

# The Relationship between Vaccine Experience and Vaccine Harm Belief

by  
Emory Bibb

A thesis presented to the Honors College of Middle Tennessee State University in partial fulfillment of the requirements for graduation from the University Honors College

Spring 2019

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Emory Bibb

APPROVED:

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Name of Project Advisor  
List Advisor's Department

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Name of Chairperson of Project  
Advisor List Chair's Department

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Name of Second Reader  
List Second Reader's Department

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Dr. Philip E. Phillips, Associate  
Dean University Honors College

## **ABSTRACT**

The research reported here evaluates the relationship between vaccine experiences and harm beliefs related to vaccines. Multiple dimensions of experience were evaluated, including personal experience, an experience of a close personal other, and information from the media. Participants also completed belief and personality measures that might help to understand any relationships between experience and belief. The results were that personal and close others' experience were strongly associated with vaccine harm belief. These results have potential implications for developing interventions to reduce vaccine harm beliefs.

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## INTRODUCTION

The purpose of this research is to evaluate the reasons why some people express a strong hesitancy towards vaccinations. In particular, I am investigating whether there is a correlation between experience of vaccine reactions and the belief that vaccines are harmful. Some examples of vaccine reactions would be as follows: severe redness or itching, swelling, pain, or autism.<sup>1</sup>

Over the last several years, there has been a rise in the anti-vaccine movement. The platform of the anti-vaccine movement is the refusal from parents to vaccinate their children. This decision to refuse inoculation could be the result of fear that the potential side effects of the vaccine are more harmful and outweigh the benefits of being protected against disease. However, these decisions can also be made based off of religious views as well. Individuals began to question or refuse vaccinations as early as the 1800s in England during the time of Jenner's discovery of the smallpox vaccine. These accounts of refusal are occurring more frequently, and the variety of dangerous side effects has broadened over the centuries.<sup>2</sup> One of the most common misguided beliefs regarding vaccines today is that vaccinations are causing autism in children.<sup>3</sup>

There is no one specific cause of autism. However, autism develops from a combination of genetic, non-genetic, or environmental influences. Research has shown that autism has a tendency to run in families. Changes in a specific gene will increase the

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<sup>1</sup> Vaccines & Immunizations. (2018, July 12). Retrieved from <https://www.cdc.gov/vaccines/vac-gen/side-effects.htm>

<sup>2</sup> Ruth, Michael. "Anti-Vaccination Movement." *Salem Press Encyclopedia*, 2016. *EBSCOhost*, [ezproxy.mtsu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ers&AN=119214545&site=eds-live&scope=site](http://ezproxy.mtsu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=ers&AN=119214545&site=eds-live&scope=site).

<sup>3</sup> Autism Speaks. (n.d.). Retrieved from <https://www.autismspeaks.org/>

risk that a child will become autistic. For example, if a parent carries one or more of these genetic markers, those alterations may get passed to the child even if the parent is not autistic.<sup>4</sup> However, autism is not the only reason that parents refuse to vaccinate their children; there are several other factors that are involved in making this decision.

Martin and Petrie (2017) conducted a study that aimed to measure general vaccination attitudes and to establish their validity. Based on their research, four distinct vaccination attitudes were identified: mistrust of vaccine benefit, worries about unforeseen future effects, concerns about commercial profiteering, and preference for natural immunity.<sup>5</sup> What began as a few individuals refusing to vaccinate their children has manifested into a global movement in which thousands of parents are choosing not to vaccinate their children. This, in turn, has led to the reoccurrence of diseases that were once eradicated. For example, in the United Kingdom, an article was published by Andrew Wakefield that demonstrated a link between the measles, mumps, and rubella vaccine (MMR) causing autism in children. Despite the article being debunked, parents were still concerned for their children's health and refused to inoculate their children. In 2008, the measles became a disease that radically affected the United Kingdom despite its eradication just 14 years earlier.<sup>6</sup>

Another reason parents might choose not to vaccinate their children is due to belief in a conspiracy theory that they genuinely believe to be true. Over the last several years, there has been an increase in the amount of theories involving vaccinations and

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<sup>4</sup>Autism Speaks. (n.d.). Retrieved from <https://www.autismspeaks.org/>

<sup>5</sup> Martin, L. R., & Petrie, K. J. (2017). Understanding the Dimensions of Anti-Vaccination Attitudes: The Vaccination Attitudes Examination (VAX) Scale. *Annals of Behavioral Medicine*, 51(5), 652-660. doi:10.1007/s12160-017-9888-y

<sup>6</sup> Jolley, D., & Douglas, K. M. (2014). The Effects of Anti-Vaccine Conspiracy Theories on Vaccination Intentions. *PLoS ONE*, 9(2). doi:10.1371/journal.pone.0089177

their harmful effects. These anti-vaccine conspiracy theories do not just cause individuals to decline a vaccine; however, they also cause individuals to develop a negative attitude towards science. In conjunction with this negative attitude towards science, a severe mistrust in the government and pharmaceutical companies has developed as a result of these conspiracy theories. Individuals who have fallen into believing these theories feel that those creating and administering the vaccines are covering up and portraying vaccinations to be beneficial while they are only harmful.<sup>7</sup>

In North America and Europe, studies have shown that vaccine hesitancy is on the rise while individuals' confidence in the effectiveness of vaccines is continuing to decrease as a result of an increase in anti-vaccine movements.<sup>8</sup> Studies have also shown that under-vaccinated individuals tend to reside in close proximity to one another which can cause an increase in the transmission of vaccine-preventable diseases. These low vaccine coverage rates can be the result of vaccine hesitancy. Valiant attempts have been made to try and present individuals with information to prove that vaccines are far from harmful; however, researchers are starting to conclude that vaccine acceptance is far more complex than general decision making.<sup>9</sup> It is thought that people's attitudes towards vaccinations and their decision to vaccinate is comprised of emotional, cultural, social, spiritual, and even political factors.<sup>10</sup>

Anti-vaccination beliefs can be hard to change. According to *The Conversation* by Claire Hooker, if parents are concerned about vaccinating their child, even a doctor

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<sup>7</sup>Jolley and Douglas, "The Effects of Anti-Vaccine Conspiracy Theories on Vaccination Intentions"

<sup>8</sup>Jolley and Douglas, "The Effects of Anti-Vaccine Conspiracy Theories on Vaccination Intentions"

<sup>9</sup>Jolley and Douglas, "The Effects of Anti-Vaccine Conspiracy Theories on Vaccination Intentions"

<sup>10</sup>Dubé, E., Gagnon, D., & Macdonald, N. E. (2015). Strategies intended to address vaccine hesitancy: Review of published reviews. *Vaccine*, 33(34), 4191-4203. doi:10.1016/j.vaccine.2015.04.041

presenting them with data about how safe vaccinations are will not convince them that vaccines are safe. Instead, Hooker says it makes them look incapable of unbiased discussion. She offers different ways that one can speak to an anti-vaxxer: do not have an outrage of your own fears, respect anti-vaxxers fears, establish trust with an anti-vaxxer, do not panic if something begins to confuse or change your mind, actions speak louder than words, and suggest “maybe” facts rather than verbally attacking them.<sup>11</sup>

In an article measuring the level of experience and belief in climate change, the researchers suggest that one explanation for the low levels of belief in global warming occurs because many people have trouble understanding exactly what climate change is. Concepts that are abstract require an analytical method of processing information about that topic; therefore, if individuals lack the motivation to analyze information about this subject, then they will fail to understand the severity of the issue. Individuals who have personally experienced global warming tap into their experiential processing which provides them with a depth of understanding that others lack. This causes the individual to be more engaged in the topic than someone who has no experience or interest in global warming. The results of this study showed that Americans who have personally experienced the effects of global warming are more likely to believe that global warming does exist.<sup>12</sup> The results of this study show that levels of experience are correlated to levels of belief.

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<sup>11</sup>Hooker, C. (2018, September 16). How to cut through when talking to anti-vaxxers and anti-fluoriders. Retrieved from <http://theconversation.com/how-to-cut-through-when-talking-to-anti-vaxxers-and-anti-fluoriders-72504>

<sup>12</sup> Myers, T. A., Maibach, E. W., Roser-Renouf, C., Akerlof, K., & Leiserowitz, A. A. (2012). The relationship between personal experience and belief in the reality of global warming. *Nature Climate Change*, 3(4), 343-347. doi:10.1038/nclimate1754

In a study conducted by Nyhan, Reifler, Richey, and Freed, they aimed to test the effectiveness of messages that were designed to decrease misperceptions associated with the measles-mumps-rubella (MMR) vaccination. Their target participant group were parents in the United States who have children that are under the age of seventeen living in their house. The participants were randomly selected to receive one of the five following intervention methods: information explaining the lack of evidence that MMR causes autism from the CDC, textual information about the dangers of the diseases prevented by MMR from the Vaccine Information Statement, images of children who have diseases prevented by the MMR vaccine, a dramatic narrative about an infant who almost died of measles from the CDC, or a control group. Upon analyzing the data, the research team discovered that none of the intervention methods increased the parent's intention to vaccinate their children. Negating the claim that the MMR vaccine causes autism reduced the misconception that vaccines are capable of causing autism while showing parents images of ill children increased the expressed level of belief in a correlation between vaccines and autism.<sup>13</sup> However, the most interesting thing to note in this study is, despite presenting parents with positive and negative information about the MMR vaccine, whether or not they chose to vaccinate their children did not change.

The goal of this research was not to explore belief change. I am simply trying to understand the basis for the belief that vaccinations are harmful. I am striving to assess what anti-vaxxers believe so we can better understand why they believe it. After extensive research had been conducted and variables to test had been chosen, we

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<sup>13</sup> Nyhan, B., Reifler, J., Richey, S., & Freed, G. L. (2014, April 01). Effective Messages in Vaccine Promotion: A Randomized Trial. Retrieved from <https://pediatrics.aappublications.org/content/133/4/e835>

compiled a survey with the intention to sort individuals into three different categories: beliefs based on a personal experience, beliefs based on the experience of a close personal other, and beliefs based on information obtained from stories and the media. Individuals who would fall into the personal experience are those that have personally had or witnessed negative side effects occur after receiving a vaccination. Those that have a close personal other's experience would be individuals who have heard a compelling story by either a close friend, relative, or co-worker about their negative experience that resulted after being inoculated, again experienced by them or witnessed by them. Individuals who believe that vaccines are harmful based on information they obtained from social media are those who have either read or heard news from stories, a celebrity, blog, social media site, or movie that vaccines are more dangerous than beneficial. Some individuals might have had an experience in more than one of the categories.

The survey also measured personality variables that could be contributing factors that would influence an individual's beliefs. We measured various types of belief: intent and behavior, beliefs about vaccines, and vaccine concerns. Based on the results from the intent and behavior section, we can establish the motives and thought process that contributes an anti-vaxxers decision as to whether or not to vaccinate their children. The belief about vaccines results allows us to understand whether or not the participant believes that vaccines aid in defense protection or that the body has natural defense protection eliminating the need for vaccinations. The belief concerns variable allows us to establish whether or not the participant is even concerned about the potential risks associated with vaccines. We measured hesitancy to establish how hesitant an individual

is about vaccines and receiving them. We measured several personality variables which are as follows: sensation seeking, schizotypy, private body consciousness (PBC), tellegen absorption scale, conspiracist ideation, locus of control, empathy, the Big 5 personality traits, critical thinking, paranoia, suspiciousness, attitude towards science, and tolerance for ambiguity. Lastly, we included a demographics section which would give us more insight about the participants who completed our survey.

We are hypothesizing that there will be a correlation between the strength of the belief and the level of experience that an individual has with vaccine effects.

### **THESIS STATEMENT**

The goal of this research is to determine why anti-vaxxers believe what they believe. Did their beliefs become established through a personal experience, a secondary, socially derived experience, or through the media? This study is important because identifying why anti-vaxxers believe what they believe has the potential to impact research on belief change about vaccinations that have the ability to eradicate diseases that could otherwise be deadly.

### **METHOD**

#### **Participants**

Two hundred seventy-eight people began the survey. Data from 41 participants were discarded for completing less than 90% of the survey and data from 22 participants were discarded because they said that their data should be excluded. The final sample included 215 participants. One hundred sixty-one participants were recruited from the psychology research pool, and 51 participants were recruited from a post on either a blog or social media site. The average age was 23.1 ( $SD = 10.89$ ; 18-67). There were 52 male

participants, 155 female participants, and 3 nonbinary participants. The level of education completed by our participants varied, with 64 completing high school or obtaining their GED, 106 with some college but no degree, 7 with an associate's degree, 13 with a bachelor's degree, and 11 with some level of graduate education.

## MATERIALS

Three types of variables were measured for the research: experience, belief, and personality.

**Experience measures.** I measured whether or not the individual had a personal negative vaccine experience or witnessed a negative vaccine experience. Those who have had a personal vaccine experience would answer yes to the following question, “Have you personally witnessed or experienced a situation where a person had an adverse reaction close in time with receiving a vaccination (think of any time of harm including the development of autism)?” If a participant answered “yes” they would be prompted with follow-up questions regarding the number of times they witnessed or personally experienced some type of harm. They would also be prompted with a question that would determine whether they themselves experienced the harm or they witnessed the vaccine harm to someone else such as a sibling, spouse, or child. The individual would also be asked to think about their most compelling or profound negative experience and choose which harmful side effects occurred from the following list: seizures, fainting, high fevers, soreness, fatigue, itching, infection at the injection site, encephalitis (a severe brain reaction), autism, or describe another harmful side effect that resulted.<sup>14</sup> The individual would use a Likert scale ranging from *Strongly Disagree* to *Strongly Agree* to

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<sup>14</sup>Vaccines & Immunizations. (2018, July 12). Retrieved from <https://www.cdc.gov/vaccines/vac-gen/side-effects.htm>

respond to fear items: “I do not want an experience like this to happen again; This experience was scary,” “Thinking about experiences like this frightens me,” “This experience was very important to me,” and “I would be afraid to have an experience like this happen again” (derived from the Anomalous Experiences Inventory Gallagher, Kumar, & Pekala, 1994).<sup>15</sup> Finally, the individual would be asked to rate the intensity of the experience on the same scale by rating the items: “This experience was intense,” “This experience is familiar to me (compared to things I have heard from others, TV, movies, etc.),” “I can form a clear mental image of this experience,” “This experience was concrete (as opposed to abstract),” and “The experience was vivid.”

If the individual responded that they know of a close personal other with a negative vaccine experience, then they would be prompted with appropriate follow-up questions. Thinking again about their most compelling experience story, the individual would be asked a question such as the following: “Did this event happen to the person you know themselves or did they witness it?” The participant would select the harmful experiences that the harmed individual experienced from the same list of side effects stated in the previous paragraph. We also requested relationship between the individual completing the survey and the person who had the negative experience. We asked them to select if the individual who had a negative experience was an immediate family member, close relative, distant relative, close friend, distant friend, acquaintance, co-worker, or other (please describe). The individual would be asked a series of questions in which they would answer how they thought the person who experienced the vaccine effects felt during the situation via the positive and negative affect scale (PANAS;

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<sup>15</sup> Gallagher, C., Kumar, V. K., & Pekala, R. J. (1994). The anomalous experiences inventory: Reliability and validity. *Journal of Parapsychology*, 58, 402–428.

Watson, Clark, & Tellegen, 1988). Next, the individual answered the same fear and intensity questions above about how they were feeling when told their experience. Finally, we asked them to evaluate the credibility of the source from which they heard about this negative vaccine experience and whether it seemed to have happened to them. With the exception of the PANAS, participants completed these items again if they reported that they heard stories about vaccine harm.

The final set of vaccine experience questions related to media exposure. We asked: “Do you follow or belong to any Facebook, Twitter, or other social media groups that present information about or discussions of vaccines (some examples include Vaccine Education Network: Natural Health Anti-vaxx Community, Vax vs Anti-Vax, Vaccine Talk: A Forum for both Pro and Anti-Vaxxers, or any similar sites)? We also asked these participants to indicate how many hours a day/week they spend on these social media sites. We also felt it was necessary to ask the individuals if they follow any celebrities who are prominent anti-vaccine supporters. Some anti-vaccine celebrities include: Jenny McCarthy, Alicia Silverstone, Billy Corgan, and Charlie Sheen. We also asked these individuals if they regularly watched any anti-vaccine movies, television programs, or talk shows that would influence their beliefs. Finally, we asked them to select which (if any) of the following blogs they have visited from the following list: Vox, Shot of Prevention, The Vaccine Blog by Karen Ernst, The History of Vaccines.org, Think Twice: Global Vaccine Institute, or other (please explain). With each of the questions regarding celebrities, television, social media, and blog sites we asked the individual to estimate how much time was spent daily and weekly on each of these

platforms, and how many of each one they followed. Participants also rated the credibility of any media sources they followed.

**Belief measures.**<sup>16</sup> Vaccine belief measures were derived from Larson, Jarrett, Schulz, Cbaudhuri, Zhou, Dube, Schuster, MacDonald, Wilson, and the SAGE Working Group on Vaccine Hesitancy (2015). We used four measures of belief: intent, vaccine attitude, harm concern, and hesitancy.

The intent measure included items such as: “Have you ever been hesitant to take a vaccine because of a concern about possible adverse effects,” “Have you ever refused to take a vaccine because of a concern about possible adverse effects,” and “Would you, personally, make the choice to receive a vaccine in the future.” The participants were asked eleven questions during this portion of the survey, and each question required a yes or no response. The internal reliability of this measure was poor ( $\alpha = .57$ ), so it will not be used in any analyses.

The next category under vaccine belief measures was vaccine attitude. Participants were asked to answer “yes” or “no” to five questions in an attempt to establish their overall beliefs about vaccines. Some of the questions asked were: “Do you believe that vaccines can protect children from serious diseases,” “Do you think that the body has natural defenses and that vaccines interfere with these and/or aren’t needed because natural defenses are good enough?” As with the intent measure, the internal reliability of this measure was poor ( $\alpha = .46$ ), so it will not be used in any analyses.

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<sup>16</sup> Larson, H. J., Jarrett, C., Schulz, W. S., Cbaudhuri, M., Zhou, Y., Dube, E., Schuster, M., MacDonald, N. E., Wilson, R., & the SAGE Working Group on Vaccine Hesitancy. (2015). Measuring vaccine hesitancy: The development of a survey tool. *Vaccine*, 33, 4165-4175. <http://dx.doi.org/10.1016/j.vaccine.2015.04.037>

Next, we asked a series of four questions that would allow us to assess harm concern related to vaccines. We asked them to rate these on a scale from *Strongly Agree* to *Strongly Disagree*. An example statement is: “Vaccines have been linked to autism.” This measure had excellent internal reliability ( $\alpha = .89$ ).

Finally, we presented the hesitancy scale from Larson et al. (2015). The individual rated ten statements from *Strongly Agree* to *Strongly Disagree*. Example statements are: “Vaccines are effective,” “New vaccines carry more risks than older vaccines,” “Generally, I do what my doctor or health care provider recommends about vaccines.” This measure also had excellent internal reliability ( $\alpha = .92$ ).

**Personality measures.** The Sensation Seeking Scale (SSS) measured the tendency an individual has to seek out sensory pleasure and excitement. This trait is seen in individuals who go after novel, complex, and intense sensations and are willing to take risks in order to obtain these sensations. Individuals who are considered to be high level sensation seekers are immensely satisfied with the instant gratification that is obtained from these intense situations.<sup>17</sup> They also seek thrills, and often, are known to engage in dangerous behaviors.<sup>18</sup> We asked participants to rate a list of four different statements from *Strongly Agree* to *Strongly Disagree*. An example of an SSS statement is: “I like to do frightening things.”<sup>19</sup>

I also measured schizotypy. Schizotypy is associated with schizophrenia and is characterized by disturbed thoughts and behavior, unusual beliefs and fears, and a

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<sup>17</sup>Sensation-Seeking. (n.d.). Retrieved from <https://www.psychologytoday.com/us/basics/sensation-seeking>

<sup>18</sup> Sensation-Seeking. (n.d.). Retrieved from <https://www.psychologytoday.com/us/basics/sensation-seeking>

<sup>19</sup> Stephenson, M. T., Hoyle, R. H., Palmgreen, P., & Slater, M. D. (2003). Brief measures of sensation seeking for screening and large scale surveys. *Drug and Alcohol Dependence*, 72, 279–286. <http://dx.doi.org/10.1016/j.drugalcdep.2003.08.003>

difficulty to form and maintain personal relationships. Often, individuals with schizotypy tend to be uncomfortable establishing close personal relationships and can express delusional thoughts or ideas.<sup>20</sup> We asked participants to rate 21 statements from *Strongly Agree* to *Strongly Disagree*. Some examples of the statements asked were as follows: “People sometimes comment on my unusual mannerisms and habits,” “I feel very uncomfortable in social situations involving unfamiliar people,” and “Have you had experiences with astrology, seeing the future, UFO’s, ESP, or a sixth sense?”<sup>21</sup>

Private body consciousness (PBC) is when an individual possesses an awareness of internal sensations. We asked participants to rate five statements from *Strongly Agree* to *Strongly Disagree*. An example statement is: “I can often feel my heart beating.”<sup>22</sup>

The Tellegen absorption scale is used to measure an individual’s absorption level. Absorption can be defined as having one’s complete attention fully engaged in their imaginative or ideational resources.<sup>23</sup> We asked the participants to rate 34 statements from *Strongly Agree* to *Strongly Disagree*. Some example statements are as follows: “Sometimes I feel and experience things as I did when I was a child,” “Sometimes I feel as if my mind could envelop the whole world,” and “I often know what someone is going to say before he or she says it.”<sup>24</sup>

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<sup>20</sup>Schizotypal Personality Disorder. (n.d.). Retrieved from

<https://www.psychologytoday.com/us/conditions/schizotypal-personality-disorder>

<sup>21</sup> Raine, A., & Benishay, D. (1995). The SPQ-B: A brief screening instrument for schizotypal personality disorder. *Journal of Personality Disorders*, 9, 346-355. <http://dx.doi.org/10.1521/pedi.1995.9.4.346>

<sup>22</sup> Miller, L. C., Murphy, R., & Buss, A. H. (1981). Consciousness of body: Private and public. *Journal of Personality and Social Psychology*, 41, 397-406. <http://dx.doi.org/10.1037/0022-3514.41.2.397>

<sup>23</sup> Tellegen, A., & Atkinson, G. (1974). Openness to absorbing and self-altering experiences (“absorption”), a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology*, 83, 268-277. <http://dx.doi.org/10.1037/h0036681>

<sup>24</sup> Tellegen, A., & Atkinson, G., “Openness to absorbing and self-altering experiences (“absorption”), a trait related to hypnotic susceptibility.”

The next variable measured was the individual's attitude towards science. The individuals were presented with a series of statements about scientists and the scientific community. They were asked to rate six statements from *Disagree Very Strongly* to *Agree Very Strongly*. Some example statements are: "People trust science a lot more than they should," and "I am concerned by the amount of influence that scientists have in society." The six statements used in this survey were obtained from the Credibility of Science Scale (CoSS) which was created by DeMarree, Dieckmann, Hartman, Sprenger, and Stastny (2017).<sup>25</sup>

Conspiracist ideations typically create alternate explanations as to why a specific event occurred. For example, those who fail to believe the link between Human immunodeficiency virus (HIV) and Acquired Immune Deficiency Syndrome (AIDS) might believe that AIDS was created by the government.<sup>26</sup> We asked participants to rate 15 statements based on responses ranging from *Completely False* to *Completely True*. Some example statements are as follows: "A powerful and secretive group, known as the New World Order, are planning to eventually rule the world through an autonomous world government, which would replace sovereign government," and "SARS (Severe Acute Respiratory Syndrome) was produced under laboratory conditions as a biological weapon."<sup>27</sup>

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<sup>25</sup> Hartman, R. O., Dieckmann, N. F., Sprenger, A. M., Stastny, B. J., & DeMarree, K. G. (n.d.). Modeling Attitudes Toward Science: Development and Validation of the Credibility of Science Scale. Retrieved from <https://www.tandfonline.com/doi/abs/10.1080/01973533.2017.1372284>

<sup>26</sup> Lewandowsky, S. (2013, February 5). The Involvement of Conspiracist Ideation in Science Denial. Retrieved from <https://www.psychologytoday.com/us/blog/thinking-global-change/201302/the-involvement-conspiracist-ideation-in-science-denial>

<sup>27</sup> Swami, V., Barron, D., Weis, L., Voracek, M., Steiger, S., & Furnham, A. (2017). An examination of the factorial and convergent validity of four measures of conspiracist ideation, with recommendations for researchers. *PLoS ONE*, *12*(2), e0172617. <http://dx.doi.org/10.1371/journal.pone.0172617>

Locus of control refers to an individual's beliefs in relation to the causes of their own experiences, and the factors that individual attributes to success or failure. This variable can be split into two different categories: internal and external. If an individual possesses an internal locus of control, they believe that success is based off of their own efforts and abilities while an individual with an external locus of control would believe that success is attained by luck or chance. Individuals with a high internal locus of control typically exhibit high levels of motivation while someone with a high external locus of control is prone to exhibiting high levels of anxiety.<sup>28</sup> Participants were asked to select option A or option B in a series of 29 different statements. The individual should select the option that they feel is the most correct. An example statement would be: "A: Who gets to be the boss often depends on who was lucky enough to be in the right place first or B: Getting people to do the right thing depends upon ability, luck has little or nothing to do with it." Based on the participant's responses from the statements asked, we are able to determine whether or not the individual has an internal or external locus of control.<sup>29</sup>

Empathy is the ability to understand another individual's thoughts, feelings and concerns from their personal point of view.<sup>30</sup> We asked participants to rank 20 statements from *Strongly Agree* to *Strongly Disagree*. Some example statements are: "My friend's emotions don't affect me that much," "I often become sad when watching

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<sup>28</sup> Joelson, R. B. (2017, August 2). Locus of Control. Retrieved from <https://www.psychologytoday.com/us/blog/moments-matter/201708/locus-control>

<sup>29</sup> Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs: General and Applied*, 80(1), 1-28. <http://dx.doi.org/10.1037/h0092976>

<sup>30</sup> Empathy. (n.d.). Retrieved from <https://www.psychologytoday.com/us/basics/empathy>

things on TV or in films,” and “I can often understand how people are feeling even before they tell me.”<sup>31</sup>

The Big 5 is a personality measure that includes five different personality traits: openness, experience, conscientiousness, extraversion, and neuroticism. This variable is often used to predict and understand the relationship between different personality traits and individual success.<sup>32</sup> We asked participants to respond to 20 different phrases that describe people’s behavior. We instructed the individuals to describe themselves as they are now not how they wish to be in the future. Some example phrases are as follows: “Am I the life of the party,” “Have frequent mood swings,” “Make a mess of things,” “Feel other’s emotions,” and “Have difficulty understanding abstract ideas.”<sup>33</sup>

Critical thinking occurs when one thinks about information in a deeper way, and how they can apply that information to a new situation rather than just regurgitating information. The critical thinking scale we used to measure the participants level of critical thinking came from Yuan, Liao, Wang, and Chou (year).<sup>34</sup> We asked participants to rate eighteen statements using the seven point Likert scale which ranges from *Strongly Agree* to *Strongly Disagree*. The statements can be grouped into three different categories—factor one to factor three. Factor one is systematicity and analyticity which allows us to see how analytic or detail oriented our participant is. Some example

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<sup>31</sup> Carré, A., Stefaniak, N., D'Ambrosio, A., Bensalah, L., & Besche-Richard, C. (2013). The Basic Empathy Scale in adults (BES-A): Factor structure of a revised form. *Psychological Assessment, 25*, 679-691. <http://dx.doi.org/10.1037/a0032297>

<sup>32</sup> Big 5 Personality Traits. (n.d.). Retrieved from <https://www.psychologytoday.com/us/basics/big-5-personality-traits>

<sup>33</sup> Donnellan, M.B., Oswald, F.L., Baird, B.M., & Lucas, R.E. (2006). The mini-IPIP scales: Tiny-yet-effective measures of the Big Five factors of personality. *Psychological Assessment, 18*, 192-203. <http://dx.doi.org/10.1037/1040-3590.18.2.192>

<sup>34</sup> Yuan, S., Liao, H., Wang, Y., & Chou, M. (2014). Development of a Scale to Measure the Critical Thinking Disposition of Medical Care Professionals. *Social Behavior and Personality: An International Journal, 42*(2), 303-311. doi:10.2224/sbp.2014.42.2.303

statements in this section are: “I am able to read between the lines and find out any conflicting or contradictory statement in an article,” and “I draw conclusions by logical thinking and methodological analysis.” Factor two is inquisitiveness and conversance. Some example statements in this category are: “I always learn as much as possible, even if I don’t know when I’ll put to use the things I learned,” and “I try to delve into anything, or any viewpoint, that is new and novel.” Factor three is maturity and skepticism. Some example statements in this section are: “During discussions, I am able to raise questions and respond to others’ opinions while remaining calm,” and “I never hesitate to question any prejudice, assumption, or belief of mine and thoroughly examine everything I have said and done.” Based on the participants results in this critical thinking section, we can have a better understanding of the thought process that they would have when making the decision to vaccinate themselves or their child.

Paranoid individuals often exhibit high levels of suspicion and believe that someone is conspiring against them. These individuals often have false ideas about people and events that are happening in the world.<sup>35</sup> The scale that we used to measure the level of paranoia in our participants came from the British Journal of Psychiatry.<sup>36</sup> We asked participants to rate 18 statements based on how strongly they believe each to be true or false. Participants chose their rating from five options ranging from *Do Not Believe It* to *Absolutely Believe It*. Some example statements asked are as follows:

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<sup>35</sup> Heshmat, S. (2016, February 24). 8 Key Traits of Paranoid Thinkers. Retrieved from <https://www.psychologytoday.com/us/blog/science-choice/201602/8-key-traits-paranoid-thinkers>

<sup>36</sup> Freeman, D., Garety, P. A., Bebbington, P. E., Smith, B., Rollinson, R., Fowler, D., Kuipers, E., Ray, K., & Dunn, G. (2005). Psychological investigation of the structure of paranoia in a non-clinical population. *British Journal of Psychiatry*, 186, 427-435. <http://dx.doi.org/10.1192/bjp.186.5.427>

“There might be negative comments being circulated about me,” “I need to be on my guard against others,” and “I can detect coded messages about me in the press/TV/radio.”

Tolerance for ambiguity is when an individual remains uncertain of something despite the natural discomfort that is associated with not knowing the answer to their question. This tolerance allows an individual to relinquish control and the desire to obtain information about their questions.<sup>37</sup> We modeled this portion of our survey after MacDonald’s (1970) tolerance for ambiguity scale. In this section of our survey, we asked participants to answer *True* or *False* to 20 different statements. Some of the statements used are as follows: “Before an examination, I feel much less anxious if I know how many questions there will be,” “I like to fool around with new ideas, even if they turn out later to be a total waste of time,” and “I get pretty anxious when I’m in a social situation over which I have no control.”

In a final section, participants were asked to provide demographic information.

### **PROCEDURE**

After extensive research, we determined where would be the best place to post the survey in order to reach our targeted demographic. Individuals that we were trying to target would best be described as those who believe that vaccines are harmful, have had a negative personal experience after receiving a vaccine, have known someone who has had a negative experience after being inoculated, or those who spend much of their time on anti-vaccine blogs and social media sites. Initially, we began trying to identify some current, active blogs where adults were vocalizing their negative opinions on vaccines. We created a list of potential blogs that would be a viable resource for posting our survey

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<sup>37</sup> Dugan, M. (n.d.). Tolerating Ambiguity. Retrieved from <http://knowinnovation.com/2013/04/tolerating-ambiguity/>

and began contacting their owners. Blogs that were contacted are as follows: The Vaccine Blog, VAXOPEDIA, History of Vaccines, The Chart by CNN, Voices for Vaccines, Modern Mom, All Natural Mom of 4, Think Love Healthy, Natural News Blog, Think Twice, and Vaccine Free. Each of the blogs were contacted by email; however, only approximately half of those responded. Several others would respond saying that they would look over the survey and decide whether or not they would allow it to be posted to their site. Sites that allowed posting of the survey were thinklovehealthy.com and the Facebook group Voices for Vaccines Discussion Forum. Typically, those individuals never responded—even after follow-up emails were sent. After reaching out to those sites previously listed, it was discovered that many of them were no longer in use. However, we were directed to two Facebook groups where those anti-vaccine discussions were taking place. Those Facebook groups were contacted, and the group Voices for Vaccines allowed us to post our survey in their group. The survey was posted in the group in October and was reposted in December.

Participants completed the survey online via Qualtrics. The average time it would take the participant to complete the survey thoroughly was 40-45 minutes. Some of the questions asked required the participant to describe a particular vaccine experience that they either experienced or were told about. Other questions simply required the participant to select an option provided on the Likert scale. We also asked participants whether or not their responses should be included in our data analysis which allowed us to determine whether or not the responses were thoughtful.

## **RESULTS**

Because the internal reliability was low for the intent and vaccine attitude measures, these measures will not be used in the analysis. The harm belief and hesitancy variables produced very similar results, so I will only present data on harm belief (the most relevant dependent variable for the research question). I will present four analyses. First, what are the overall levels of experience and harm belief? Second, I will compare the participants across four groups based on high and low experience and high and low belief. Third, I will present the relationships between experience and belief. Finally, I will present the relationships between personality and belief.

The overall experience data are presented in Table 1. The majority of the participants reported no or weak experience (77.2%); relatively few participants had a stronger or definite experience (13.0%). Overall harm belief scores ranged from 0.00 to 16.00, with a mean of 5.14 ( $SD = 4.08$ ). This reflects a relatively low level of vaccine harm belief (approximately 1.3 scale points on a 0-4 scale).

For the second analysis, participants were broken into four groups based on experience (coded as “high” if they had a personal or close other’s experience and “low” otherwise) and a median split on harm belief (coded as “high” if their score was greater than or equal to 5.0 and “low” otherwise). The numbers of participants in each group were 72 in the low experience/low belief group, 62 in the low experience/high belief group, 27 in the high experience/low belief group, and 53 in the high experience/high belief group. The experience data for the four groups are included in Table 1.

I used one-way ANOVA to compare the four groups on all of the personality variables. The purpose of this analysis was to determine if there were any differences

associated with the experience-belief combinations. Because there were 22 total dependent variables, the criterion for statistical significance was set at  $\alpha = .002$ . Any pairwise comparisons for significant main effects were conducted using Bonferroni corrections within that set of comparisons. The data for the significant comparisons are presented in Table 2. Only conspiracist ideation and attitude towards science differed. In both cases, the groups appeared to cluster together based on belief (the two low belief groups were similar and the two high belief groups were similar), but this pattern was only fully significant for attitude towards science.

For the third analysis I looked at the relationship between experience and belief. These data are presented in the top row of Table 3. Because there were five correlations being computed, the criterion for statistical significance was set at  $\alpha = .01$ . Only personal experience and close other's experience were significantly correlated with harm belief.

The final analysis was to explore the relationship between personality variables and belief. These data are presented in the bottom row of Table 3. As in the second analysis, there were 22 correlations computed, so the significance level was set at  $\alpha = .002$ . For purposes of clarity, only significant relationships are reported. Once again, the only two personality variables that produced a significant relationship were conspiracist ideation and attitude towards science.

Table 1  
*Experience Data*

Personal experience					
	Definitely not	Probably not	Might or might not	Probably	Definitely yes
Overall ( <i>N</i> = 214)	55.3%	21.9%	9.8%	6.5%	6.5%
Low experience/ Low belief ( <i>N</i> = 72)	86.1	13.9	0.0	0.0	0.0
Low experience/ High belief ( <i>N</i> = 62)	61.3	38.7	0.0	0.0	0.0
High experience/ Low belief ( <i>N</i> = 27)	29.6	18.5	22.2	18.5	11.1
High experience/ High belief ( <i>N</i> = 53)	20.8	13.2	28.3	17.0	20.8
Other types of experience					
	Close other's	Story	Social media		Movies
Overall ( <i>N</i> = 214)	25.6%	28.4%	19.5%		19.5%
Low experience/ Low belief ( <i>N</i> = 72)	0.0	22.2	20.8		13.9
Low experience/ High belief ( <i>N</i> = 62)	0.0	22.6	8.1		22.6
High experience/ Low belief ( <i>N</i> = 27)	66.7	37.0	37.0		33.3
High experience/ High belief ( <i>N</i> = 53)	69.8	37.7	22.6		17.0

Table 2

*Comparisons between the Four Believer Groups*

Dependent Variable	Low experience/ Low belief ( $N = 72$ ) <sup>a</sup>		Low experience/ High belief ( $N = 62$ ) <sup>b</sup>		High experience/ Low belief ( $N = 27$ ) <sup>c</sup>		High experience/ High belief ( $N = 53$ ) <sup>d</sup>		Overall
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
<b>Belief</b>									
Harm belief	1.32 bd	1.47	7.71 acd	2.20	2.11 bd	1.67	8.89 abc	3.32	$F(3, 213) = 156.84^*$
<b>Personality</b>									
Conspiracist ideation	31.07 b	25.57	49.08 a	22.49	35.12	27.78	41.70	24.10	$F(3, 206) = 6.39^*$
Attitude towards science	25.61 bd	8.30	17.73 ac	6.65	27.56 bd	5.22	17.62 ac	8.81	$F(3, 213) = 22.05^*$

*Note.* The letters indicate significant differences between groups.

\* $p < .002$

Table 3  
*Zero-Order Correlations between the Variables*

<b>Experience</b>					
	Personal Experience	Close Other's	Story	Social Media.	Movies
Harm belief	.40*	.19*	.03	-.06	.12
<b>Personality</b>					
	Conspiracist Ideation		Attitude towards Science		
Harm belief	-.50**		.29**		

\* $p < .01$ ; \*\* $p < .002$

## DISCUSSION

The proposed hypothesis was that there would be a correlation between the strength of the belief and the level of experience that an individual has with vaccine effects. As shown in the analysis, participants who had higher levels of personal or close others' experience reported having higher levels of belief that vaccinations are harmful, while participants who claimed to have lower levels of experience possessed lower levels of belief that vaccinations are harmful. Overall, there is a relatively low level of harm belief towards vaccines based on results from the participants in this study. This is due to the fact that the majority of our participants were college students who are not the target audience for anti-vaccine information.

Most of the participants in our study reported that they had not had a personal experience themselves; however, in the second analysis, we see that there is a much higher percentage of participants who have either known someone who had a vaccine experience, have heard a vaccination experience story, have seen a movie regarding vaccine experience, or have seen information presented by the media regarding vaccines. Table 1 shows that close other's experiences and stories were the two factors that were the most common. In Table 1, we see that the individuals who stated they had high experience levels had the most experience with a close others' personal story. The third analysis displays the relationship between experience and belief. The only two scenarios that proved to impact harm belief were personal experience and close other's experiences. During initial research, I believed that media would have the greatest impact on harm belief; however, that proved not to be the case. Again, this is probably due to the sample.

Although these results did give us an idea on the correlation between the levels of experience and belief, I do not think that our sample of participants included enough anti-vaccine individuals to allow us to fully understand the reasoning behind their beliefs. Many of the participants in our sample were college students, and after analyzing the results, it does not appear that college students are the target market for anti-vaccine information. It seems that parents who have young children are the target for these types of anti-vaccination beliefs, and we just did not get enough of them to take our survey. In order to better reach our target participant group, I would suggest that this experiment should be conducted again; however, this time the survey should be placed on more blogs and sites where anti-vaccine members are present. If our participant pool was predominately people who are against vaccines, we would have a better understanding of why they believe what they believe.

Much like Myers et al., we did find a relationship between experience and vaccine harm belief. Perhaps if an individual is more involved in the anti-vaccine community, they would display higher levels of harm belief. Similar to the experiment on global warming, we did observe that individuals who have higher levels of vaccine experience also possess higher harm beliefs.<sup>38</sup> Similar to the Martin and Petrie study, we also noticed that there is still a mistrust in the benefits of vaccines.<sup>39</sup> Our participants displayed conspiracist ideation and attitude towards science personality variables which

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<sup>38</sup> Myers, T. A., Maibach, E. W., Roser-Renouf, C., Akerlof, K., & Leiserowitz, A. A. "The relationship between personal experience and belief in the reality of global warming."

<sup>39</sup> Martin, L. R., & Petrie, K. J. "Understanding the Dimensions of Anti-Vaccination Attitudes: The Vaccination Attitudes Examination (VAX) Scale."

show the correlation that individuals do not trust physicians and pharmaceutical companies to tell them the truth.

In a study conducted by Nyhan, Reifler, Richey, and Freed, they aimed to test the effectiveness of messages that were designed to decrease misperceptions associated with the measles-mumps-rubella (MMR) vaccination.<sup>40</sup> Perhaps the interventions they used in their experiment did not pay enough attention to the vaccine experience, or they did not target the right participant group for their study. Based on the correlation between experience and harm belief that appeared in our results, the Nyhan et al., study could be replicated using more effective experiential methods of conveying the dangers of vaccines to their participants.

Parents might choose not to vaccinate their children due to belief in a conspiracy theory or possession of a negative attitude towards science. Over the last several years, there has been an increase in the amount of theories involving vaccinations and their harmful effects. Associated with this negative attitude towards science, is a severe mistrust in the government and pharmaceutical companies.<sup>41</sup> As we can see from the results, the only two personality variables that proved to impact vaccine beliefs were conspiracist ideation and a negative attitude towards science. Mistrust in the government, pharmaceutical companies, and vaccines are ideas that are continuing to prove to be problematic in healthcare. The development and spread of conspiracy theories has created a mistrust in physicians and healthcare professionals that has, in turn, caused

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<sup>40</sup> Nyhan, B., Reifler, J., Richey, S., & Freed, G. L. (2014, April 01). Effective Messages in Vaccine Promotion: A Randomized Trial. Retrieved from <https://pediatrics.aappublications.org/content/133/4/e835>

<sup>41</sup>Jolley and Douglas, "The Effects of Anti-Vaccine Conspiracy Theories on Vaccination Intentions"

individuals to refuse vaccinations out of fear. This fear is heightened by spread of these false testimonies and mistrust in our health system.

Keeping in mind the study Anti-vaccination beliefs conducted by Claire Holt, it is difficult to change the mind of an anti-vaccine believer.<sup>42</sup> However, if we are able to understand why they believe what they believe, we can have a better grasp on how to communicate with them. Perhaps the best way to communicate with an anti-vaccine believer is not to overwhelm them with the positive impacts of vaccines; rather, we should listen to their beliefs then inform about vaccine benefits in an understanding conversational manner.

One surprising finding from our study was the relatively poor reliability of some of the measures of belief. Understanding the origins of vaccine hesitancy is already complicated by the number of aspects of belief that might be implicated. When the measures themselves are ineffective, that makes the task that much more difficult. This is an especially relevant problem for studies looking at belief change. If the measures are unreliable, then changes that do occur could be a product of that unreliability and not the intervention. This issue deserves additional attention from researchers.

In the future (including after studies with a better sample are conducted), these results could be useful in designing studies on the best way to get information to an anti-vaccine individual. If we are able to understand the most effective way to communicate with these individuals, we could be potentially successful in educating individuals who may not be properly informed about the dangers that can occur if they are not vaccinated. Not only is it dangerous for the unvaccinated individual, it is dangerous for everyone

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<sup>42</sup> Hooker, C. "How to cut through when talking to anti-vaxxers and anti-fluoriders."

because diseases that were once eradicated are already beginning to manifest themselves in a different form that we do not have a vaccination for. Although we were not trying to change anyone's mind with our specific study, expanding upon this research could one day allow someone to be able to better inform the anti-vaccine population and prevent more diseases from returning.

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## Measuring experience

Blue is where each chunk of items starts

Note:

Mass media provide a message path for establishing and strengthening superstition and pseudoscientific beliefs among adults and children (Losh, 2010; Losh & Nzekwe, 2011; NSB, 2000; Turgut, 2011). Superstitious beliefs most likely come from story-telling, family, friends, TV, personal experiences, or a combination thereof (Afonso & Gilbert, 2010; Preece & Baxter, 2000; Shermer, 2003) (Tseng, Tsai, Hsieh, Hung, & Huang, 2013, p. 4).

## Personal vaccine-autism experience

Have you personally witnessed or experienced a situation where a person had an adverse reaction close in time with receiving a vaccination (think of any type of harm including development of autism)? Definitely not; probably not; might or might not; probably yes; definitely yes

For anything but definitely not:

How many of these reactions have you personally experienced?

How many of these reactions have you personally witnessed?

For the next set of questions, please answer based on the most compelling event you have experienced or witnessed.

Was the event you're thinking of something you experienced or witnessed? (This event happened to me personally (experienced); This event was something I personally witnessed)

Which of the following best describes this event? Physical harm; autism; something else (describe briefly)

Still thinking of your most compelling event, check each of the following that was a part of it: seizures (jerking or staring); fainting; high fevers; soreness; fatigue; redness; itching; infection at the injection site; encephalitis (severe brain reaction); autism, something else (describe briefly)

Still thinking of your most compelling event: (matrix with the same 5 scale points for all statements below: Strongly disagree; somewhat disagree; neither agree nor disagree; somewhat agree; strongly agree)

Fear items: I do not want an experience like this to happen again; This experience was scary; Thinking about experiences like this frightens me; This experience was very important to me; I would be afraid to have an experience like this happen again

Quality items: This experience was intense; This experience is familiar to me (compared to things I have heard from others, TV, movies, etc.); I can form a clear mental image of this experience; This experience was concrete (as opposed to abstract); The experience was vivid

Note:

The fear items were modified from the AEI fear subscale to fit the autism context, and some were added in to round out what the AEI-FAP scale is getting at. The quality items were modified from our word-norming studies looking at the aspects of an experience. All choices were randomized by Qualtrics for each participant.

## Other people's vaccine-autism experience

Has someone in your social circle told you about a time they personally experienced or witnessed an adverse reaction close in time with someone receiving a vaccination (think of any type of harm including development of autism)? (A close other is someone like a family member, friend, or co-worker) No; yes

For yes:

For the questions below, please answer based on the most compelling event you have been told about by a person who experienced or witnessed it.

Did this event happen to that person themselves, or did they witness it? This event happened to them personally (experienced); This event was something they personally witnessed

Which of the following best describes this event? Physical harm; autism; something else (describe briefly)

Who told you about this event? Immediate family member; close relative; distant relative; close friend; distant friend; acquaintance; co-worker; If none of the above describe that person, please enter a description of the person who told you about their event:

Still thinking of this person's most compelling event, check each of the following that was a part of it: seizures (jerking or staring); high fevers; soreness; fatigue; fainting; redness; itching; infection at the injection site; encephalitis (severe brain reaction); autism, something else (please describe briefly)

Still thinking of the same person's experience that has been told directly to you, choose answers below to describe how you think the person who experienced it felt about it.

Note:

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology*, *54*, 1063-1070.  
<http://dx.doi.org/10.1037/0022-3514.54.6.1063>

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer next to that word. Again, this is how the person felt when they had the experience: (matrix with the same 5 scale points for all statements below: Very slightly or not at all; a little; moderately; quite a bit; extremely)

Interested; distressed; excited; upset; strong; guilty; scared; hostile; enthusiastic; proud; irritable; alert; ashamed; inspired; nervous; determined; attentive; jittery; active; afraid

Still thinking of the same person's experience that has been told directly to you, think about YOUR personal reaction to hearing about this experience: (matrix with the same 5 scale points for all statements below: Strongly disagree; somewhat disagree; neither agree nor disagree; somewhat agree; strongly agree)

Fear items: I would not want an experience like this to happen to me; Hearing about this experience was scary; Thinking about experiences like this frightens

me; Hearing about this experience was very important to me; I would be afraid to have this experience happen to me

Quality items: This experience was intense; This experience is familiar to me (compared to things I have heard from others, TV, movies, etc.); I can form a clear mental image of this experience; This experience was concrete (as opposed to abstract); The experience was vivid

Note:

Choices were modified to make it clear it was someone else's experience.

All choices were randomized by Qualtrics for each participant.

Still thinking of the same person's experience that has been told directly to you:

This experience feels as though it happened to me. Strongly disagree; somewhat disagree; neither agree nor disagree; somewhat agree; strongly agree

Source credibility (individual)

Still thinking about the same person's experience that has been told directly to you, and thinking about the person who told you about this experience:

Please indicate your impression of that person by choosing the appropriate number between the pairs of adjectives below. The closer the number is to an adjective, the more certain you are of your evaluation.

Measure of Ethos/Credibility

**Instructions:** Please indicate your impression of the person noted below by circling the appropriate number between the pairs of adjectives below. The closer the number is to an adjective, the more certain you are of your evaluation.

---

<b>Competence</b>	Intelligent	1	2	3	4	5	6	7	Unintelligent
	Untrained	1	2	3	4	5	6	7	Trained
	Inexpert	1	2	3	4	5	6	7	Expert
	Informed	1	2	3	4	5	6	7	Uninformed
	Incompetent	1	2	3	4	5	6	7	Competent
	Bright	1	2	3	4	5	6	7	Stupid
<b>Goodwill</b>	Cares about me	1	2	3	4	5	6	7	Doesn't care about me
	Has my interests at heart	1	2	3	4	5	6	7	Doesn't have my interests at heart
	Self-centered	1	2	3	4	5	6	7	Not self-centered
	Concerned with me	1	2	3	4	5	6	7	Unconcerned with me
	InSENSITIVE	1	2	3	4	5	6	7	SENSITIVE
	Not understanding	1	2	3	4	5	6	7	Understanding
<b>Trustworthiness</b>	Honest	1	2	3	4	5	6	7	Dishonest
	Untrustworthy	1	2	3	4	5	6	7	Trustworthy
	Honorable	1	2	3	4	5	6	7	Dishonorable
	Moral	1	2	3	4	5	6	7	Immoral
	Unethical	1	2	3	4	5	6	7	Ethical
	Phoney	1	2	3	4	5	6	7	Genuine

---

FIGURE 1

(McCroskey & Teven, 1999, p. 95)

### Story vaccine-autism experiences

Do you spend time with people in your social network sharing stories about vaccines and people's experiences with them (not personal experiences that happened to you or people in your social network, but stories that you have heard or read)? ("People in your social

network" are people like family, friends, co-workers, or acquaintances) No; yes

For yes:

About how often do you share these stories with people in your social network?

More than once per week; at least once per week; at least once per month; at least once per year; less than once per year

For the next set of questions, please answer based on the most compelling vaccine event story you have heard. Which of the following best describes the event in this story? Physical harm; autism; something else (describe briefly)

Thinking of this most compelling vaccine event story, check each of the following that was a part of it: seizures (jerking or staring); high fevers; soreness; fatigue;

fainting; redness; itching; infection at the injection site; encephalitis (severe brain reaction); autism, something else (please describe briefly)

Still thinking of the same vaccine event story, think about YOUR personal reaction to the experience in this story: (matrix with the same 5 scale points for all statements below: Strongly disagree; somewhat disagree; neither agree nor disagree; somewhat agree; strongly agree)

Fear items: I would not want an experience like this to happen to me; Hearing about this experience was scary; Thinking about experiences like this frightens me; Hearing about this experience was very important to me; I would be afraid to have this experience happen to me

Quality items: This experience was intense; This experience is familiar to me (compared to things I have heard from others, TV, movies, etc.); I can form a clear mental image of this experience; This experience was concrete (as opposed to abstract); The experience was vivid

Note:

Choices were modified to make it clear it was a story. All choices were randomized by Qualtrics for each participant.

Still thinking of the same vaccine event story: This experience feels as though it happened to me. Strongly disagree; somewhat disagree; neither agree nor disagree; somewhat agree; strongly agree

**Social media/Media**

**Do you follow or belong to any Facebook, twitter, or other social media groups that present information about or discussions of vaccines (some examples include Vaccine**

Education Network: Natural Health Anti-vaxx Community, Vax vs Anti-Vax, Vaccine Talk: A Forum for both Pro and Anti Vaxxers, or any similar sites)?

Please estimate how much time you spend in these types of groups or sites on the typical day. Less than one hour per day; one to two hours per day; two to three hours per day; three to four hours per day; more than four hours per day

Thinking about all of the vaccine-related social media sources you might view, please rate them (and the people producing them) on the following items: (matrix with the same 7 scale points for all statements below: Far below average; moderately below average; slightly below average; average; slightly above average; moderately above average; far above average)

Level of knowledge; Competence; Intelligence; Credibility; Expertise

Do you follow any celebrities who routinely discuss vaccine-issues (for example, Jenny McCarthy, Alicia Silverstone, Billy Corgan, Charlie Sheen, or anyone similar)?

Note:

These are the names of a few of the confirmed prominent media stars who have either written books against vaccines, have been outspoken about anti-vaxxer beliefs on their shows that they host, or have been outspoken on their personal anti-vaxxer beliefs in regards to their children.

17 Celebrity Anti-Vaxxers. (n.d.). Retrieved March 11, 2018, from <https://www.ranker.com/list/celebrity-anti-vaxxers/celebrity-lists>

Staff, T. (2014, September 10). Hollywood's Biggest Anti-Vaccine Proponents. Retrieved March 11, 2018, from

<https://www.hollywoodreporter.com/gallery/hollywoods-biggest-anti-vaccine-proponents-731277/1-alicia-silverstone>

Please estimate how many of these you follow. One to two; three to four; five to six; seven to eight; more than eight

Thinking about all of the vaccine-relevant celebrities you follow, please rate them on the following items: (matrix with the same 7 scale points for all statements below: Far below average; moderately below average; slightly below average; average; slightly above average; moderately above average; far above average)

Level of knowledge; Competence; Intelligence; Credibility; Expertise

**Do you watch any YouTube or other internet channels dealing with vaccines or vaccine-related issues (e.g., Vaxxed TV, or something similar)?**

Please estimate how much time you spend watching these types of channels on the typical day. Less than one hour per day; one to two hours per day; two to three hours per day; three to four hours per day; more than four hours per day

Thinking about all of the vaccine-related channels you might view, please rate them (and the people producing them) on the following items: (matrix with the same 7 scale points for all statements below: Far below average; moderately below average; slightly below average; average; slightly above average; moderately above average; far above average)

Level of knowledge; Competence; Intelligence; Credibility; Expertise

**Have you watched any movies whose subject matter was vaccines or vaccine-related issues (for example, Vaxxed, The Greater Good, Man Made Epidemic, The Truth About Vaccines, or something similar)?**

Please estimate how many of this type of movie you have seen. One to two; three to four; five to six; seven to eight; more than eight

Thinking about all of the vaccine-related movies you've seen, please rate them (and the people producing them) on the following items: (matrix with the same 7 scale points for all statements below: Far below average; moderately below average; slightly below average; average; slightly above average; moderately above average; far above average)

Level of knowledge; Competence; Intelligence; Credibility; Expertise

Do you read or participate in any blogs, forums, or websites dealing with vaccines or vaccine-related issues (for example, Vox, Shot of Prevention, The Vaccine Blog by Karen Ernst, The History of Vaccines.org, Think Twice: Global Vaccine Institute, or something similar)?

Please estimate how much time you spend with these types of sites on the typical day.

Less than one hour per day; one to two hours per day; two to three hours per day; three to four hours per day; more than four hours per day

Thinking about all of the vaccine-related websites, blogs, and forums you might view, please rate them (and the people producing them) on the following items: (matrix with the same 7 scale points for all statements below: Far below average; moderately below average; slightly below average; average; slightly above average; moderately above average; far above average)

Level of knowledge; Competence; Intelligence; Credibility; Expertise

Notes on credibility (for all sections above):

At the end of the experiment, following the attitude and attitude certainty measures, manipulation check items were included. To assess perceived source

credibility, one question asked participants to report how much expertise they thought the source of the information in the advertisement had. Participants responded to this question on a scale ranging from 1 (*none at all*) to 9 (*very much*) (Tormala & Petty, 2004, p. 432). [Tormala, Z. L., & Petty, R. E. (2004). Source credibility and attitude certainty: A metacognitive analysis of resistance to persuasion. *Journal of Consumer Psychology, 14*, 427-442.]

After reading the persuasive message, participants completed a brief impression-formation questionnaire assessing the source of the arguments. Ratings included the following: (a) level of knowledge, (b) competence, (c) intelligence, (d) credibility, (e) likability, and (f) expertise. All questions were rated on 7-point scales ranging from 1 (*not at all*) to 7 (*extremely*). The mean of Items 1, 2, 3, 4, and 6 formed an internally consistent index of source expertise ( $\alpha = .36$ ). Item 5 served as an index of likability (Jones, Sinclair, & Courneya, 2003, p. 184).

[Jones, L. W., Sinclair, R. C., & Courneya, K. S. (2003). The effects of source credibility and message framing on exercise intentions, behaviors, and attitudes: An integration of the elaboration likelihood model and prospect theory. *Journal of Applied Social Psychology, 33*, 179- 196.]

Subjects then rated the communicator on eight 9-point bipolar dimensions relevant to his performance as a product spokesman. Two of these dimensions (inept-expert, knowledgeable-not knowledgeable) served as indicators of the communicator's perceived expertise, whereas three others (credible-not credible, reliable-unreliable, trustworthy-untrustworthy) were intended as checks on the manipulation of communicator credibility. The remaining three items (unbiased-

biased, sincere-insincere, convincing-unconvincing) were included to further strengthen our claim that we were interested in the apparent convincingness of the source and his testimonial. And footnote 4: Our grouping of these evaluative items was based on a factor analysis of data provided by 62 pilot subjects from a group-testing session, each of whom read one of the testimonials and rated its source. The eight evaluative items loaded (as described by their groupings in the text) on three factors that seemed to us to be measures of the communicator's perceived expertise, perceived credibility, and perceived convincingness (Wu & Shaffer, 1987, p. 680). [Wu, C., & Shaffer, D. R. (1987). Susceptibility to persuasive appeals as a function of source credibility and prior experience with the attitude object. *Journal of Personality and Social Psychology*, 52, 677-688.] To examine further if source characteristics may have been mediating the attitude change observed for subjects in the indirect- experience condition, we first constructed two source-evaluation indexes for each subject: (a) *perceived-credibility index*, created by summing the subject's ratings of the communicator's credibility, reliability, and trustworthiness, and (b) a more global *source-impression* score that reflected the sum of the subject's ratings of the communicator across all eight evaluative dimensions from the posttestimonial questionnaire (Wu & Shaffer, 1987, p. 683).

## Belief

### Intent and behavior

These were derived from tables 2-4 in Larson, H. J., Jarrett, C., Schulz, W. S., Cbaudhuri, M., Zhou, Y., Dube, E., Schuster, M., MacDonald, N. E., Wilson, R., & the SAGE

Working Group on Vaccine Hesitancy. (2015). Measuring vaccine hesitancy: The development of a survey tool. *Vaccine*, 33, 4165-4175.

<http://dx.doi.org/10.1016/j.vaccine.2015.04.037>

Note:

Probably Rasch scale the yes/no ones to get a score on personal hesitancy?

[Qualtrics will randomize these for each participant]

Have you ever been hesitant to take a vaccine because of a concern about possible adverse effects? (Yes; no)

Have you ever refused to take a vaccine because of a concern about possible adverse effects? (Yes; no)

Have you ever contracted a disease as a result of not being vaccinated? (Yes; no)

Have you, personally, ever made the choice to receive a vaccine? (Yes; no)

Have you, personally, ever made the choice to have someone in your care receive a vaccine? (Yes; no)

Would you, personally, make the choice to receive a vaccine in the future? (Yes; no)

Would you, personally, make the choice to have someone in your care receive a vaccine in the future? (Yes; no)

Do you know someone who has been hesitant to take a vaccine because of a concern about possible adverse effects? (Yes; no)

Do you know someone who has refused to take a vaccine because of a concern about possible adverse effects? (Yes; no)

Do you know someone who has contracted a disease as a result of not being vaccinated? (Yes; no)

Do you think that most parents have their children vaccinated with all the recommended vaccines? (Yes; no)

### Beliefs Vaccines

These were derived from Appendix A in Larson, H. J., Jarrett, C., Schulz, W. S., Cbaudhuri, M., Zhou, Y., Dube, E., Schuster, M., MacDonald, N. E., Wilson, R., & the SAGE Working Group on Vaccine Hesitancy. (2015). Measuring vaccine hesitancy: The development of a survey tool. *Vaccine*, 33, 4165-4175.

<http://dx.doi.org/10.1016/j.vaccine.2015.04.037>

[Qualtrics will randomize these for each participant]

Do you believe that vaccines can protect children from serious diseases? (Yes; no)

Have you ever heard negative information about vaccines? (Yes; no)

Do you think there are reasons why children should not be vaccinated? (Yes; no)

These two are from blogs in Bibb notes as reasons people give...

Do you think too many vaccines are given at once (vaccinations should be spread out)? (Yes; no)

Do you think the body has natural defenses and that vaccines interfere with these and/or aren't needed because natural defenses are good enough? (Yes; no)

### Beliefs Concern

What is your overall level of concern about adverse effects from vaccines? (Not at all concerned; a little concerned; somewhat concerned; moderately concerned; very concerned)

[Qualtrics will randomize these for each participant]

How much do you agree with each of the following statements on vaccinations? (matrix with the same 5 scale points for all statements below: Strongly disagree; disagree; neither agree nor disagree; agree; strongly agree)

1. Vaccines have been linked to autism.
2. Vaccines have been linked to short term physical harm.
3. Vaccines have been linked to long term physical harm.

### Attitude towards science

From Hartman, R. O., Dieckmann, N. F., Sprenger, A. M., Stastny, B. J., & DeMarree, K. G. (2017). Modeling attitudes toward science: Development and validation of the credibility of science scale. *Basic and Applied Social Psychology, 39*, 358-371.

<http://dx.doi.org/10.1080/01973533.2017.1372284>

Note:

(p. 371)

### **Credibility of Science Scale (CoSS)**

Your Views on the Scientific Community and Its Work

On the next few screens you will be presented with a series of statements about scientists and the scientific community. Please indicate how well each statement describes your own views—that is, how strongly you disagree or agree with each statement. Note that these statements deliberately focus on your general impressions about today's scientific community, its methods, and its conclusions. Further, note that some of the items may seem repetitive or redundant. This is intentional. Even if a statement seems very similar to a previous item, please take the time to rate each item on its own terms.

---

Disagree very strongly	Disagree strongly	Disagree somewhat	Neither agree nor disagree	Agree somewhat	Agree strongly	Agree very strongly
1. People trust scientists a lot more than they should.						
2. People don't realize just how flawed a lot of scientific research really is.						
3. A lot of scientific theories are dead wrong.						
4. Sometimes I think we put too much faith in science.						
5. Our society places too much emphasis on science.						
6. I am concerned by the amount of influence that scientists have in society.						

---

Note: All items are reverse coded, such that higher values indicate more favorable (less negative) attitudes.

Now you will be presented with a series of statements about scientists and the scientific community. Please indicate how well each statement describes your own views—that is, how strongly you disagree or agree with each statement. Note that these statements deliberately focus on your general impressions about today’s scientific community, its methods, and its conclusions. Further, note that some of the items may seem repetitive or redundant. This is intentional. Even if a statement seems very similar to a previous item, please take the time to rate each item on its own terms: (matrix with the same 7 scale points for all statements below: Disagree very strongly; disagree strongly; disagree somewhat; neither agree nor disagree; agree somewhat; agree strongly; agree very strongly)

1. People trust scientists a lot more than they should.
2. People don’t realize just how flawed a lot of scientific research really is.
3. A lot of scientific theories are dead wrong.
4. Sometimes I think we put too much faith in science.
5. Our society places too much emphasis on science.
6. I am concerned by the amount of influence that scientists have in society.

#### Hesitancy scale

These were modified from Appendix B in Larson, H. J., Jarrett, C., Schulz, W. S., Cbaudhuri, M., Zhou, Y., Dube, E., Schuster, M., MacDonald, N. E., Wilson, R., & the SAGE Working Group on Vaccine Hesitancy. (2015). Measuring vaccine hesitancy: The development of a survey tool. *Vaccine*, 33, 4165-4175.

<http://dx.doi.org/10.1016/j.vaccine.2015.04.037> (p. 4172)

How much do you agree with each of the following statements on vaccinations? (matrix with the same 5 scale points for all statements below: Strongly disagree; disagree; neither agree nor disagree; agree; strongly agree)

1. Vaccines are important for people's health
2. Vaccines are effective
3. Being vaccinated is important for the health of others in my community
4. All vaccines offered in my community are beneficial
5. New vaccines carry more risks than older vaccines
6. The information I receive about vaccines from the medical community is reliable and trustworthy
7. Getting vaccines is a good way to protect people from disease
8. Generally, I do what my doctor or health care provider recommends about vaccines
9. I am concerned about the serious adverse effects of vaccines
10. People do not need vaccines for diseases that are not common anymore

Personality etc.

Pink is the name of a new scale

Blue indicates the actual wording of the items in Qualtrics (everything from the blue to the next scale is the part actually in Qualtrics)

SSS

Stephenson, M. T., Hoyle, R. H., Palmgreen, P., & Slater, M. D. (2003). Brief measures of sensation seeking for screening and large scale surveys. *Drug and Alcohol Dependence*, 72, 279–286. <http://dx.doi.org/10.1016/j.drugalcdep.2003.08.003>

**Please rate the following items:** (matrix with the same 5 scale points for all statements

below: Strongly disagree; disagree; neither agree nor disagree; agree; strongly agree)

I would like to explore strange places; I like to do frightening things; I like new and exciting experiences, even if I have to break the rules; I prefer friends who are exciting and unpredictable

### Schizotypy

Raine, A., & Benishay, D. (1995). The SPQ-B: A brief screening instrument for schizotypal personality disorder. *Journal of Personality Disorders, 9*, 346-355.

<http://dx.doi.org/10.1521/pedi.1995.9.4.346>

**Please answer true or false to the following items:** (matrix with the same 2 scale points

for all statements below: True; false)

People sometimes find me aloof and distant; Have you ever had the sense that some person or force is around you, even though you cannot see anyone?; People sometimes comment on my unusual mannerisms and habits; Are you sometimes sure that other people can tell what you are thinking?; Have you ever noticed a common event or object that seemed to be a special sign for you?; Some people think that I am a very bizarre person; I feel I have to be on my guard even with friends; Some people find me a bit vague and elusive during a conversation; Do you often pick up hidden threats or put-downs from what people say or do?; When shopping do you get the feeling that other people are taking notice of you?; I feel very uncomfortable in social situations involving unfamiliar people; Have you had experiences with astrology, seeing the future, UFOs, ESP, or a sixth sense?; I sometimes use words in unusual ways; Have you found that it is best not to let other people know too much about you?; I tend to keep in the background

on social occasions; Do you ever suddenly feel distracted by distant sounds that you are not normally aware of?; Do you often have to keep an eye out to stop people from taking advantage of you?; Do you feel that you are unable to get “close” to people?; I am an odd, unusual person; I find it hard to communicate clearly what I want to say to people; I feel very uneasy talking to people I do not know well; I tend to keep my feelings to myself

### PBC

Miller, L. C., Murphy, R., & Buss, A. H. (1981). Consciousness of body: Private and public. *Journal of Personality and Social Psychology*, 41, 397-406.

<http://dx.doi.org/10.1037/0022-3514.41.2.397>

**Please rate the following items:** (matrix with the same 5 scale points for all statements

below: Strongly disagree; disagree; neither agree nor disagree; agree; strongly agree)

I am sensitive to internal bodily tensions; I know immediately when my mouth or throat gets dry; I can often feel my heart beating; I am quick to sense the hunger contractions of my stomach; I'm very aware of changes in my body temperature.

### Tellegen Absorption Scale

Tellegen, A., & Atkinson, G. (1974). Openness to absorbing and self-altering experiences (“absorption”), a trait related to hypnotic susceptibility. *Journal of Abnormal Psychology*, 83, 268-277. <http://dx.doi.org/10.1037/h0036681>

Note:

5. Sometimes I feel and experience things as I did when I was a child.

13. I can be greatly moved by eloquent or poetic language.

21. While watching a movie, a T.V. show, or a play, I may become so involved that I forget about myself and my surroundings, and experience the story as if it were real and as if I were taking part in it.
30. If I stare at a picture and then look away from it, I can sometimes "see" an image of the picture, almost as if I were still looking at it.
37. Sometimes I feel as if my mind could envelop the whole world.
45. I like to watch cloud shapes change in the sky.
53. If I wish I can imagine some things so vividly that it's like watching a good movie or hearing a good story.
60. I think I really know what some people mean when they talk about mystical experiences.
68. I sometimes "step outside" my usual self and experience a completely different state of being.
73. Textures—such as wool, sand, wood—sometimes remind me of colors or music.
81. Sometimes I experience things as if they were doubly real.
90. When I listen to music I can get so caught up in it that I don't notice anything else.
99. If I wish, I can imagine that my body is so heavy that I cannot move it.
108. I can often somehow sense the presence of another person before I actually see or hear her/him.
116. The crackle and flames of a wood fire stimulate my imagination.

123. Sometimes I am so immersed in nature or in art that I feel as if my whole state of consciousness has somehow been temporarily changed.

131. Different colors have distinctive and special meanings for me.

141. I can wander off into my thoughts so completely while doing a routine task that I actually forget what I am doing and a few minutes later find that I have finished it.

149. I can sometimes recall certain past experiences so clearly and vividly that it is like living them again.

156. Things that might seem meaningless to others often make sense to me.

165. If I acted in a play I think I would really feel the emotions of the character and “become“ that person for the time being, forgetting both myself and the audience.

173. My thoughts often occur as visual images rather than as words.

182. I am often delighted by small things (like the colors in soap bubbles and the five pointed star shape that appears when you cut an apple across the core).

189. When listening to organ music or other powerful music, I sometimes feel as if I am being lifted into the air.

197. Sometimes I can change noise into music by the way I listen to it.

208. Some of my most vivid memories are called up by scents and smells.

215. Some music reminds me of pictures or changing patterns of color.

223. I often know what someone is going to say before he or she says it.

231. I often have “physical memories“; for example, after I've been swimming I may feel as if I'm still in the water.

238. The sound of a voice can be so fascinating to me that I can just go on listening to it.

249. At times I somehow feel the presence of someone who is not physically there.

257. Sometimes thoughts and images come to me without any effort on my part.

265. I find that different smells have different colors.

273. I can be deeply moved by a sunset.

Absorption Subscales

Absorption Subscale 1 *Sentient* (AB1, 11 items)

13 45 73 116 131 182 208 215 238 265 273

Absorption Subscale 2 *Prone to imaginative and altered states* (AB2, 18 items)

5 21 30 37 53 68 81 99 108 123 141 149 165 173 223 231 249 257

**Please respond true or false to each of the following items:** (matrix with the same 2 scale points for all statements below: True; false)

Sometimes I feel and experience things as I did when I was a child; I can be greatly moved by eloquent or poetic language; While watching a movie, a T.V. show, or a play, I may become so involved that I forget about myself and my surroundings, and experience the story as if it were real and as if I were taking part in it; If I stare at a picture and then look away from it, I can sometimes "see" an image of the picture, almost as if I were still looking at it; Sometimes I feel as if my mind could envelop the whole world; I like to watch cloud shapes change in the sky; If I wish I can imagine some things so vividly that it's like watching a good movie or hearing a good story; I think I really know what some people mean when they talk about mystical experiences; I sometimes "step outside" my

usual self and experience a completely different state of being; Textures—such as wool, sand, wood—sometimes remind me of colors or music; Sometimes I experience things as if they were doubly real; When I listen to music I can get so caught up in it that I don't notice anything else; If I wish, I can imagine that my body is so heavy that I cannot move it; I can often somehow sense the presence of another person before I actually see or hear her/him; The crackle and flames of a wood fire stimulate my imagination; Sometimes I am so immersed in nature or in art that I feel as if my whole state of consciousness has somehow been temporarily changed; Different colors have distinctive and special meanings for me; I can wander off into my thoughts so completely while doing a routine task that I actually forget what I am doing and a few minutes later find that I have finished it; I can sometimes recall certain past experiences so clearly and vividly that it is like living them again; Things that might seem meaningless to others often make sense to me; If I acted in a play I think I would really feel the emotions of the character and “become“ that person for the time being, forgetting both myself and the audience; My thoughts often occur as visual images rather than as words; I am often delighted by small things (like the colors in soap bubbles and the five pointed star shape that appears when you cut an apple across the core); When listening to organ music or other powerful music, I sometimes feel as if I am being lifted into the air; Sometimes I can change noise into music by the way I listen to it; Some of my most vivid memories are called up by scents and smells; Some music reminds me of pictures or changing patterns of color; I often know what someone is going to say before he or she says it; I often have “physical memories“; for example, after I've been swimming I may feel as if I'm still in the water; The sound of a voice can be so fascinating to me that I can just go on listening to it; At

times I somehow feel the presence of someone who is not physically there; Sometimes thoughts and images come to me without any effort on my part; I find that different smells have different colors; I can be deeply moved by a sunset.

### Conspiracist Ideation

From Swami, V., Barron, D., Weis, L., Voracek, M., Steiger, S., & Furnham, A. (2017).

An examination of the factorial and convergent validity of four measures of conspiracist ideation, with recommendations for researchers. *PLoS ONE*, *12*(2), e0172617.

<http://dx.doi.org/10.1371/journal.pone.0172617>

Note:

**Belief in Conspiracy Theories Inventory.** The version of the BCTI that we used was the 15-item, adapted version [15]. This version includes 14 items from the parent study [6] and an additional item added in a subsequent study [15]. The factor structure of this adapted version of the BCTI has not been previously investigated, but researchers have assumed that it retains its parent, one-factor structure. Internal consistency coefficients for this one-factor solution have tended to be acceptable (see Table 1). In the present study, all items were rated on a 9-point scale, ranging from 1 (*Completely false*) to 9 (*Completely true*). Higher scores on this scale reflect greater endorsement of a range of real-world conspiracy theories. BCTI items are reported in Table 4.

**Table 4. Items and factor loadings for the Belief in Conspiracy Theory Inventory.**

Item	Factor 1	Factor 2
8. The US government allowed the 9/11 attacks to take place so that it would have an excuse to achieve foreign (e.g., wars in Afghanistan and Iraq) and domestic (e.g., attacks on civil liberties) goals that had been determined prior to the attacks.	.81	-.06
5. The assassination of Martin Luther King, Jr., was the result of an organised conspiracy by US government agencies such as the CIA and FBI.	.78	-.07
4. US agencies intentionally created the AIDS epidemic and administered it to Black and gay men in the 1970s.	.77	.02
15. Government agencies in the UK are involved in the distribution of illegal drugs to ethnic minorities.	.76	-.26
3. The US government had foreknowledge about the Japanese attack on Pearl Harbour, but allowed the attack to take place so as to be able to enter the Second World War.	.71	-.19
11. Princess Diana's death was not an accident, but rather an organised assassination by members of the British royal family who disliked her.	.61	.16
1. A powerful and secretive group, known as the New World Order, are planning to eventually rule the world through an autonomous world government, which would replace sovereign government.	.69	.14
2. SARS (Severe Acute Respiratory Syndrome) was produced under laboratory conditions as a biological weapon.	.67	.25
13. The Coca Cola company intentionally changed to an inferior formula with the intent of driving up demand for their classic product, later reintroducing it for their financial gain.	.66	-.12
9. The assassination of John F. Kennedy was not committed by the lone gunman, Lee Harvey Oswald, but was rather a detailed, organised conspiracy to kill the President.	.65	.25
6. The Apollo moon landings never happened and were staged in a Hollywood film studio.	.65	.17
12. The Oklahoma City bombers, Timothy McVeigh and Terry Nichols, did not act alone, but rather received assistance from neo-Nazi groups.	.64	-.01
14. Special interest groups are suppressing, or have suppressed in the past, technologies that could provide energy at reduced cost or reduced pollution output.	.62	-.08
7. Area 51 in Nevada, US, is a secretive military base that contains hidden alien spacecraft and/or alien bodies.	.57	.72
10. In July 1947, the US military recovered the wreckage of an alien craft from Roswell, New Mexico, and covered up the fact.	.60	.69

doi:10.1371/journal.pone.0172617.t004

The items were taken from Swami, V., Coles, R., Stieger, S., Pietschnig, J., Furnham, A., Rehim, S., & Voracek, M. (2011). Conspiracist ideation in Britain and Austria: Evidence of a monological belief system and associations between individual psychological differences and real-world and fictitious conspiracy theories. *British Journal of Psychology*, 102, 443-463.

<http://dx.doi.org/10.1111/j.2044-8295.2010.02004.x>

*Belief in conspiracy theories inventory (BCTI; Swami et al., 2010)*

This is a 14-item scale consisting of items describing prominent conspiracy theories. The items were originally designed to be recognized by an international audience and were rated on a 9-point Likert-type scale (1 = *completely false*, 9 = *completely true*). Higher scores on this inventory indicate greater belief in a range of real-world conspiracy theories. In their study, Swami *et al.* (2010) reported that this scale had a unidimensional structure with high reliability ( $\alpha = .86$ ) following the exclusion of one item. In the present study, this excluded item was replaced by a distinct item relating to conspiracist ideation concerning the September 11, 2001, terrorist attacks, which was also previously used by Swami *et al.* (2010). In the present study, Cronbach's  $\alpha$  for the BCTI was .90.

The original scale was from Swami, V., Chamorro-Premuzic, T., & Furnham, A.

(2010). Unanswered questions: A preliminary investigation of personality and

individual difference predictors of 9/11 conspiracist beliefs. *Applied Cognitive*

*Psychology*, 24, 749-761. <http://dx.doi.org/10.1002/acp.1583>

*Belief in conspiracy theories inventory.* This is a 15-item, novel scale devised for the present study, consisting of items describing prominent conspiracy theories (sample item: 'The assassination of John F. Kennedy was not committed by the lone gunman, Lee Harvey Oswald, but was rather a detailed, organised conspiracy to kill the President'). Participants rated whether they agreed each statement was true or false on a 9-point scale (1 = *Completely false*, 9 = *Completely true*). A principal components analysis using Direct Oblimin (oblique) rotation revealed a single factor onto which all but one of the items loaded (eigenvalue = 5.20, 34.6% of the variance accounted for). Dropping the single item

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Appl. Cognit. Psychol. 24: 749–761 (2010)

DOI: 10.1002/acp

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(which pertained to the belief that Elvis Presley was still alive) allowed us to compute a single factor score (henceforth 'General Conspiracist Beliefs') by taking an average of responses across the 14 items associated with the extracted factor. Cronbach's  $\alpha$  for the resulting scale was high at 0.86.

**Please rate the following items:** (matrix with the same 9 scale points for all statements below: Completely false; blank; mostly false; blank; neither true nor false; blank; mostly true; blank; completely true)

1. A powerful and secretive group, known as the New World Order, are planning to eventually rule the world through an autonomous world government, which would replace sovereign government.
2. SARS (Severe Acute Respiratory Syndrome) was produced under laboratory conditions as a biological weapon.
3. The US government had foreknowledge about the Japanese attack on Pearl Harbor, but allowed the attack to take place so as to be able to enter the Second World War.
4. US agencies intentionally created the AIDS epidemic and administered it to Black and gay men in the 1970s.
5. The assassination of Martin Luther King, Jr., was the result of an organized conspiracy by US government agencies such as the CIA and FBI.
6. The Apollo moon landings never happened and were staged in a Hollywood film studio.
7. Area 51 in Nevada, US, is a secretive military base that contains hidden alien spacecraft and/or alien bodies.
8. The US government allowed the 9/11 attacks to take place so that it would have an excuse to achieve foreign (e.g., wars in Afghanistan and Iraq) and domestic (e.g., attacks on civil liberties) goals that had been determined prior to the attacks.
9. The assassination of John F. Kennedy was not committed by the lone gunman, Lee Harvey Oswald, but was rather a detailed, organized conspiracy to kill the President.

10. In July 1947, the US military recovered the wreckage of an alien craft from Roswell, New Mexico, and covered up the fact.
11. Princess Diana's death was not an accident, but rather an organized assassination by members of the British royal family who disliked her.
12. The Oklahoma City bombers, Timothy McVeigh and Terry Nichols, did not act alone, but rather received assistance from neo-Nazi groups.
13. The Coca Cola company intentionally changed to an inferior formula with the intent of driving up demand for their classic product, later reintroducing it for their financial gain.
14. Special interest groups are suppressing, or have suppressed in the past, technologies that could provide energy at reduced cost or reduced pollution output.
15. Government agencies in the UK are involved in the distribution of illegal drugs to ethnic minorities.

### Locus of Control

Rotter, J. B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs: General and Applied*, 80(1), 1-28.

<http://dx.doi.org/10.1037/h0092976>

Note:

Instructions-Please circle the letter that best describes how you feel.

1. a. Children get into trouble because their parents punish them too much.

b. The trouble with most children nowadays is that their parents are too easy with them.

2. a. Many of the unhappy things in people's lives are partly due to bad luck.  
b. People's misfortunes result from the mistakes they make.
3. a. One of the major reasons why we have wars is because people don't take enough interest in politics.  
b. There will always be wars, no matter how hard people try to prevent them.
4. a. In the long run people get the respect they deserve in this world.  
b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.
5. a. The idea that teachers are unfair to students is nonsense.  
b. Most students don't realize the extent to which their grades are influenced by accidental happenings.
6. a. Without the right breaks one cannot be an effective leader.  
b. Capable people who fail to become leaders have not taken advantage of their opportunities.
7. a. No matter how hard you try some people just don't like you.  
b. People who can't get others to like them don't understand how to get along with others.
8. a. Heredity plays the major role in determining one's personality.  
b. It is one's experiences in life which determine what they're like.
9. a. I have often found that what is going to happen will happen.  
b. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.

10. a. In the case of the well-prepared student there is rarely if ever such a thing as an unfair test.

b. Many times exam questions tend to be so unrelated to course work that studying is really useless.

11. a. Becoming a success is a matter of hard work, luck has little or nothing to do with it.

b. Getting a good job depends mainly on being in the right place at the right time.

12. a. The average citizen can have an influence in government decisions.

b. This world is run by the few people in power, and there is not much the little guy can do about it.

13. a. When I make plans, I am almost certain that I can make them work.

b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.

14. a. There are certain people who are just no good.

b. There is some good in everybody.

15. a. In my case getting what I want has little or nothing to do with luck.

b. Many times we might just as well decide what to do by flipping a coin.

16. a. Who gets to be the boss often depends on who was lucky enough to be in the right place first.

b. Getting people to do the right thing depends upon ability, luck has little or nothing to do with it.

17. a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.

b. By taking an active part in political and social affairs the people can control world events.

18. a. Most people don't realize the extent to which their lives are controlled by accidental happenings.

b. There really is no such thing as "luck."

19. a. One should always be willing to admit mistakes.

b. It is usually best to cover up one's mistakes.

20. a. It is hard to know whether or not a person really likes you.

b. How many friends you have depends upon how nice a person you are.

21. a. In the long run the bad things that happen to us are balanced by the good ones.

b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.

22. a. With enough effort we can wipe out political corruption.

b. It is difficult for people to have much control over the things politicians do in office.

23. a. Sometimes I can't understand how teachers arrive at the grades they give.

b. There is a direct connection between how hard I study and the grades I get.

24. a. A good leader expects people to decide for themselves what they should do.

b. A good leader makes it clear to everybody what their jobs are.

25. a. Many times I feel that I have little influence over the things that happen to me.

b. It is impossible for me to believe that chance or luck plays an important role in my life.

26. a. People are lonely because they don't try to be friendly.

b. There's not much use in trying too hard to please people, if they like you, they like you.

27. a. There is too much emphasis on athletics in high school.

b. Team sports are an excellent way to build character.

28. a. What happens to me is my own doing.

b. Sometimes I feel that I don't have enough control over the direction my life is taking.

29. a. Most of the time I can't understand why politicians behave the way they do.

b. In the long run the people are responsible for bad government on a national as well as on a local level.

## SCORING

### Rotter Locus of Control Scale

Score one point for each of the following:

2.a, 3.b, 4.b, 5.b, 6.a, 7.a, 9.a, 10.b, 11.b, 12.b, 13.b, 15.b, 16.a, 17.a, 18.a, 20.a,

21.a, 22.b, 23.a, 25.a, 26.b, 28.b, 29.a. A high score = External Locus of Control;

a low score = Internal Locus of Control

Please choose the letter that best describes how you feel (for every item below)

- a. Children get into trouble because their parents punish them too much.
- b. The trouble with most children nowadays is that their parents are too easy with them.
- a. Many of the unhappy things in people's lives are partly due to bad luck.
- b. People's misfortunes result from the mistakes they make.
- a. One of the major reasons why we have wars is because people don't take enough interest in politics.
- b. There will always be wars, no matter how hard people try to prevent them.
- a. In the long run people get the respect they deserve in this world.
- b. Unfortunately, an individual's worth often passes unrecognized no matter how hard he tries.
- a. The idea that teachers are unfair to students is nonsense.
- b. Most students don't realize the extent to which their grades are influenced by accidental happenings.
- a. Without the right breaks one cannot be an effective leader.
- b. Capable people who fail to become leaders have not taken advantage of their opportunities.
- a. No matter how hard you try some people just don't like you.
- b. People who can't get others to like them don't understand how to get along with others.
- a. Heredity plays the major role in determining one's personality.
- b. It is one's experiences in life which determine what they're like.
- a. I have often found that what is going to happen will happen.
- b. Trusting to fate has never turned out as well for me as making a decision to take a definite course of action.

- a. In the case of the well-prepared student there is rarely if ever such a thing as an unfair test.
- b. Many times exam questions tend to be so unrelated to course work that studying in really useless.
- a. Becoming a success is a matter of hard work, luck has little or nothing to do with it.
- b. Getting a good job depends mainly on being in the right place at the right time.
- a. The average citizen can have an influence in government decisions.
- b. This world is run by the few people in power, and there is not much the little guy can do about it.
- a. When I make plans, I am almost certain that I can make them work.
- b. It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow.
- a. There are certain people who are just no good.
- b. There is some good in everybody.
- a. In my case getting what I want has little or nothing to do with luck.
- b. Many times we might just as well decide what to do by flipping a coin.
- a. Who gets to be the boss often depends on who was lucky enough to be in the right place first.
- b. Getting people to do the right thing depends upon ability, luck has little or nothing to do with it.
- a. As far as world affairs are concerned, most of us are the victims of forces we can neither understand, nor control.

- b. By taking an active part in political and social affairs the people can control world events.
- a. Most people don't realize the extent to which their lives are controlled by accidental happenings.
- b. There really is no such thing as "luck."
- a. One should always be willing to admit mistakes.
- b. It is usually best to cover up one's mistakes.
- a. It is hard to know whether or not a person really likes you.
- b. How many friends you have depends upon how nice a person you are.
- a. In the long run the bad things that happen to us are balanced by the good ones.
- b. Most misfortunes are the result of lack of ability, ignorance, laziness, or all three.
- a. With enough effort we can wipe out political corruption.
- b. It is difficult for people to have much control over the things politicians do in office.
- a. Sometimes I can't understand how teachers arrive at the grades they give.
- b. There is a direct connection between how hard I study and the grades I get.
- a. A good leader expects people to decide for themselves what they should do.
- b. A good leader makes it clear to everybody what their jobs are.
- a. Many times I feel that I have little influence over the things that happen to me.
- b. It is impossible for me to believe that chance or luck plays an important role in my life.
- a. People are lonely because they don't try to be friendly.
- b. There's not much use in trying too hard to please people, if they like you, they like you.
- a. There is too much emphasis on athletics in high school.
- b. Team sports are an excellent way to build character.

- a. What happens to me is my own doing.
- b. Sometimes I feel that I don't have enough control over the direction my life is taking.
- a. Most of the time I can't understand why politicians behave the way they do.
- b. In the long run the people are responsible for bad government on a national as well as on a local level.

### Empathy

Carré, A., Stefaniak, N., D'Ambrosio, A., Bensalah, L., & Besche-Richard, C. (2013).

The Basic Empathy Scale in adults (BES-A): Factor structure of a revised form.

*Psychological Assessment*, 25, 679-691. <http://dx.doi.org/10.1037/a0032297>

Note:

The participants had to give their ratings on a 5-point Likert type scale (1 \_ *Strongly Disagree*, 2 \_ *Disagree*, 3 \_ *Neither Agree nor Disagree*, 4 \_ *Agree*, 5 \_ *Strongly Agree*) (Carre, Stefaniak, D'Ambrosio, Bensalah, & Besche-Richard, 2013, p. 682).

**Please rate the following items:** (matrix with the same 5 scale points for all statements below: Strongly disagree; disagree; neither agree nor disagree; agree; strongly agree)  
 My friends' emotions don't affect me much; After being with a friend who is sad about something, I usually feel sad; I can understand my friend's happiness when she/he does well at something; I get frightened when I watch characters in a good scary movie; I get caught up in other people's feelings easily; I find it hard to know when my friends are frightened; I don't become sad when I see other people crying; Other people's feelings don't bother me at all; When someone is feeling 'down' I can usually understand how they feel; I can usually work out when my friends are scared; I often become sad when

watching sad things on TV or in films; I can often understand how people are feeling even before they tell me; Seeing a person who has been angered has no effect on my feelings; I can usually work out when people are cheerful; I tend to feel scared when I am with friends who are afraid; I can usually realize quickly when a friend is angry; I often get swept up in my friends' feelings; My friend's unhappiness doesn't make me feel anything; I am not usually aware of my friends' feelings; I have trouble figuring out when my friends are happy

Note:

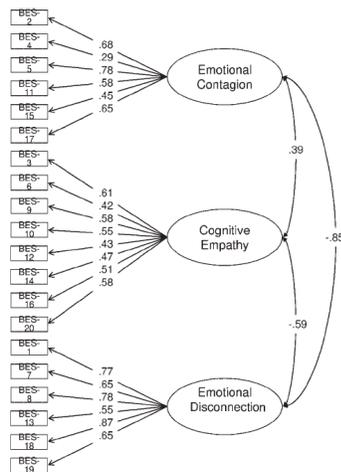


Figure 2. Three-factor structure of Basic Empathy Scale in Adults (BES-A).

(Carre, Stefaniak, D'Ambrosio, Bensalah, & Besche-Richard, 2013, p. 690).

## Big 5

Donnellan, M.B., Oswald, F.L., Baird, B.M., & Lucas, R.E. (2006). The mini-IPIP scales: Tiny-yet-effective measures of the Big Five factors of personality. *Psychological Assessment*, 18, 192-203. <http://dx.doi.org/10.1037/1040-3590.18.2.192>

Mini IPIP

Note:

From <https://www.msu.edu/~lucasri/ipip.html>

Instructions: On the following pages, there are phrases describing people's behaviors. Please use the rating scale below to describe how accurately each statement describes you. Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. So that you can describe yourself in an honest manner, your responses will be kept in absolute confidence. Please read each statement carefully, and then fill in the bubble that corresponds to the number on the scale.

1. Am the life of the party (E)
2. Sympathize with others' feelings (A)
3. Get chores done right away (C)
4. Have frequent mood swings (N)
5. Have a vivid imagination (I)
6. Don't talk a lot (E)
7. Am not interested in other people's problems (A)
8. Often forget to put things back in their proper place (C)
9. Am relaxed most of the time (N)
10. Am not interested in abstract ideas (I)
11. Talk to a lot of different people at parties (E)
12. Feel others' emotions (A)
13. Like order (C)
14. Get upset easily (N)
15. Have difficulty understanding abstract ideas (I)

16. Keep in the background (E)
17. Am not really interested in others (A)
18. Make a mess of things (C)
19. Seldom feel blue (N)
20. Do not have a good imagination (I)

Note: Items 6, 7, 8, 9, 10, 15, 16, 17, 18, 19, and 20 are reverse scored.

**These are phrases describing people's behaviors.** Please use the rating scale below to describe how accurately each statement describes you. Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. (matrix with the same 5 scale points for all statements below: Very Inaccurate; Moderately Inaccurate; Neither Inaccurate nor Accurate; Moderately Accurate; Very Accurate)

Am the life of the party; Sympathize with others' feelings; Get chores done right away; Have frequent mood swings; Have a vivid imagination; Don't talk a lot; Am not interested in other people's problems; Often forget to put things back in their proper place; Am relaxed most of the time; Am not interested in abstract ideas; Talk to a lot of different people at parties; Feel others' emotions; Like order; Get upset easily; Have difficulty understanding abstract ideas; Keep in the background; Am not really interested in others; Make a mess of things; Seldom feel blue; Do not have a good imagination

## Critical thinking (suspicion)

Yuan, S.-P., Liao, H.-C., Wang, Y.-H., & Chou, M.-J. (2014). Development of a scale to measure the critical thinking disposition of medical care professionals. *Social Behavior and Personality*, 42, 303-312. <http://dx.doi.org/10.2224/sbp.2014.42.2.303>

Notes:

“...rated on a 7-point Likert scale, ranging from 1 = *strongly disagree* to 7 = *strongly agree*” (Yuan, Liao, Wang, & Chou, 2014, p. 306)

### **Factor 1: Systematicity and analyticity**

- 29. I am able to read between the lines, and find out any conflicting or contradictory statement in an article.
- 31. Before making a judgment, I am used to analyzing all the available information and the current situation.
- 39. I am able to determine the value of a piece of information, and then evaluate the reasonableness of the conclusion accordingly.
- 38. I try to know every detail about controversial problems that occurred recently.
- 37. I draw conclusions by logical thinking and methodological analysis.
- 30. I always examine the pros and cons of each opinion I am exposed to.
- 27. I often contemplate what is right and wrong about the things I have done and experienced.

### **Factor 2: Inquisitiveness and conversance**

- 52. I always learn as much as possible, even if I don't know when I'll put to use the things I learned.

51. Before making an important decision, I always make every effort to collect all the relevant information.

35. When solving a problem, I manage to keep myself updated with everything relevant.

47. I try to delve into anything, or any viewpoint, that is new and novel.

46. When making a decision, people expect me to lay down proper rules as guidance.

6. In times of trouble, I strive to seek all potential solutions before deciding on the best one.

### **Factor 3: Maturity and skepticism**

15. During discussions, I am able to raise questions and respond to others' opinions while remaining calm.

21. During discussions, I always try my best to understand, and listen to, different opinions before communicating.

14. When I am thinking, I am able to tolerate different viewpoints or opinions.

8. I will correct my viewpoint immediately when there is enough evidence to prove that it is biased.

7. I never hesitate to question any prejudice, assumption, or belief of mine and thoroughly examine everything I have said and done.

(Yuan, Liao, Wang, & Chou, 2014, p. 307-308)

**Please rate the following items:** (matrix with the same 7 scale points for all statements below: Strongly disagree; disagree; somewhat disagree; neither agree nor disagree; somewhat agree; agree; strongly agree)

In times of trouble, I strive to seek all potential solutions before deciding on the best one; I never hesitate to question any prejudice, assumption, or belief of mine and thoroughly examine everything I have said and done; I will correct my viewpoint immediately when there is enough evidence to prove that it is biased; When I am thinking, I am able to tolerate different viewpoints or opinions; During discussions, I am able to raise questions and respond to others' opinions while remaining calm; During discussions, I always try my best to understand, and listen to, different opinions before communicating; I often contemplate what is right and wrong about the things I have done and experienced; I am able to read between the lines, and find out any conflicting or contradictory statement in an article; I always examine the pros and cons of each opinion I am exposed to; Before making a judgment, I am used to analyzing all the available information and the current situation; When solving a problem, I manage to keep myself updated with everything relevant; I draw conclusions by logical thinking and methodological analysis; I try to know every detail about controversial problems that occurred recently; I am able to determine the value of a piece of information, and then evaluate the reasonableness of the conclusion accordingly; When making a decision, people expect me to lay down proper rules as guidance; I try to delve into anything, or any viewpoint, that is new and novel; Before making an important decision, I always make every effort to collect all the relevant information; I always learn as much as possible, even if I don't know when I'll put to use the things I learned.

### Paranoia (suspicion)

Freeman, D., Garety, P. A., Bebbington, P. E., Smith, B., Rollinson, R., Fowler, D., Kuipers, E., Ray, K., & Dunn, G. (2005). Psychological investigation of the structure of

paranoia in a non-clinical population. *British Journal of Psychiatry*, 186, 427-435.

<http://dx.doi.org/10.1192/bjp.186.5.427>

Note:

Justification to use only one dimension: Lincoln, T. M., Ziegler, M., Lullmann, E., Muller, M. J., & Rief, W. (2010). Can delusions be self-assessed?

Concordance between self- and observer-rated delusions in schizophrenia.

*Psychiatry Research*, 178, 249-254.

<http://dx.doi.org/10.1016/j.psychres.2009.04.019>

Factor structure for general suspicion vs. paranoia: Moritz, S., Van Quaquebeke, N., & Lincoln, T. M. (2012). Jumping to conclusions is associated with paranoia but not general suspiciousness: A comparison of two versions of the probabilistic reasoning paradigm. *Schizophrenia Research and Treatment*, 2012, 9 pages, article ID 384039. <http://dx.doi.org/10.1155/2012/384039>

**For each of the thoughts below, how strongly do you believe it:** (matrix with the same 5

scale points for all statements below: Do not believe it; believe it a little; Believe it somewhat; Believe it a lot; Absolutely believe it)

I need to be on my guard against others

There might be negative comments being circulated about me

People deliberately try to irritate me

I might be being observed or followed

People are trying to make me upset

People communicate about me in subtle ways

Strangers and friends look at me critically

People might be hostile towards me

Bad things are being said about me behind my back

Someone I know has bad intentions towards me

I have a suspicion that someone has it in for me

People would harm me if given an opportunity

Someone I don't know has bad intentions towards me

There is a possibility of a conspiracy against me

People are laughing at me

I am under threat from others

I can detect coded messages about me in the press/TV/radio

My actions and thoughts might be controlled by others

Tolerance for ambiguity

Note:

Mac Donald, Jr., A. P. (1970). Revised scale for ambiguity tolerance: Reliability and validity. *Psychological Reports, 26*, 791-798.

TABLE 1  
THE AT-20 SCALE\*

Please do not spend too much time on the following items. There are no right or wrong answers and therefore your first response is important. Mark *T* for true and *F* for false. Be sure to answer every question.

1. A problem has little attraction for me if I don't think it has a solution. (F)
2. I am just a little uncomfortable with people unless I feel that I can understand their behavior. (F)
3. There's a right way and a wrong way to do almost everything. (F)
4. I would rather bet 1 to 6 on a long shot than 3 to 1 on a probable winner. (T)
5. The way to understand complex problems is to be concerned with their larger aspects instead of breaking them into smaller pieces. (T)
6. I get pretty anxious when I'm in a social situation over which I have no control. (F)
7. Practically every problem has a solution. (F)
8. It bothers me when I am unable to follow another person's train of thought. (F)
9. I have always felt that there is a clear difference between right and wrong. (F)
10. It bothers me when I don't know how other people react to me. (F)
11. Nothing gets accomplished in this world unless you stick to some basic rules. (F)
12. If I were a doctor, I would prefer the uncertainties of a psychiatrist to the clear and definite work of someone like a surgeon or X-ray specialist. (T)
13. Vague and impressionistic pictures really have little appeal for me. (F)
14. If I were a scientist, it would bother me that my work would never be completed (because science will always make new discoveries). (F)
15. Before an examination, I feel much less anxious if I know how many questions there will be. (F)
16. The best part of working a jigsaw puzzle is putting in that last piece. (F)
17. Sometimes I rather enjoy going against the rules and doing things I'm not supposed to do. (T)
18. I don't like to work on a problem unless there is a possibility of coming out with a clear-cut and unambiguous answer. (F)
19. I like to fool around with new ideas, even if they turn out later to be a total waste of time. (T)
20. Perfect balance is the essence of all good composition. (F)

*Note.*—Items 1-16 are taken from Rydell and Rosen (1966) and are reproduced by permission from *Psychological Reports*. Items 17 and 18 are taken from the California Personality Inventory (Items 275 and 363; Gough, 1957) and are reproduced by special permission from the Consulting Psychologists Press. Items 19 and 20 are taken from Barron's Conformity Scale (Items 15 and 18; Barron, 1953) and are reproduced by permission from the Duke University Press.

\*Test is scored for high ambiguity tolerance.

Please answer true or false to each of the following:

A problem has little attraction for me if I don't think it has a solution

I am just a little uncomfortable with people unless I feel that I can understand their behavior

There is a right way and a wrong way to do almost everything

I would rather bet 1 to 6 on a long shot than 3 to 1 on a probable winner

The way to understand complex problems is to be concerned with their larger aspects instead of breaking them into smaller pieces

I get pretty anxious when I'm in a social situation over which I have no control

Practically every problem has a solution

It bothers me when I am unable to follow another person's train of thought  
I have always felt that there is a clear difference between right and wrong  
It bothers me when I don't know how other people react to me  
Nothing gets accomplished in this world unless you stick to some basic rules  
If I were a doctor, I would prefer the uncertainties of a psychiatrist to the clear and definite work of someone like a surgeon or X-ray specialist  
Vague and impressionistic pictures really have little appeal for me  
If I were a scientist, it would bother me that my work would never be completed (because science will always make new discoveries)  
Before an examination, I feel much less anxious if I know how many questions there will be  
The best part of working a jigsaw puzzle is putting in that last piece  
Sometimes I rather enjoy going against the rules and doing things I'm not supposed to do  
I don't like to work on a problem unless there is a possibility of coming out with a clear-cut and unambiguous answer  
I like to fool around with new ideas, even if they turn out later to be a total waste of time  
Perfect balance is the essence of all good composition

### Demographics

Respondents were also asked to provide general demographic information, including their age, sex, level of education, income level, intensity of religious belief (scale of “1” to “10” with “10” being most intense) and whether or not they typically attended a weekly religious service. Responses of “yes” were coded with “1” and responses of “no” were as “0” (Sparks & Miller, 2001, p. 104).

Please choose your gender from the list below: Agender; woman; man; gender fluid; if none of these accurately describes you, please enter your response:

Do you identify as intersex? (Yes/No)

Do you identify as transgender? (Yes/No)

Please choose the option that best captures your level of education: Did not complete high school; high school diploma or GED; some college or university, but no degree; associates degree or equivalent; bachelor's degree; some graduate school but no graduate degree; masters degree; Ph.D.; if none of the above accurately describes your level of education, please type your level of education below:

How would you describe your race/ethnicity?

Please indicate the intensity of your religious belief: Not at all intense; blank; slightly intense; blank; somewhat intense; blank; moderately intense; blank; very intense; blank; extremely intense

Do you typically attend a weekly religious service? No; yes

How did you find out about the survey? Source checkboxes: A blog site (e.g., The Vaccine Blog, VAXOPEDIA, History of Vaccines, Voices for vaccines, etc.); twitter; email or personal communication; Facebook post; research pool web site; other (please describe briefly)

Please answer this question honestly. Your answer will have no effect on you, but it may help us to better understand the results:

How much effort did you put into the task? I did not try very hard, and you should probably not include my results; I did my best and feel that my results should be included



**IRB**

**INSTITUTIONAL REVIEW BOARD** Office of Research Compliance, 010A Sam Ingram Building,  
2269 Middle Tennessee Blvd Murfreesboro, TN 37129

**IRBN007 – EXEMPTION DETERMINATION NOTICE**

Wednesday, October 10, 2018

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Principal Investigator Faculty Advisor Co-Investigators Investigator Email(s) Department

Protocol Title Protocol ID

Dear Investigator(s),

**Emory Bibb** (Student)  
William Langston  
NONE  
*elb4s@mtmail.mtsu.edu; william.langston@mtsu.edu* Honors College & Psychology

***Vaccine experience and belief***

**19-1059**

The above identified research proposal has been reviewed by the MTSU Institutional Review Board (IRB) through the **EXEMPT** review mechanism under 45 CFR 46.101(b)(2) within the research category (2) *Educational Tests* A summary of the IRB action and other particulars in regard to this protocol application is tabulated as shown below:

IRB Action	<b>EXEMPT from further IRB review***</b>	Date	<b>10/10/18</b>
Date of Expiration	<b>NOT APPLICABLE</b>		
Sample Size	400 (FOUR HUNDRED)		
Participant Pool	<b>Healthy Adults (18 or older) - MTSU SONA and others</b>		
Exceptions	Online consent permitted		
Mandatory Restrictions	1. Participants must be 18 years or older		

	2. Informed consent must be obtained from the participants 3. Identifying information must not be collected
Restrictions	<b>All restrictions for exemption apply</b>
Comments	NONE

\*\*\*This exemption determination only allows above defined protocol from further IRB review such as continuing review. However, the following post-approval requirements still apply:

- Addition/removal of subject population should not be implemented without IRB approval
- Change in investigators must be notified and approved
- Modifications to procedures must be clearly articulated in an addendum request and the proposed

changes must not be incorporated without an approval

- Be advised that the proposed change must comply within the requirements for exemption
- Changes to the research location must be approved – appropriate permission letter(s) from external

institutions must accompany the addendum request form

- Changes to funding source must be notified via email ([irb\\_submissions@mtsu.edu](mailto:irb_submissions@mtsu.edu))
- The exemption does not expire as long as the protocol is in good standing
- Project completion must be reported via email ([irb\\_submissions@mtsu.edu](mailto:irb_submissions@mtsu.edu))
- Research-related injuries to the participants and other events must be reported within 48 hours of

such events to [compliance@mtsu.edu](mailto:compliance@mtsu.edu)

IRBN007

Version 1.3 Revision Date 05.22.2018

Institutional Review Board Office of Compliance Middle Tennessee State University

### **Post-approval Protocol Amendments:**

The current MTSU IRB policies allow the investigators to make the following types of changes to this protocol without the need to report to the Office of Compliance, as long as the proposed changes do not result in the cancellation of the protocols eligibility for exemption:

- Editorial and minor administrative revisions to the consent form or other study documents
- Increasing/decreasing the participant size

The investigator(s) indicated in this notification should read and abide by all applicable post-approval conditions imposed with this approval. [Refer to the post-approval guidelines posted in the MTSU IRB's website](#). Any unanticipated harms to participants or adverse events must be reported to the Office of Compliance at (615) 494-8918 within 48 hours of the incident.

All of the research-related records, which include signed consent forms, current & past investigator information, training certificates, survey instruments and other documents related to the study, must be retained by the PI or the faculty advisor (if the PI is a student) at the secure location mentioned in the protocol application. The data storage must be maintained for at least three (3) years after study completion. Subsequently, the researcher may destroy the data in a manner that maintains confidentiality and anonymity. IRB reserves the right to modify, change or cancel the terms of this letter without prior notice. Be advised that IRB also reserves the right to inspect or audit your records if needed.

Sincerely,

Institutional Review Board  
Middle Tennessee State University

Quick Links:

[Click here](#) for a detailed list of the post-approval responsibilities. More information on exempt procedures can be found [here](#).

