.82). Similarly, the literal immortality subscale items loaded to two separate components: component 5 contained the items on *avoiding* death via science (with both items loading = .94) and component 6 on science that enables continuity *after* death (loadings .74–.76). The subscales were merged for an overall measure of self-reported meaning, morality, and post-death continuity from science. The reliability of the measure as internal consistency was high (Cronbach's $\alpha = .89$). For further analyses, median scores were computed for the measure and each subscale. In the following sections, the items and internal consistency of each subscale are described. The items and their median values for God belief groups are listed in Tables 1–4.

For formulation of the items on a sense of meaning, George and Park's (2017) operationalization of existential meaning in life was applied (cf. also Singer 2004). According to

⁵ However, the final sample contained more non-religious participants (269) than religious participants (118). Therefore, the PCA item reduction procedure was also conducted for the non-religious and religious participants separately to investigate any differences in response patterns and/or interpretation of items.

George and Park, meaning in life contains at least the following 1) increasing comprehension of one's life, 2) providing a sense of purpose and 3) a sense that one's existence matters. Although items drawing from all three dimensions were included, the items exploring the comprehension of one's life were excluded from the subscale based on the PCA analysis on the underlying component of the subscale. The items on purpose and mattering of one's own existence, however, loaded onto a single component that is applied here as the meaning subscale. The internal consistency of the subscale was good (Cronbach's $\alpha = 0.86$).

TABLE 1 Science-oriented worldview items on sense of meaning: medians organized by subscale for God belief groups (scale 1–5, where 1 = totally disagree, and 5 = totally agree)

Sense of meaning	Atheists (unbelief in God)	Unsure / cannot say	Theists
1. Science increases the feeling of purpose and meaning in my life.	4.50	4.00	4.00
2. Scientific research strengthens my identity.	4.00	4.00	4.00
3. Science gives my life direction.	4.00	3.00	3.00
4. Science makes my life more valuable.	4.00	3.00	3.00
5. Science motivates me.	5.00	4.00	4.00
6. Science and research increase my sense that my life is meaningful.	3.00	3.00	3.00

According to Darrell and Pyszczynski (2016), worldviews also provide “standards of value for individuals within a culture to live up to”. In this study, these standards of value were interpreted similarly to Vidal's (2008) suggestions on the worldview components of axiology (What is good and bad?) and praxeology (What actions we should take?), and the items were formed accordingly (van Mulukom et al., manuscript; see also Taves 2018). However, the underlying components of the items did not adhere to this theoretical structure – instead, in the PCA analysis

the items that contain milder expressions and mainly depict science as a *tool* loaded onto one component, and items that mostly focus on science as a *source* for these standards were isolated to another component. Despite this, the subscale had moderately high internal consistency (Cronbach's $\alpha = 0.86$).

TABLE 2 Science-oriented worldview items on standards assessing human behaviour: medians organized by subscale for God belief groups (scale 1–5, where 1 = totally disagree, and 5 = totally agree)

Standards for assessing human behaviour	Atheists (unbelief in God)	Unsure / cannot say	Theists
1. Scientific research is irrelevant for moral decision-making. [R]	5.00	4.00	4.00
2. I evaluate people's [or human's] moral character with science.	3.00	3.00	2.00
3. Science provides ingredients for my moral views.	4.00	4.00	4.00
4. Science provides me with a framework for evaluating the actions of the humankind.	4.00	4.00	4.00
5. Science provides me with a framework for evaluating my own actions.	4.00	4.00	3.00
6. Scientific research tells me what actions we should take.	4.00	4.00	3.00
7. Science tells me what is good and bad.	2.00	2.00	2.00
8. Science helps to evaluate whether humankind has succeeded or failed.	4.00	3.00	4.00
9. Science tells us what is valuable.	3.00	3.00	2.00

Some have suggested that similar to religious belief, scientific progress may provide hope of literal immortality. According to Lifshin et al. (2018), afterlife belief may be interchangeable with the belief in avoiding death via indefinite life extension, which can serve as alternative means for literal immortality (see also Vail et al. 2020). Therefore, the items on hope of literal immortality via science refer to 1) surviving death or 2) avoiding death with scientific tools. The internal consistency of the literal continuity items was acceptable (Cronbach's $\alpha = 0.75$).

TABLE 3 Science-oriented worldview items on literal immortality: medians organized by subscale for God belief groups (scale 1–5, where 1 = totally disagree, and 5 = totally agree)

Literar immortality	Atheists (unbelief in God)	Unsure / cannot say	Theists
1. Science provides hope that my loved ones can avoid death.	1.00	1.00	1.00
2. Science provides hope that I can avoid death.	1.00	1.00	1.00
3. Scientific research provides a feeling of my own continuity after death.	2.00	2.00	2.00
4. Science makes it possible that my essence survives death.	1.00	2.00	1.00

However, cultural meaning systems can also provide hope of continuity in less literal ways, and these were explored in the items on symbolic continuity. According to Pyszczynski, Greenberg, and Solomon (1999), people gain hope of symbolic immortality when they contribute to something meaningful that outlasts their individual existence. Symbolic continuity is often described as being a part of something larger and more significant than oneself (Dechesne et al. 2003), an experience Caldwell-Harris et al. (2011) also associate with feelings of awe that they describe as “feelings of wonderment and of being a part of something greater than themselves” (cf. also Gottlieb, Keltner, and Lombrozo 2018). Therefore, an item on awe from science was also added to the symbolic continuity subscale. The other items were drawn from open-ended responses of Finnish atheists in a prior study (Haimila, manuscript). In PCA analysis of all subscales, the symbolic immortality items loaded onto a single component, and the Cronbach’s alpha measure of the subscale was good ($\alpha = 0.84$).

TABLE 4 Science-oriented worldview items on symbolic continuity: medians organized by subscale for God belief groups (scale 1–5, where 1 = totally disagree, and 5 = totally agree)

DOES A SCIENCE-ORIENTED WORLDVIEW ENTAIL UNBELIEF?

Symbolic continuity	Atheists (unbelief in God)	Unsure / cannot say	Theists
1. I feel that science connects me to a chain of generations.	4.00	4.00	4.00
2. I feel that science connects me to animals [part of the animal kingdom].	5.00	4.00	3.00
3. I feel that scientific research attaches me to humankind.	4.50	4.00	4.00
4. I feel that science connects me to the circulation of nature.	5.00	4.50	4.00
5. Science offers me an experience of respectful wonder (awe experience).	5.00	4.00	4.00
6. Science makes me feel that I am a part of the universe.	5.00	4.00	4.00

The symbolic immortality subscale was followed by an open-ended field to explore which bigger whole the participants felt connected to via science (for those participants that agreed that science connected them to a larger whole or community). Due to the multiple possible connotations of the word “science”, it was also explored what kind of science the participants thought of while they answered the measure. This was investigated with an open-ended question: “Could you tell us briefly what kind science you thought of while answering the questions?”

The open-ended responses were analysed with question-dependent coding templates, and the categories of the templates were based on the open-ended data. The responses were coded without demographic information on the participants.

Belief in Science Scale

The participants also completed a Belief in Science Scale (Farias et al. 2013). During recent years, the scale has been applied in several studies on psychology of religion and nonreligion (Valdesolo, Park, and Gottlieb 2016; Ståhl, Zaal, and Skitka 2016), including studies implemented in non-Western contexts (e.g., Aghababaei 2016). However, there are multiple interpretations on what

the Belief in Science Scale measures, as the scale has been utilized to measure “scientific faith” (Farias et al. 2013) but also other concepts, such as “belief in the values of science” (Irwin, Dagnall, and Drinkwater 2016). The items are based on Swedish philosopher Mikael Stenmark’s suggestions on scientism that 1) aims to increase the influence of science in research and other parts of society (“science expansionism”), and 2) includes a negative disposition towards religion (Farias et al. 2013; see Stenmark 2001). It was expected that the Belief in Science Scale and science as a cultural worldview items might measure different, yet possibly overlapping, aspects of attitudes towards science. Firstly, the items on the Belief in Science Scale focus on possible content of science endorsement instead of its self-reported functions. Secondly, the Belief in Science Scale juxtaposes science with religion. As in prior studies, the internal consistency of the measure was high (Cronbach’s $\alpha = .90$).

TABLE 5 Belief in science scale (Farias et al. 2013): item medians organized by subscale for God belief groups (scale 1-6, where 1 = totally disagree, and 6 = totally agree)

Belief in science scale items	Atheists (unbelief in God)	Unsure / cannot say	Theists
1. Science provides us with a better understanding of the universe than does religion.	6.00	5.00	4.00
2. “In a demon-haunted world, science is a candle in the dark.” (Carl Sagan)	5.00	5.00	3.50
3. We can only rationally believe in what is scientifically provable.	5.00	4.00	3.00
4. Science tells us everything there is to know about what reality consists of.	4.00	3.00	2.00
5. All the tasks human beings face are soluble by science.	3.00	2.00	1.50
6. The scientific method is the only reliable path to knowledge.	5.00	4.00	2.00
7. The only real kind of knowledge we can have is scientific knowledge.	5.00	3.00	2.00
8. Science is the most valuable part of human culture.	4.00	4.00	3.00
9. Science is the most efficient means of attaining truth.	5.00	4.00	3.00
10. Scientists and science should be given more respect in modern society.	6.00	5.00	5.00

3 Results

Preliminary analysis

Preliminary analyses indicated that God belief was not related to age, gender, education or work affiliation to research institutions. The overall belief in supernatural agency and purpose was not associated with age or work affiliation to research, but women endorsed supernatural belief more than men, albeit with very weak effect size ($H(2) = 10.416$, $p = .005$, $\eta^2 = 0.02$; Dunn's test with Bonferroni correction between women and men $p = .024$, mean rank of women 209.13, men 180.29). Additionally, education years were associated with less supernatural belief, although the correlation was weak ($r_s = -0.13$, $p = .013$). As expected, respondents that believed in God scored higher in general belief in supernatural agency and purpose ($H(2) = 167.139$, $p = .000$) with large effect size ($\eta^2 = 0.43$).⁶

The belief in science scale medians were moderately associated with overall median score of science-oriented worldview subscales ($r_s = 0.50$, $p = .000$) and with the science-oriented worldview subscales, except for literal immortality ($r_s = 0.11$, $p = .032$). In accordance with prior studies, the belief in science median was strongly related to God belief ($H(2) = 102.717$, $p = .000$, $\eta^2 = 0.26$), and mean ranks indicated that atheists (229.83) endorsed the Belief in Science Scale more than the undecided (135.29), and theists endorsed the items the least (80.12).

326 participants elaborated on what kind of science they thought about while answering the science-oriented worldview measure. Many participants reported that they mainly thought of

⁶ It should be noted that there were no significant differences in education years among gender groups. To investigate how the participants interpreted the God belief question, self-reported belief identities were examined for each God belief group. Respondents that answered "Yes" to the question "Do you believe in God?" primarily identified themselves as religious (45%), other (26%), or spiritual but not religious (17%). Those that responded that they do not know (or cannot say) whether they believe in God mainly self-reported as agnostics (41%), spiritual but not religious (29%), or other (15%). On the other hand, participants who did not believe in God most frequently identified themselves as atheists (45%), as having no religion (18%), as agnostics (14%) or indifferent (9%).

natural sciences (34% of those who answered the question). However, more respondents described that their perception of science also included social sciences and/or humanities (43%). Several respondents also stated that they thought about different research fields in different subscales or items (7%). For instance, one participant wrote that s/he thought about “primarily the natural sciences but also about the humanities, especially in the question ‘I feel that scientific research connects me to humankind’” (P1054). Additionally, some participants mentioned that they thought about their own field of study (9%).⁷

Group comparisons on self-reported functions of science

To explore the relationship of God belief and endorsement of meaning, morality and literal and symbolic continuity from science, Kruskal-Wallis H tests were carried out on the science-oriented worldview measure and each subscale, followed by Dunn’s test with Bonferroni correction for pairwise group comparisons. Furthermore, a Welch F test of equality of means was conducted when the variances of subscale medians were non-homogenous across groups (see Delacre et al., 2019). The pairwise comparisons of the Welch test were conducted using the Games-Howell test. The relationship between scale results and demographic variables was also investigated.⁸

Overall, God belief was associated with endorsement of worldview components from science ($H(2) = 26.941$, $p = .000$) with medium effect size ($\eta^2 = 0.06$). Pairwise comparisons of God belief groups showed significant differences between atheists and theists ($p = .000$) and between

⁷ A minority reported that they thought about e.g., the scientific method (5%) or science as research conducted at the universities or by the “scientific community” (4%). The respondents also held other notions of science, but these were less common in the open-ended responses (e.g., science as progress and a remedy for humankind (3%); science as an explanation/increasing humans’ understanding of the world (2%)).

⁸ Education years weakly correlated the meaning subscale median ($r_s = 0.11$, $p = .041$), and also work affiliation to research was related to a higher median in the meaning subscale (Mann-Whitney $U = 16549.00$, $p = .043$, research affiliation M rank = 205.20, non-affiliated M rank = 182.75). Endorsement of literal continuity from science was negatively correlated to age ($r_s = -0.25$, $p = .000$). Interestingly, respondents that had not worked in research institutions scored slightly higher on the symbolic continuity subscale (M rank = 205.38) than those working in research (M rank = 182.68), according to a Mann-Whitney test ($U = 16525.00$, $p = .035$).

atheists and those unsure of their God belief ($p = 0.011$). Mean ranks indicated that atheists scored the highest in the science-oriented worldview (212.43), followed by those undecided in their God belief (168.06), and God believers (133.11).

Science providing meaning and morality

The God belief groups differed significantly in their sense of meaning from science ($H(2) = 18.210$, $p = .000$, $\eta^2 = 0.04$). Post hoc comparisons indicated differences between atheists and theists ($p = .001$), and between atheists and those unsure of their God belief ($p = 0.009$). Mean ranks showed that atheists scored the highest in meaning from science (mean rank 209.59), followed by the undecided (165.02), and theist participants (151.24).

God belief was also related to perceived significance of science for morality ($H(2) = 22.814$, $p = .000$, $\eta^2 = 0.05$). Post hoc comparisons indicated a difference between atheists and theists ($p = .000$), atheists scoring higher than theists (atheists' mean rank 209.15, theists' mean rank 137.67). Due to the non-homogeneity of variances, a Welch F test was also conducted ($F(2, 100.26) = 10.93$, $p = .000$) with Games-Howell post hoc tests, indicating a significant difference between atheists and theists ($p = .000$).

167 respondents specified their responses with open-ended comments (118 atheists, 26 unsure in their God belief, and 23 theists). Twenty-seven participants commented on the implications of confidence in science for a sense of meaning.⁹ However, the comments mostly

⁹ Most frequently, the respondents mentioned a sense of paradox between science and meaning in life (nine respondents). They described that the endeavour of scientific research on one hand increases their sense of significance, yet decreases it. As one participant wrote, "[...] science and research have made my life very meaningful, but also deprived it of all meaning. I feel positive about the personal goals I've set for science and research, and I therefore experience my everyday life as meaningful, but on the other hand when you think of the vastness of the universe and time, in the long run what I do doesn't matter at all" (P688, atheist). The respondents experienced human insignificance in differing ways. Four participants specified that the lack of personal significance is a positive experience that brings comfort or "relief" (P1302, atheist). However, few described personal insignificance as a pathway to their own existential anxiety or increased "nihilism" (P804, atheist).

discussed the role of science for morality (100 respondents, 60% of open-ended responses). The comments on morality were coded into two main categories: 1) importance of science for morality (54 respondents), and 2) limitations/resistance of combining science and morality (65 respondents). In general, the most widely mentioned limitation was that science can only answer "factual questions" (P1294), as science cannot inform us of good and bad, or right and wrong (27 respondents). However, many respondents both described the significance of science for morality and acknowledged the limitations of science. These responses were coded to both categories (33 respondents). One pattern of responses described science as a necessary *tool* for moral consequences, as one participant wrote:

Science in itself does not tell what is good and bad or what we should choose to develop a just society. However, it helps to predict the consequences of choices, in one's own life as well as societally and globally, and is therefore an essential tool when we aim for morally right actions. (P1066, atheist)

Fewer respondents reflected on the moral importance of science without discussing possible limitations (21 participants). Some focused on the ability of research to increase well-being, as one of the respondents described:

... we know through research on things that are important to humans and what causes [social] malaise. This [knowledge] can be applied to understand humanity and to make the world a better place to live for us all. Bad causes suffering, good well-being. (P1284, unsure of God belief)

A Kruskal-Wallis H tests indicated no significant differences between God belief groups in the two main categories of open-ended responses (importance of science for morality; limitations/resistance of combining science and morality). However, the number of theists that specified their views on morality and science was small (11 theists, 16 unsure in their God belief, and 73 atheists), as theist respondents were fewer in the sample than atheists or those unsure of their God belief.¹⁰

Literal and symbolic immortality from science

There was no significant effect of God belief on self-reported hope of literal continuity via science ($H(2) = 0.582$, $p = .748$). Further insight was sought from the open-ended comments following the continuity subscales. The most frequent feedback on the literal continuity subscale concerned the “hope of” avoiding death: thirty respondents criticized the expectation that human immortality would be a positive phenomenon (25 atheists, 3 unsure in their God belief, and 2 God believers).¹¹ For instance, one participant wrote that it is “[...] weird to talk of these kinds of ‘hopes’ since I don’t have any. I consider that humans are not immortal, and consciousness does not survive death” (P796). Several atheist participants also described mortality as comforting, and some perceived the thought of surviving death as negative or “distressing” (P2522). An atheist respondent specified that the finity of life “makes the things I do during these 80–90 years more meaningful” (P1294). In a similar vein, another respondent wrote, “the question gave me the

¹⁰ Additionally, in the Kruskal-Wallis test between God belief groups on the importance of science for morality the p-value of the significance test was small, albeit non-significant ($H(2) = 5.250$, $p = .072$).

¹¹ Although 30 responses out of 387 might seem like a small number, these responses are noteworthy especially since the open-ended field following the literal continuity subscale was *not* a general comments field but explored what kind of science the participants thought of while answering.

impression that mortality would be somehow negative. But isn't it mortality that makes life sweet?" (P792).

Despite this, God belief groups did differ in *symbolic* continuity items, operationalized here as a sense of belonging from science to something that outlasts individual existence and awe from science, ($H(2) = 24.138, p = .000$). The differences between groups were small to moderate in effect size ($\eta^2 = 0.06$). Pairwise comparisons indicated that the differences were between atheists and theists ($p = .000$), and theists and respondents not sure about their God belief ($p = .035$). Similar to the meaning and morality measures, atheists (mean rank 209.15) endorsed symbolic continuity from science the most, followed by the undecided (181.92) and theists (132.45). Due to non-homogenous variances, a Welch F test was conducted. The Welch test supported the Kruskal-Wallis results ($F(2, 93.75) = 11.34, p = .000$) with Games-Howell post hoc tests indicating a significant difference between atheists and theists ($p = .000$).

191 respondents also answered the open-ended question of the item "Science makes me feel that I'm a part of some bigger whole, what?" In the responses, participants mainly reported that science connects them to other humans and communities, such as the research community (36% of those who answered the question), other communities (9%), humankind or humans more generally (8%), and/or like-minded people who were described in positive and at times moral terms (Intelligent/curious/good people, 7%). Relatedly, some respondents felt that science connects them to human progress (9%). All categories and the frequencies of the responses are reported in Table 6. The categories overlap in many of the responses. The possible relationship of the open-ended responses and God belief was examined for the top categories (1–5). Chi-square tests of independence showed no significant association between God belief and open-ended reports on the connection with a larger whole via science.

TABLE 6 Open-ended responses for agreement in “Science makes me feel a part of some other bigger whole, what?” (N = 191) Responses have been coded into one or more categories.

Category	N (% of open-ended responses)	Example quotes from respondents
1. Scientific community	68 (36%)	“Scientific community” “Researchers”
2. Other/nonspecified community	18 (9%)	“Community” “My own inner circle” “Gender”
3. Progress/Enlightenment/Future	17 (9%)	“The project of Enlightenment” “The constant progress of the society” “The civilization of humankind”
4. Humankind	15 (8%)	“Humankind” “Humanity”
5. All living/biological	15 (8%)	“Everything living” “The circle of life.” “Nature, animals and plants, soil” “History, nature. Existence as one of the results of the universe and evolution.”
6. Intelligent/curious/good people	14 (7%)	“Advanced level of thought” “The chain of people that are curious and thirsty for knowledge” “The group of those that aspire to truth and wisdom”
7. Society/culture	12 (6%)	“Society” “Society and culture” “Society where the science rhetoric is strong (in its good and bad ways)”
8. Cosmos/space	12 (6%)	“Space” “A very tiny part of the universe”
9. History/time	12 (6%)	“History” “Chain of generations” “Inheritance of thought”
10. Nature/physical	6 (3%)	“Nature” “The circulation of matter in this world”
11. Interconnectedness	4 (2%)	“Everything” “The common consciousness that we share”
12. This planet/Earth	3 (2%)	“This planet”
13. Creation or God’s plan	3 (2%)	“The created universe”

Science-orientation and belief in agency and purpose

The relationship between science-oriented worldview scores and supernatural belief was explored with Spearman correlation coefficients, due to ordinal measurement and non-normal distribution of variables. There was a weak negative correlation between the science-oriented worldview score and the overall supernatural belief score ($r_s(385) = -0.21, p = .000$). Belief in supernatural agency and purpose was associated with lower endorsement of all science-oriented

worldview subscales except for literal continuity after death. All correlations between supernatural belief items and science-oriented worldview subscales were weak (between coefficients -0.30 and 0.21) (see Table 7). In general, reporting a sense of meaning, moral standards, and symbolic continuity from research was associated with less supernatural belief. However, the literal continuity from the science subscale formed an exception: the median score was mainly not related to supernatural belief, and the median was even positively associated with two items: reality as created in scientific terms and perceiving nature as a living creature. Similarly, belief in science was also associated with less supernatural belief, albeit more strongly than science-oriented worldview measure ($r(385) = -0.43$, $p = .000$).

The negative correlations were the strongest between science-oriented worldview measures and supernatural beliefs that may often be perceived as religious (afterlife belief and statements containing the word “God”). Similarly, supernatural belief statements that apply secular terms were less associated with science-oriented worldview scores. Moreover, some secular belief items were not correlated to the endorsement of a science-oriented worldview or belief in science. These included items on a purposeful and/or just world (“The world is a fair place”, “Everything happens for a purpose”), dualistic free will belief (“Humans have free will that is independent of the body”), agentic nature belief (e.g., “Nature is a living creature”, “Nature maintains a balance by self-regulating”), and creator belief operating with scientific terminology (e.g., “It is most likely we live in a reality created by an agent (such as AI)”).

TABLE 7 Spearman's correlation coefficient between the median scores of supernatural belief items and science-oriented worldview measures

Items on supernatural agency and purpose	Science-oriented worldview	Meaning subscale	Morality subscale	Literal continuity subscale	Symbolic continuity subscale	Belief in science scale
1. The world is a fair place.	0.048	0.018	0.011	0.102*	-0.039	-0.059
2. Everything happens for a reason [in Finnish: purpose].	-0.089	-0.062	-0.086	0.027	-0.123*	-0.272**
3. People eventually get what they deserve.	-0.112*	-0.080	-0.105*	0.038	-0.146**	-0.221**
4. The essence of a human survives his/her death.	-0.213**	-0.134**	-0.197**	0.091	-0.232**	-0.395**
5. Life events are random in the sense that they don't have a purpose. [R]	-0.253**	-0.185**	-0.228**	-0.018	-0.275**	-0.407**
6. The human mind is somewhat separate from bodily functions.	-0.173**	-0.198**	-0.119*	0.022	-0.206**	-0.210**
7. Humans have a soul.	-0.174**	-0.154**	-0.151**	0.026	-0.202**	-0.386**
8. Humans have free will that is independent of the body.	-0.091	-0.064	-0.108*	0.046	-0.062	-0.093
9. I believe in fate.	-0.128*	-0.118*	-0.100	0.040	-0.168**	-0.244**
10. I believe in life after death.	-0.260**	-0.206**	-0.244**	0.032	-0.257**	-0.492**
11. Events have a purpose determined by God.	-0.256**	-0.199**	-0.259**	0.024	-0.253**	-0.479**
12. Nature is a living creature.	0.002	0.010	-0.035	0.125*	-0.013	-0.158**
13. Some kind of greater force created the Earth and living things (animals, plants) and continues to have an influence on them.	-0.265**	-0.192**	-0.248**	-0.001	-0.265**	-0.520**
14. God created the Earth and living things (animals, plants).	-0.310**	-0.253**	-0.300**	-0.023	-0.289**	-0.514**
15. It is most likely we live in a reality created by an agent (such as AI) (in Finnish: agent/actor)	-0.048	-0.064	-0.059	0.209**	-0.053	-0.035
16. Nature maintains a balance by self-regulating.	0.087	0.019	0.079	-0.048	0.185**	0.095
17. Animal species can change their own biological traits in order to survive.	0.104*	0.046	0.101*	-0.065	0.153**	0.119*
18. In the world, there is some purposeful force (e.g., a life force).	-0.231**	-0.191**	-0.187**	0.004	-0.216**	-0.478**
19. All humans are made of the same material (for instance, matter/energy, stardust).	-0.023	-0.027	-0.043	0.005	-0.041	-0.116*

* $p < .05$; ** $p < .01$

4 Discussion

It has long been suggested that people may find a sense of meaning and comfort from secular beliefs as some do from religion (e.g., Popper 1945, 3–4; Bailey 1983; Smith 1994). According to the belief replacement hypothesis, secular worldviews may serve similar psychological functions as religious belief and replace supernatural beliefs *for atheists* (Farias 2013). This study investigated whether endorsement of meaning, morality, and continuity from science is associated with unbelief for pro-science respondents. The study operationalized supernatural belief (and therefore unbelief) in two ways: 1) as belief in God and 2) as belief in supernatural agency or purpose that can operate with religious or secular terminology, where supernatural is defined as beliefs that mix ontological core knowledge (Pyysiäinen, Lindeman, and Honkela 2003; Lindeman and Svedholm 2012).

Contrary to expectations, both types of unbelief were related to higher endorsement of a sense of meaning, moral standards, and symbolic continuity from science. The effect sizes of these differences ranged from weak to moderate. The respondents self-reports therefore align with Farias' (2013) suggestion that science may serve worldview functions that have been associated with religiosity (e.g., meaning and moral guidance) for unbelievers, since atheists did differ from other God belief groups and endorsement of worldview functions was related to less supernatural belief – and religious belief in particular.

However, small to moderate effect sizes suggest that among science-oriented individuals, the differences between God believers, atheists and those unsure of God's existence (e.g., agnostics) might be *less significant* than some have suggested. For instance, Rutjens et al. (2018, 133) have argued that “science and religion both function as ultimate (and therefore

incompatible) explanatory frameworks” (see also Farias 2013).¹² The results reported here suggest that among science-oriented Finns, also God believers draw a sense of meaning and purpose from science, endorse the role of research for moral decision-making, and experience a sense of connection and awe through science (see Tables 1–4). Therefore, the results question at least the statements on an *irreconcilable* conflict between a science-oriented worldview and supernatural beliefs (cf. Farias 2013, 5; see also Watts et al. 2020; Legare et al. 2012).¹³ Small differences between groups also suggest that it would be premature to discuss science as relevant for merely the worldviews of atheists and/or religiously non-affiliated.

Interestingly, unbelief in the supernatural was not related to the hope of exceeding human mortality via science. Comments from participants suggest that a this-worldly orientation and the rejection of afterlife belief might partly account for the low scores in literal immortality from science in atheist respondents. Prior literature has associated atheist worldviews with the importance of the “here and now” that has even been suggested as the “Atheist Salvation” (Coleman and Arrowood 2015, 11, 19; Coleman et al. 2019). However, this plausible reason for the low belief in literal continuity via science for atheists does not explain the low scores among theists and participants that are unsure of their God belief. Although literal immortality may not be commonly associated with science in public discussions, the same could be argued for the significance of science for morality, which still yields higher endorsement in all belief groups. It is also interesting that scientific research provides *hope* of literal continuity for so few in the sample, despite prior findings on the ability of indefinite life extension to provide literal immortality for

¹² However, Rutjens et al. (2018) also take into account studies on explanatory coexistence and that scientific and religious explanation can coexist “in some cases”.

¹³ However, it is possible that in the context of this study, theists did not apply their God belief mainly as an explanatory framework but relied more on the explanatory power of science (Ecklund et al. 2016), as also science-oriented God believers mostly agreed with the Belief in Science item “Science provides us with a better understanding of the universe than does religion” (albeit less strongly than atheists, see Table 5). Still, it should be noted that although many God believers in this sample identified as religious, God belief does not equal to religiosity.

the non-religious (Lifshin et al. 2018). However, in this study merely the significance of “science” and “scientific research” was explored – it is possible that items with more specific content (e.g., on indefinite life extension or mind uploading) would have yielded different and more versatile kinds of results.

The results also suggest that supernatural belief that operated with secular terminology was less negatively associated with a science-oriented worldviews than religious belief. If religious belief and the importance of science for many (science-invested God believers) do not clash, it appears there is even less sense of conflict between trust in science and supernatural belief that does not contain religious or paranormal terminology (e.g., perceiving that everything happens for a purpose). This may be related to many adhering to the perceived conflict of science and religion also in the Finnish context (Science Barometer 2019), as prior studies have noted the importance of cultural connotations of terms and their relationship to respondents’ identities for self-reported attitudes (e.g., Caldwell-Harris et al. 2011). However, in the case of nature items, it should be noted that some of the participants may have interpreted the items metaphorically (e.g., the item “Nature maintains a balance by self-regulating”). As prior studies have noted, there is a fine line between a so-called “strong metaphor” and belief, as both can infer goal-directed causality and hinder non-teleological understanding of phenomena (Taber and Watts 1996; Sacchi et al. 2013; cf. also Boyer 2018). Still, the question is relevant as the endorsement of items is interpreted as an indication of self-reported explicit belief.¹⁴ However, it is not uncommon to endorse agency or purpose in nature in the Finnish context (Metelinen 2020).¹⁵

¹⁴ Based on the pilot analysis, it was suspected that some respondents might interpret two items metaphorically, as the items were widely endorsed and the wordings were not disputed in the open-ended comments (unlike other items that applied nature/naturalistic terminology and contained agency or purpose). Therefore, the statements were preceded by a filler item that did not contain agency or purpose but was otherwise identical in content, see [Supplementary online material C](#). However, this procedure does not clarify to what extent the respondents may have interpreted other nature items as metaphors (e.g., “Animal species can change their own biological traits in order to survive”).

¹⁵ For instance, a recent representative survey found that 49% of Finns somewhat agree or agree with the statement “The coronavirus epidemic is nature’s own way to reduce overpopulation and care for the capacity of the environment and the climate” (Metelinen

In popular and academic discussions, the role of religion and science in worldviews is at times depicted in a dualistic manner: scientific research tells us what is true (*Weltbild*), and religion guides us in meaning and morality (*Weltanschauung*) (see e.g., Enqvist 2014; The Finnish National Church Council 2019; Gould 1999). Although some respondents of this study endorse this view, the results suggest that people's belief in science is a more complex phenomenon and overlaps with "magisteria" that are traditionally associated with religion (Gould 1997, 18). Science-oriented respondents report gaining meaning in life from science and many depict science as important, and occasionally essential, for moral decision-making. Therefore, in the responses of science-invested Finns, science does extend to the scope of meaning and morality – although in differing ways.

Limitations and further questions

The findings of this study should be evaluated in relation to general limitations of self-report methods (Järnefelt 2020). One of the limitations relates to self-reported functions of science as the topic of interest in this research, as studies have found that experimental findings often collide with self-reports (Greenwald et al. 2002). More simply put, humans may not be aware of the functions beliefs provide for them. This also applies to the worldview paradigm applied in this research (Burke et al. 2010). For instance, the open-ended comments from participants suggest that some atheists consider mortality to be important for their meaning in life – an articulated belief that is in contradiction with terror management theory paradigm (Pyszczynski et al. 2015). In this study, the aim was not to provide results on the psychological functions of science per se –

2020). However, such a high endorsement rate of purposeful agency in nature might be exceptional and somewhat accounted for by the COVID epidemic, as the data of the survey were collected during the Finnish epidemic (cf. Sibley and Bulbulia 2012; Legare et al. 2012).

instead, the rationale is to increase insight into people's own evaluations on phenomena and the role of unbelief in these assessments. Prior studies suggest that identification with scientific and supernatural accounts are context-dependent (Preston and Epley 2009), and scientific knowledge is endorsed more in a secular than a religious context (Watson-Jones et al. 2017). Therefore, it might be expected that the participants were more inclined to endorse the importance of science for their worldview in a research context in which they were recruited as science-oriented individuals, and this context might partly account for the small effect sizes of differences between belief groups. However, it is noteworthy that despite these contextual cues, unbelief was associated with higher endorsement of meaning, morality, and symbolic continuity from scientific research.

One further limitation of the study is the limited nature of the sample regarding cultural context. Many Finns, like Americans, expect that "science and religion" are in inherent conflict (Pew Research Center 2015; Science Barometer 2019). Therefore, future studies could recruit respondents in more versatile cultural contexts and examine what underlies the systematic differences between science-oriented unbelievers and believers – what is the role of cultural expectations concerning the roles of science and religion? Would unbelievers and believers differ in their evaluations of the role of science for meaning, morality, and continuity in a cultural context that does not portray science and religion as opposites (or where supernatural beliefs are not commonly associated with "religion")? For instance, scientists in India, Hong Kong and Taiwan endorse a conflict account less often than Americans, and in Taiwan and Hong Kong biologists and physicists are more religious than the general population (Ecklund et al. 2016).

The Nordic context underlies how participants perceive "science" also in other ways. Although most participants reported that they thought of natural sciences in their responses, many also included social sciences and/or humanities in their conception of science. This is in line

with prior philosophical suggestions on the term “science” in many Nordic and West European countries (Hansson 2015, 15; Kiikeri and Ylikoski, 2004, 16). As prior literature often refers to science in the Anglo-American connotation of the term, cultural differences in terminology should be noted while citing this study and planning future research. The diverse connotations of terminology may be relevant especially for self-reports on “science” serving worldview functions, as some respondents described thinking about the humanities (such as historical research) in items that explored a sense of connection to humankind and e.g., educational sciences while completing the question on the role of science in moral standards.

5 Conclusion

The study investigated a sense of meaning and post-death continuity from science, and respondents’ evaluations on the significance of science for morality. The results suggest that endorsement of the worldview components of science are associated with unbelief also among science-oriented respondents. Therefore, the results lend support for the belief replacement hypothesis, which emphasizes the importance of secular worldviews (e.g., trust in science) for atheists. However, the results also indicate that many science-oriented God believers endorse the significance of science for meaning, morality, and symbolic continuity. As prior research has been mainly experimental, the current study provides rare knowledge on people’s identification with science providing moral guidance and deeper meaning. However, the results highlight the need to discuss what constitutes “science” in different countries to better make sense of cross-cultural results, as many respondents in this study include social sciences and the humanities in the Finnish equivalent for the term “science”.

Ethics and consent

Research has been performed in accordance with the Declaration of Helsinki. The University of Helsinki Ethical Review Board has stated that the study design follows the ethical principles of research in the humanities and social and behavioural sciences issued by the Finnish Advisory Board on Research Integrity (statement number: 56/2019). Informed consent has been obtained from the participants, and the identity of the respondents has been anonymized.

Competing interests

The author has no competing interests to declare.

Acknowledgements

The research was funded by the Finnish Cultural Foundation (grant number: 00191671). I would also like to thank Dr. Elisa Järnefelt and Dr. Teemu Taira for comments on the research design and manuscript, Docent Vesa Niskanen for statistical advice, and Dr. Mikko Sillfors for comments on the manuscript.

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