

CHAPTER 0: INTRODUCTION

PREFACE

Logic is the science that evaluates arguments. It provides the machinery for determining whether the premises of arguments imply their conclusions—that is, whether believing the premises justifies us in believing the conclusions. So logic, in the broadest sense, is about what we should believe and why and about whether and when we have good reasons for what we believe.

A Prelude to Logic is a ‘critical reasoning’ or ‘informal logic’ textbook. It is intended to:

- present an updated version of what are commonly called ‘informal fallacies’—errors of reasoning or conceptual illusions, including those discussed in recent work in psychology and behavioral economics.
- provide a sampler of topics from different philosophical areas including metaphysics, philosophy of language, epistemology, ethics and philosophy of religion.
- introduce concepts that figure in the study of formal logic, for example, the concept of logical possibility and related notions of necessity and contingency which figure in our account of validity.

As we shall see in this introductory chapter, some common beliefs are unwarranted. Most people believe—or half-believe or quasi-believe—a lot of false and even silly things. This is, for the most part, harmless: if you knock wood, avoid stepping on cracks or read your daily horoscope for fun, it’s not a big deal. But some false beliefs, including some popular ones, have mild to disastrous bad consequences. In this chapter, as a preliminary to the discussion of logic, we’ll consider some examples.

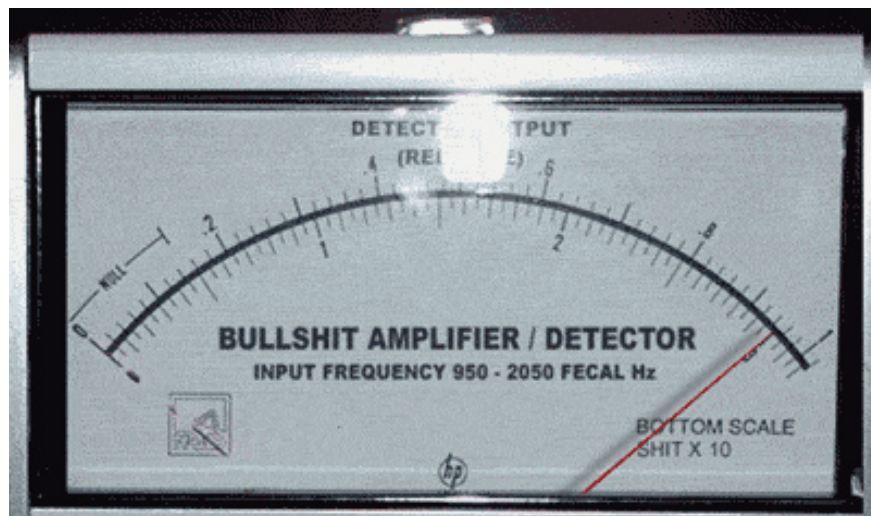
1 WHAT DO YOU BELIEVE?

About three in four Americans profess at least one paranormal belief, according to a 2005 Gallup survey.¹

¹ For the complete results see <http://www.gallup.com/poll/16915/three-four-americans-believe-paranormal.aspx>. A special analysis of the data shows that 73% of Americans believe in at least one of the 10 items listed below, while 27% believe in none of them. A Gallup survey in 2001 provided similar results -- 76% professed belief in at least one of the 10 items. Over the years, USD students’ views, at least judging from the sample of logic students to whom this survey was administered, have been similar to those of the general population surveyed in this Gallup Poll.

2005 Jun 6-8 (sorted by "believe in")	Believe in %	Not sure about %	Don't believe
Psychic or spiritual healing or the power of the human mind to heal the body	55	17	26
That people on this earth are sometimes possessed by the devil	42	13	44
ESP or Extrasensory Perception	41	25	32
That houses can be haunted	37	16	46
Ghosts/that spirits of dead people can come back in certain places/situations	32	19	48
Telepathy/communication between minds without using traditional senses	31	27	42
Clairvoyance/the power of the mind to know the past and predict the future	26	24	50
Astrology, or that the position of the stars and planets can affect people's lives	25	19	55
That extra-terrestrial beings have visited earth at some time in the past	24	24	51
That people can communicate mentally with someone who has died	21	23	55
Witches	21	12	66
Reincarnation, that is, the rebirth of the soul in a new body after death	20	20	59
Channeling/allowing a 'spirit-being' to temporarily assume control of body	9	20	70

Should you believe this stuff? What should you believe—and why?
Get out your b.s. detectors. And *let's roll...*



'The roots of pseudoscience grow strong near the septic tank of misinformation.'

2 ALTERNATIVE MEDICINE: CHIROPRACTIC



Chiropractic School Angers FSU Professors²

A growing number of professors in the Florida State University College of Medicine are saying they will resign if FSU administrators continue to pursue a proposed chiropractic school...

The threatened resignations...reflect a belief among many in the medical establishment that chiropractic is a 'pseudo-science' that leads to unnecessary and sometimes harmful treatments. Professors are even circulating a parody map of campus that places a fictional Bigfoot Institute, School of Astrology and Crop Circle Simulation Laboratory near a future chiropractic school...

In recent weeks, more than 500 faculty members have signed petitions against the chiropractic school, including about 70 in the medical college, said Dr. Raymond Bellamy, an assistant professor who is leading the charge against the proposal. The medical college has more than 100 faculty members. Some of them say they're willing to do more than sign a petition.

'I teach wonderful medical students from Florida State University here in Orlando', Dr. James W. Louttit wrote in an e-mail to Bellamy, who shared it with the St. Petersburg Times. 'If they decide to start a chiropractic school I would no longer be able to support this program'.

'It should come as no surprise that no major medical institution in this country, public or private, has embraced chiropractic medicine', wrote Dr. Henry Ho, a Winter Park physician and FSU assistant professor, in another e-mail. 'If Florida State University were to do so, its fledgling attempt for credibility as a medical institution of stature would be severely jeopardized'.

² http://www.sptimes.com/2004/12/29/State/Chiropractic_school_a.shtml

Why Chiropractic Is Controversial³

William T. Jarvis, Ph.D.

Chiropractic is a controversial health-care system that has been legalized throughout the United States and in several other countries...Although it has existed for nearly 100 years, the chiropractic health-care system has failed to meet the most fundamental standards applied to medical practices: to clearly define itself and to establish a science-based scope of practice....

Spinal Manipulative Therapy (SMT)

An estimated 80% of adults will experience a severe bout with back pain and dysfunction at some time in their life. There is substantial evidence that spinal manipulative therapy (SMT) has value in relieving back pain and improving the range of impaired spinal motion at least temporarily. Although SMT is probably no more effective than other modalities in the long term, it appears to offer faster relief in about one third of patients. Further, because SMT involves the laying on of hands, a technique widely employed throughout history by folk and faith healers, it enhances suggestibility and the placebo effect...

Chiropractic is commonly thought to be synonymous with SMT. In reality, SMT's history goes back at least to Hippocrates (400 B.C.), while chiropractic's roots go back less than 100 years...Today SMT is employed by medical specialists (physiatrists, orthopedists, sports medicine practitioners), osteopathic physicians, physical therapists, and athletic trainers, as well as by chiropractors...

Chiropractic's Unique Theory

Chiropractic's uniqueness lies not in its use of SMT, but in its theoretical reason for doing so...The word chiropractic literally means 'done by hand'. The term was adopted by chiropractic's founder, Daniel David Palmer. Palmer was a layman with an intense interest in metaphysical health philosophies such as magnetic healing (Mesmer's 'animal magnetism'), phrenology, and spiritualism. In 1895, he claimed to have restored the hearing of a nearly deaf janitor by manipulating the man's spine.

Obsessed with uncovering 'the primary cause of disease', Palmer theorized that '95 percent of all disease' was caused by spinal 'subluxations' (partial dislocations) and the rest by 'luxated bones elsewhere in the body.' Palmer speculated that subluxations impinged upon spinal nerves, impeding their function, and that this led to disease. He taught that medical diagnosis was

³ <http://www.chirobase.org/01General/controversy.html> This article was originally published as 'Chiropractic: Controversial Health Care' in the May 1990 issue of Ministry magazine (pp 25-28) This article was revised on February 9, 2000.

unnecessary, that one need only correct the subluxations to liberate the body's own natural healing forces. He disdained physicians for treating only symptoms, alleging that, in contrast, his system corrected the cause of disease.

Palmer did not employ the term subluxation in its medical sense, but with a metaphysical, pantheistic meaning. He believed that the subluxations interfered with the body's expression, of the 'Universal Intelligence' (God), which Palmer dubbed the 'Innate Intelligence.' (soul, spirit, or spark of life). Palmer's notion of having discovered a way to manipulate metaphysical life force is sometimes referred to as his 'biotheology'.

Scientific Shortcomings

...Palmer can be forgiven for his nineteenth-century misconceptions, but his followers cannot be excused for failing to avail themselves of the scientific advances of the twentieth century to test chiropractic theory and practice...

In the mid-1960s, an official delegation of chiropractic representatives, including a radiologist of their own choosing, failed to identify a single subluxation on a series of 20 x-ray films that had been submitted for insurance reimbursement to the National Association of Letter Carriers...

Chiropractors not only find subluxations as elusive as the mythical unicorn, but they also disagree wildly about how to go about treating them...Anyone visiting a number of chiropractors will be confronted with a bewildering variety of pseudoscientific diagnostic procedures. In 1981 Mark Brown, a reporter for the *Quad City Times*, spent five months visiting chiropractors in the Davenport, Iowa, area (the birthplace of chiropractic). Diagnostic methods included placing a potato on his chest and pressing down on his arm (applied kinesiology) projecting lines on his back to read body contours (Moire contour analysis), reading the iris and comparing markings with a chart (iridology), measuring leg lengths for unevenness (one chiropractor said Brown's right leg was shorter, another said his left leg was shorter), measuring skin surface temperature differences, and palpation. Other dubious... methods used by some chiropractors include pendulum divining, electroacupuncture, reflexology, hair analysis, herbal crystallization analysis, computerized 'nutritional deficiency' questionnaires, a cytotoxic food allergy test, and the Reams urine and saliva test...Magnetic therapy (placing magnets on the body), homeopathy, herbology, colonics, colored-light therapy, megavitamin therapy, radionics (black box devices), bilateral nasal specifics (inserting a balloon in the nose and inflating it), and cranial manipulation...

One thing chiropractors excel at is satisfying their patients. Patients rank them above medical doctors in the concern exhibited about their problems, understanding their concerns, amount of time spent listening to a description of their pain, information provided about the cause of their pain, making them feel welcome, and other factors related to the art of fulfilling human needs.



Although it is important for physicians to differentiate between mere patient satisfaction and true clinical effectiveness, it seems that they could learn something from chiropractors about meeting the emotional needs of suffering patients.

3 MORE ALTERNATIVE MEDICINE: AGAINST VACCINATION⁴

Even though chiropractic theory is balderdash, chiropractors are skilled at SMT, which relieves back pain, have good bedside manner and are relatively cheap. Many other forms of 'alternative medicine' are useless, expensive and, occasionally, dangerous. The widespread distrust of orthodox medicine can be hazardous to your health—and the health of others.

Evidence surrounding vaccination shows that prevented suffering and death from infectious diseases outweigh any adverse effects. Despite this, vaccine controversies have raged since vaccine and vaccination were introduced, and continue to this day. Opponents question the effectiveness, safety, and necessity of recommended vaccines. They also argue that mandatory vaccination violates individual rights to medical decisions and religious principles. These arguments have reduced vaccination rates in certain communities, resulting in outbreaks and deaths from preventable childhood diseases.

Immunization programs depend on public confidence to be effective. Safety concerns often follow a pattern: a potential adverse affect is hypothesized; a premature announcement is made; the initial study is not reproduced; and finally, it takes several years to regain public confidence in

⁴ https://en.wikipedia.org/wiki/Vaccine_controversies_-_Autism_controversies

the vaccine. A recent and notable example involved Andrew Wakefield's discredited claims of MMR vaccines causing autism.

Public reaction has contributed to a significant increase in preventable diseases, notably measles. In 2011 the vaccine-autism connection was described as 'the most damaging medical hoax of the last 100 years'...

The MMR Vaccine Controversy: A Doctor Follows the Money

In the UK, the MMR vaccine was the subject of controversy after the publication in *The Lancet* of a 1998 paper by Andrew Wakefield and others reporting case histories of 12 children mostly with autism spectrum disorders with onset soon after administration of the vaccine. At a 1998 press conference, Wakefield suggested that giving children the vaccines in three separate doses would be safer than a single vaccination. This suggestion was not supported by the paper, and several subsequent peer-reviewed studies have failed to show any association between the vaccine and autism. It later emerged that Wakefield had received funding from litigants against vaccine manufacturers and that he had not informed colleagues or medical authorities of his conflict of interest; had this been known, publication in *The Lancet* would not have taken place in the way that it did. Wakefield has been heavily criticized on scientific grounds and for triggering a decline in vaccination rates (vaccination rates in the UK dropped to 80% in the years following the study), as well as on ethical grounds for the way the research was conducted. In 2004, the MMR-and-autism interpretation of the paper was formally retracted by 10 of Wakefield's 12 coauthors, and in 2010 *The Lancet*'s editors fully retracted the paper. Wakefield was struck off the UK medical register, with a statement identifying deliberate falsification in the research published in *The Lancet*, and is barred from practicing medicine in the UK.

The CDC, the IOM of the National Academy of Sciences, and the UK National Health Service have all concluded that there is no evidence of a link between the MMR vaccine and autism. A systematic review by the Cochrane Library concluded that there is no credible link between the MMR vaccine and autism, that MMR has prevented diseases that still carry a heavy burden of death and complications, that the lack of confidence in MMR has damaged public health, and that the design and reporting of safety outcomes in MMR vaccine studies are largely inadequate.

In 2009, *The Sunday Times* reported that Wakefield had manipulated patient data and misreported results in his 1998 paper, creating the appearance of a link with autism. A 2011 article in the *British Medical Journal* described how the data in the study had been falsified by Wakefield so that it would arrive at a predetermined conclusion. An accompanying editorial in the same journal described Wakefield's work as an 'elaborate fraud' that led to lower vaccination rates, putting hundreds of thousands of children at risk and diverting energy and money away from research into the true cause of autism.

A special court convened in the United States to review claims under the National Vaccine Injury Compensation Program ruled on 12 February 2009 that parents of autistic children are not entitled to compensation in their contention that certain vaccines caused autism in their

children.

Alternative Medicine and the Anti-Vaccination Movement

Historically, chiropractic strongly opposed vaccination based on its belief that all diseases were traceable to causes in the spine and therefore could not be affected by vaccines. Daniel D. Palmer, the founder of chiropractic, wrote, 'It is the very height of absurdity to strive to 'protect' any person from smallpox or any other malady by inoculating them with a filthy animal poison.' Vaccination remains controversial within the profession. Although most chiropractic writings on vaccination focus on its negative aspects, The American Chiropractic Association and the International Chiropractic Association support individual exemptions to compulsory vaccination laws; a 1995 survey of US chiropractors found that about one third believed there was no scientific proof that immunization prevents disease. While the Canadian Chiropractic Association supports vaccination, a survey in Alberta in 2002 found that 25% of chiropractors advised patients for, and 27% advised against, vaccinations for patients or their children....

In March 2015, the Oregon Chiropractic Association invited Andrew Wakefield, chief author of a fraudulent research paper, to testify against Senate Bill 442, 'a bill that would eliminate nonmedical exemptions from Oregon's school immunization law.' The California

Chiropractic Association lobbied against a 2015 bill ending belief exemptions for vaccines. They had also opposed a 2012 bill related to vaccination exemptions.

Several surveys have shown that some practitioners of homeopathy, particularly homeopaths without any medical training, advise patients against vaccination. For example, a survey of registered homeopaths in Austria found that only 28% considered immunization an important preventive measure, and 83% of homeopaths surveyed in Sydney, Australia, did not recommend vaccination. Many practitioners of naturopathy also oppose vaccination.

Homeopathic 'vaccines' (nosodes) are ineffective because they do not contain any active ingredients and thus do not stimulate the immune system. They can be dangerous if they take the place of effective treatments.

Qui bono?

Alternative medicine proponents gain from promoting vaccine conspiracy theories through the sale of ineffective and expensive medications, supplements, and procedures such as chelation therapy and hyperbaric oxygen therapy, sold as able to cure the 'damage' caused by vaccines. Homeopaths in particular gain through the promotion of water injections or 'nosodes' which are alleged to have a 'natural' vaccine-like effect. Additional bodies with a vested interest in promoting the unsafeness of vaccines may include lawyers and legal groups organizing court cases and class action lawsuits against vaccine providers. Conversely, alternative medicine providers have accused the vaccine industry of misrepresenting the safety and effectiveness of vaccines, covering up and suppressing information, and influencing health policy decisions for

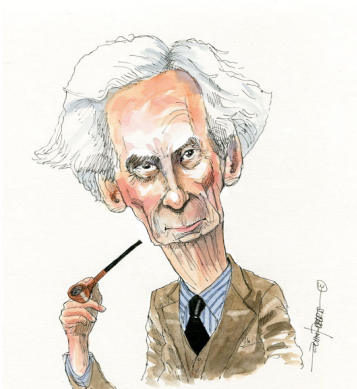
financial gain.

In the late 20th century, vaccines were a product with low profit margins, and the number of companies involved in vaccine manufacture declined. In addition to low profits and liability risks, manufacturers complained about low prices paid for vaccines by the CDC and other US government agencies.

4 HOW SKEPTICAL SHOULD WE BE?

On the Value of Scepticism⁵

Bertrand Russell (from *The Will to Doubt*)



A story is told of Pyrrho, the founder of Pyrrhonism (which was the old name for scepticism). He maintained that we never know enough to be sure that one course of action is wiser than another. In his youth, when he was taking his constitutional one afternoon, he saw his teacher in philosophy (from whom he had imbibed his principles) with his head stuck in a ditch, unable to get out. After contemplating him for some time, he walked on, maintaining that there was no sufficient ground for thinking he would do any good by pulling the man out. Others, less sceptical, effected a rescue, and blamed Pyrrho for his heartlessness. But

his teacher, true to his principles, praised him for his consistency. Now I do not advocate such heroic scepticism as that. I am prepared to admit the ordinary beliefs of common sense, in practice if not in theory. I am prepared to admit any well-established result of science, not as certainly true, but as sufficiently probable to afford a basis for rational action. If it is announced that there is to be an eclipse of the moon on such-and-such a date, I think it worth while to look and see whether it is taking place. Pyrrho would have thought otherwise. On this ground, I feel justified in claiming that I advocate a middle position.

There are matters about which those who have investigated them are agreed; the dates of eclipses may serve as an illustration. There are other matters about which experts are not agreed. Even when the experts all agree, they may well be mistaken. Einstein's view as to the magnitude of the deflection of light by gravitation would have been rejected by all experts not many years ago, yet it proved to be right. Nevertheless the opinion of experts, when it is unanimous, must be accepted by non-experts as more likely to be right than the opposite opinion. The scepticism that I advocate amounts only to this: (1) that when the experts are agreed, the opposite opinion cannot be held to be certain; (2) that when they are not agreed, no opinion can be regarded as certain by a non-expert; and (3) that when they all hold that no sufficient grounds for a positive opinion exist, the ordinary man would do well to suspend his judgment. These propositions may seem mild, yet, if accepted, they would absolutely revolutionize human life.

⁵ <http://www.positiveatheism.org/hist/russell4.htm>

5 GENDER MYTHS

Back down to Earth⁶

Deborah Cameron



No group of men and women in history has ever been less different, or less at the mercy of their biology, than those living in western societies today. And yet 21st-century westerners are drawn to a mythology that says that differences between men and women are profound and unalterable. So what is it that attracts us to the concept of Mars versus Venus?

The idea that men and women metaphorically 'speak different languages' - that they use language in different ways and for different reasons - is one of the great myths of our time. Research debunks the various smaller myths that contribute to it: for instance, that women talk more than men (research suggests the opposite); that women's talk is cooperative and men's competitive (research shows that both sexes engage in both kinds of talk); that men and women systematically misunderstand one another (research has produced no good evidence that they do).

There is a great deal of similarity between men and women, and the differences within each gender group are typically as great as or greater than the difference between the two...If these points were acknowledged, the science sound bites would be headed 'Men and women

⁶ Deborah Cameron, 'Back Down to Earth,' *The Guardian*, Wednesday 3 October 2007. For recent research on the brains of men and women see the results of a 2015 study here: <http://www.sciencemag.org/news/2015/11/brains-men-and-women-aren-t-really-different-study-finds>

pretty similar, research finds', and popular psychology books would bear titles like There's No Great Mystery About the Opposite Sex or We Understand Each Other Well Enough Most of the Time. Of course, these titles do not have the makings of bestsellers, whereas the 'men and women are from different planets' story is a tried and tested formula.

...For the past 15 years, the myth of Mars and Venus has told us what is normal for men and women in the sphere of language and communication. Its generalizations about male and female language use have come to influence our expectations and our judgments...[T]his is not just harmless fun. We see its less benign consequences when employers view women as better candidates than men for jobs that demand the ability to chat (and men as better candidates than women for jobs that demand verbal authority and directness). We see them when parents and educators expect girls to be better at languages, and boys to be better at maths...

The importance of being different

Sex differences fascinate us to a degree that most biological differences don't...[T]o my knowledge, there has never been a bestselling popular science book about the differences between right- and left-handed people.

Handedness makes an instructive comparison with sex, because it too is associated with differences in the organization of the brain. In December 2006, for instance, an article in the journal Neuropsychology reported that left-handed people were quicker and more efficient than right-handers at tasks such as computer gaming that required the simultaneous processing of multiple stimuli. If that had been a sex-difference finding, it would surely have got the same attention as the 'men have trouble listening to women' study, the 'men are better shoppers' study, and the 'women talk three times as much as men' claim. But it wasn't, and it didn't.

If handedness generates fewer sound bites than sex, it is probably because findings about it cannot be slotted into any larger narrative about the difference between right-handed and left-handed people...Handedness, in short, is not significant for the organization of human social affairs: it does not determine a person's identity, role, or status in society. An account of how left-handers differ from right-handers would therefore lack one of the crucial ingredients that draw us to accounts of how women differ from men: it would not serve the purpose of justifying institutionalized social inequality by explaining it as the inevitable consequence of natural differences...

Change and the problem of couple communication

The target audience for Mars and Venus material is prototypically a middle-class one, and the main theme is the difficulty middle-class men and women have communicating with one another...But that raises the question of why male-female (mis)communication does not seem to be such a problem in other societies and communities. More puzzling still, if its cause is indeed social segregation, the communities in which it is seen as a major issue appear to be those where there is least segregation.

In her classic 1962 study *Blue Collar Marriage*, the sociologist Mira Komarovsky reported that the working-class American women she interviewed did not generally expect to have extended conversations with their husbands. In their community, sex segregation was extensive: for everyday companionship and emotional support, they relied on female friends and kin...This attitude is typical of traditional societies and traditional working-class communities...

Today, far fewer westerners live in communities like the one described in *Blue Collar Marriage*. Economic and social changes - greater mobility, smaller families, increasing rates of divorce - have weakened the bonds that held traditional families and communities together...In these conditions people expect more from communication with their spouse or partner. When it falls short of their high expectations, the stage is set for communication between men and women to be perceived as a serious social problem. There are other reasons for that perception. The more similar men and women become, the more they are in direct competition for jobs, status, money, leisure time and personal freedom...

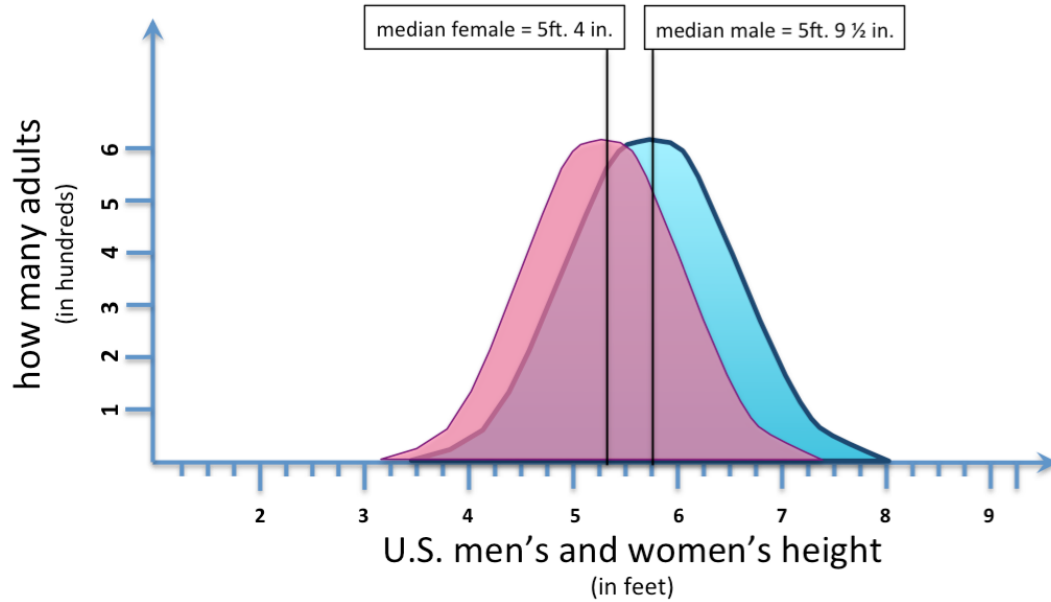
[M]iddle-class women's aspirations and attitudes [are] becoming more like men's, focused on individual achievement and individual freedom...This change has not been compensated for by any reciprocal shift in men's attitudes... Women are still doing most of the caring, but - unsurprisingly, given how much else they now do - they are more inclined to question why it should fall to them alone. That is another source of conflict in contemporary male-female relationships...The genius of the myth of Mars and Venus is to acknowledge the problems many people are now experiencing as a result of social change, while explaining those problems and conflicts in a way that implies they have nothing to do with social change. The solution, it follows, is to do nothing: we should accept what cannot be altered, and suppress any urge to apportion blame. In practice this tends to result in women being made responsible for ensuring that communication flows smoothly. Once again, 'personal stuff' is assumed to be women's business rather than the business of both sexes.

But this isn't just personal stuff: these problems are symptomatic of deeper social dislocations...If we want real understanding to take the place of mythology, we need to reject trite formulas and sweeping claims about male and female language use. The evidence is more in line with what it says on a postcard someone once sent me: 'Men are from Earth. Women are from Earth. Deal with it.'

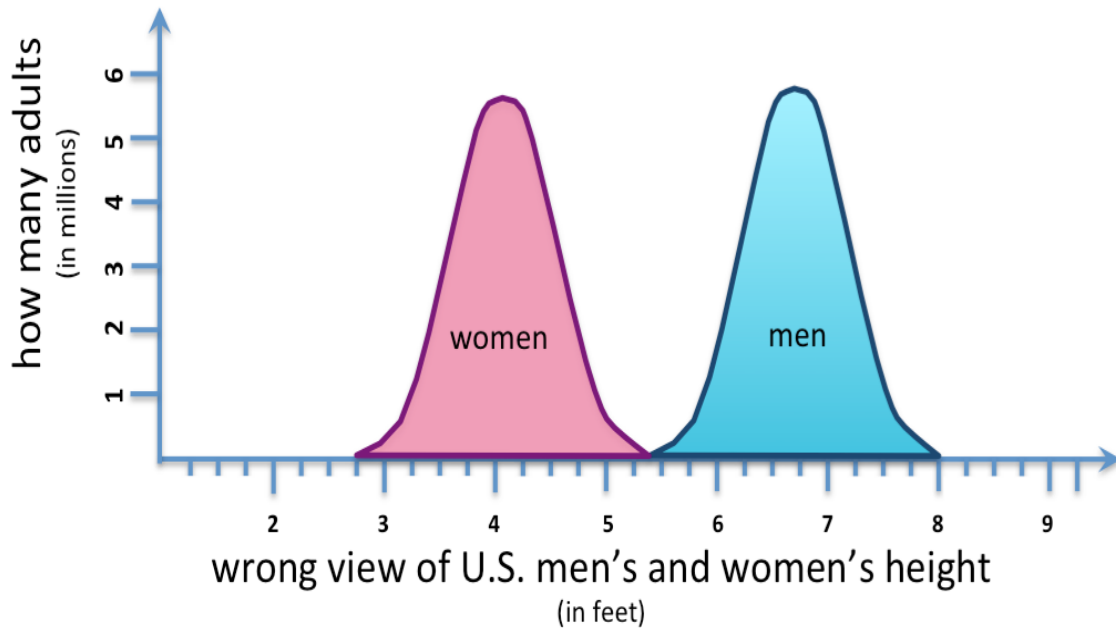
6 STATISTICAL AND INDIVIDUAL DIFFERENCES

Are men and women different? Yes and no—it depends on what you mean by different. There are *statistical differences* between men and women in, for example, height: the average height of men and women, and distributions, are different—but there is substantial overlap.

The height difference between men and women is statistical—not individual...



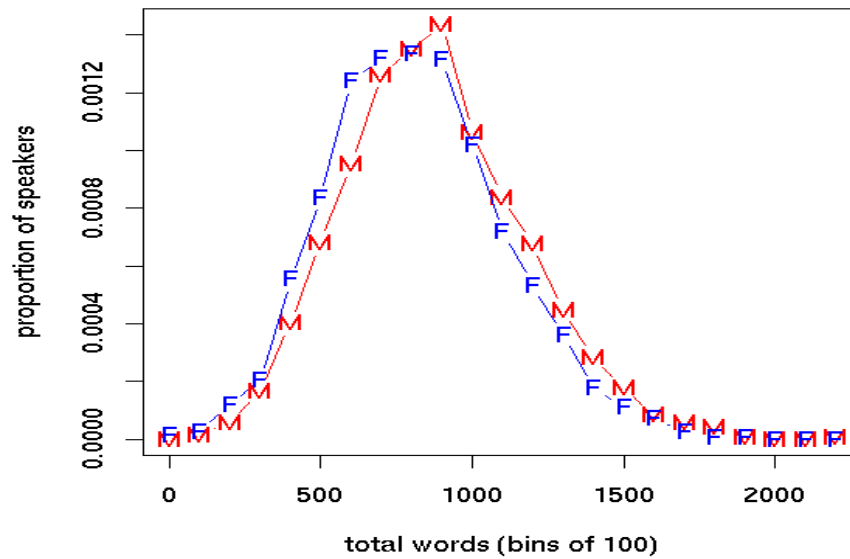
... it is *not* the case that every man is taller than any women!



There are also statistical differences between men and women when it comes to a range of psychological characteristics and behaviors, but they are smaller than the difference in height—that is, there is more overlap. Not every man talks more than every women, but statistically, men talk more than women:

Whether comparing men and women or groups of any kind, make sure to distinguish between statistical differences and individual differences!

Female vs. Male Word Counts, Fisher 2003
(mixed-sex conversations only)



7 THE FIRST INSTINCT FALLACY



Don't worry about 'overthinking'!⁷

Research shows that first instincts can stink, but we trust them anyway. Why?

⁷ Karen Kersting *Monitor Staff* April 2005, Vol 36, No. 4 <http://www.apa.org/monitor/apr05/instincts.aspx>

Refuting the old saw that your first guess is always best, 33 studies over 70 years suggest sticking with your first instinct is *not* always a smart tack. But because getting an answer wrong after going against our first instinct is so frustrating, we tend to believe that changing answers is generally a foolish practice that will result in more wrong answers, according to recent studies by a research team at the University of Illinois at Urbana-Champaign, Northern Arizona University and Stanford University.

In an article in May's *Journal of Personality and Social Psychology* (Vol. 88, No. 5), the team presents its finding that people buy into the first-instinct myth because it *feels* worse to change a correct answer to an incorrect one than to stick with an original incorrect answer. And that feeling makes changing right answers to wrong more memorable than a wrong-to-right change and therefore seemingly more probable.

‘Our first thought was that this is just an old wives' tale that got propagated,’ says University of Illinois psychologist and study co-author Justin Kruger, PhD. ‘But that doesn't explain just how ubiquitous it is. With our research, it became clear that there is a fundamental asymmetry to how people react to getting a problem wrong when they've changed their answer, as opposed to failing to switch from a wrong answer to the right answer.’

Take the example of switching into a grocery store line that appears to move faster, says Kruger: Most people have the intuition that as soon as they switch, their new line slows down and their old one speeds up. ‘Are the gods punishing us for our impulsiveness?’ Kruger asks. ‘Probably not.’ A better explanation might be that moving over to an even slower line is more frustrating and memorable than just staying put in a dud line, says Kruger, who theorized that it's much the same for test-taking.

To establish the first-instinct fallacy, the researchers examined the introductory psychology midterm exams of 1,561 University of Illinois students for eraser marks. They counted the number of times students changed answers and found that 51 percent of the changes were from wrong to right, 25 percent were from right to wrong and 23 percent were from wrong to wrong. Changes from wrong to right outnumbered changes from right to wrong 2-to-1, Kruger points out.

When the researchers surveyed 51 of those students for their intuitions on answer-changing, 75 percent expected changes from right to wrong to outnumber changes from wrong to right--a sentiment proven false by the eraser marks on the students' tests, Kruger says.

In further tests, students indicated that switching a correct answer to an incorrect answer is more regrettable, frustrating and memorable than failing to switch from an incorrect answer.

‘Getting the answer wrong on your first instinct is just nowhere near as bad as seeing that you had the answer right and changed it to wrong,’ he says. ‘That's just incredibly frustrating.’

To test the power of such potential regret and frustration to influence people's test-taking

behavior, the researchers mimicked the game show 'Who Wants to Be a Millionaire?' 'The game was perfect for this research because, with the life lines, Regis manages to create precisely the dilemma that we're arguing test-takers face all the time: Do I take the life-line's advice or should I stick with my first instinct?' Kruger says. 'If you watch the show, you know that it creates a lot of tension and sets up exactly the hedonic asymmetry we wanted to test.'

Through a team version of the game, participants again showed that they were more frustrated with wrong answers when a teammate switched from a first instinct than when they stuck. They also remembered their teammate having better luck when they stuck with their first instincts than when they changed--even though the two conditions produced even results. And finally, students were more critical of their teammate's test-taking strategy when they changed their answers than when they stuck with a first instinct, demonstrating that the frustration with and memory of correct answers being changed to wrong answers causes people to *think* answer-changing is bad, Kruger says. 'It's not that first instincts are generally bad or wrong,' he says, 'just that people are too conservative in changing answers.'

The fallacy could apply to many situations, and Kruger hopes to test some of them, such as choosing between cars, career paths and potential dates or marriage partners. 'In these situations, people may also be willing to place greater trust in their first instinct than they should,' he adds. 'The results of that sort of trust could prove quite illuminating too.'

