Psychological Misconceptions: Recent Scientific Advances and Unresolved Issues

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Abstract
Psychological misconceptions present problems for psychology students as well as for laypersons, experts, and others who need to think critically about psychological information. Recent progress in measuring psychological misconceptions has led to fresh understandings of how people with better critical thinking skills and dispositions are less prone to misconceptions and how people who adopt a more intuitive approach to thinking are more prone to them, as predicted by dual process models of cognition. Recent studies also suggest that people who endorse more misconceptions show more impaired metacognition by failing to accurately monitor what they know. These new findings help to explain why refutational approaches, which explicitly activate misconceptions and debunk them with contrary evidence, often reduce misconception endorsement. Nevertheless, they may not readily explain why some efforts to eliminate misconceptions backfire or are otherwise ineffective, highlighting the need for more research on misconception content and individual differences in cognition, personality, and attitudes that predict misconception endorsement.

Growing evidence suggests that psychological misconceptions hold important implications for people's understanding of psychological phenomena. These erroneous beliefs may also impede the learning of information in psychology. Moreover, misconceptions can pose serious challenges for laypersons, policy makers, journalists, attorneys, and others, all of whom need to think critically about psychological information in everyday life. Psychological misconceptions can even contribute to serious real-world consequences. For example, jurors who believe that memory works like a video recorder, capturing events with perfect accuracy, may be insufficiently skeptical of confidently expressed but questionable eyewitness testimony. Two studies show that approximately 50% of U.S. laypersons endorse this misconception (Simons & Chabris, 2011, 2012). Many other psychological misconceptions are surprisingly widespread (Hughes, Lyddy, & Lambe, 2013; Lilienfeld, Lynn, Ruscio, & Beyerstein, 2010). Owens and McGowan (2006) found that nearly 81% of mental health professionals believed that full moons are associated with abnormal behavior. In other studies, 72% of laypersons believed that people only use 10% of their brains, and remarkably, 6% of neuroscientists shared this belief (Herculano-Houzel, 2002)! Many laypersons also appear to believe that brain-training exercises increase the intelligence of ordinary individuals despite evidence to the contrary (Redick et al., 2013).

Several psychological misconceptions are particularly relevant to education. For example, in one study (Dekker, Lee, Howard-Jones, & Jolles, 2012), 93% of teachers in the United Kingdom and 96% of teachers in the Netherlands subscribed to the belief that teachers should match their teaching styles to their students' learning styles despite compelling scientific evidence to the contrary (Lilienfeld et al., 2010). In several surveys, majorities of students have expressed belief in the "first instinct fallacy," the empirically refuted assumption that one should virtually never change one's initial response on a multiple choice exam (Kruger, Wirtz, & Miller, 2005). Even many university professors believe

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this misconception, with 55% of them endorsing it in one study (Benjamin, Cavell, & Shallenberger, 1984).

In this article, we examine these and other prevalent psychological misconceptions that are consequential to everyday and professional behavior. We first discuss how to define misconceptions and the newly emerging scientific literature on how to study them, which is helping to identify their correlates and causes. We place particular emphasis on the relations between psychological misconceptions and thinking. Because of the challenges that psychological misconceptions pose for education and practice, we then discuss promising methods for dispelling misconceptions, their potential risks, and unresolved scientific questions in misconceptions research.

What Are Psychological Misconceptions?

According to diSessa (2006, p. 269), misconceptions are "false, persistent beliefs" contradicted by established scientific evidence. Most often, they are found among people who lack accurate knowledge in the scientific fields relevant to those beliefs (Taylor & Kowalski, 2014), although as we have seen they are occasionally held even by specialists in these fields. Psychological misconceptions, in turn, are claims about behavior and mental processes that are unsupported or contradicted by high-quality psychological research, that is, they are assertions inconsistent with well-established scientific research. This approach defines misconceptions in terms of what they lack, namely, empirical support. Conversely, defining psychological misconceptions in terms of properties they possess, they are "commonsense," mistaken beliefs that typically arise from everyday sources of information (and misinformation), such as television, the Internet, social media, and informal conversation. As Hughes, Lyddy, and Lambe (2013) and Lilienfeld et al. (2010) observed, psychological misconceptions vary greatly in their frequency of endorsement in the general population.

Identifying the frequencies of psychological misconceptions depends on possessing reliable and valid measures of misconceptions, but until recently misconceptions tests have been marked by many psychometric shortcomings. For example, some misconception tests contain items phrased in ambiguous language, which can lead to errors in estimating the frequencies of false beliefs (Hughes, Lyddy, & Kaplan 2013). In addition, many psychological misconceptions tests contain too few items to adequately sample the domain of psychology and have included items that research has not clearly identified as misconceptions. Another problem is that many tests use a true/false format in which the

correct answer is always true, leaving them vulnerable to guessing and acquiescence ("yea-saying") response bias.

Recently, researchers have developed improved tests, such as those that contain more items that are better established as misconceptions and that avoid the problems of a true/false format (e.g., Bensley, Lilienfeld, & Powell, 2014; Gardner & Brown, 2013; Taylor & Kowalski, 2012). In particular, Bensley & Lilienfeld (2016) constructed the Test of Psychological Knowledge and Misconceptions (TOPKAM), which minimizes response bias by using a forced-choice response format. In this measure, a statement describing a misconception is pitted against an option that describes the scientifically supported alternative (Bensley, in press).

One way of defining misconceptions is to operationalize them as assertions inconsistent with psychological research that are endorsed by at least 50% of respondents (Brown, 1983; Taylor & Kowalski, 2012; Vaughan, 1977). This definition, although perhaps defensible, is problematic on at least three counts. First, misconceptions held by less than 50% of the laypersons can nonetheless engender powerful social consequences. For example, in a recent Gallup Poll, 6% of parents stated that vaccines cause autism and 52% stated that they were unsure (Newport, 2015). Belief in a causal link between vaccinations and autism, which is roundly contradicted by scientific evidence, has probably contributed to thousands of parents forgoing vaccinations for their children, putting their own and other peoples' children at risk for serious diseases. Second, the 50% definition hinges on having a test that accurately identifies the 50% or more of respondents endorsing a misconception item. Third, it assumes that respondents are not simply guessing on two-choice response items for which the expected frequency is 50%.

To deal with the latter two problems, Bensley and Lilienfeld (2015) calculated the frequencies of endorsement for the 40 forced-choice misconception items of the TOPKAM and tested whether the frequencies differed significantly from the 50% expected by chance. They found several items across two samples that psychology majors answered incorrectly at significantly higher frequencies than 50%. Several other items were answered incorrectly by significantly less than half of the students. Taylor and Kowalski (2012) obtained similar frequencies with forced-choice items similar to the TOPKAM items. These findings suggest that misconception research should take into account the frequencies with which misconceptions are endorsed.

Psychological misconceptions surely arise from many sources, including exposure to the news and entertainment media, misinformation on the Internet and social

media, and informal conversations (Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012). Although examination of these sources is useful, the following discussion focuses on one key psychological wellspring of misconceptions, namely, the failure to think critically about psychological information and the recent findings from the new improved tests.

Psychological Misconceptions as a Failure to Think Critically

Critical thinking (CT) involves possessing the appropriate skills, such as reasoning and argumentation abilities, possessing the appropriate attitudinal dispositions, such as open-mindedness and a skeptical attitude, and engaging in metacognition by accurately monitoring and regulating the quality of one's thinking (Bensley & Murtagh, 2012; Halpern, 1998). From this perspective, failing to revise mistaken ideas may be due to a lack of CT skill, not being disposed to skeptically examine knowledge claims, or failing to accurately monitor what one does and does not know about psychology. Three studies have shown that CT skill significantly predicts the rejection of psychological misconceptions (Bensley, Lilienfeld, & Powell, 2014; McCutcheon, Apperson, Hanson, & Wynn, 1992; Taylor & Kowalski, 2004). Only recently has research also addressed CT dispositions and metacognitive monitoring.

Addressing this deficiency, Bensley, Lilienfeld, and Powell (2014) examined the potential contribution of CT skills and CT dispositions to scores on the TOPKAM. To test CT skills, they administered Analyzing Psychological Statements, an argument analysis test (Bensley, in press). To test CT dispositions, they administered the Inventory of Thinking Dispositions in Psychology, which measures commitment to open-minded and rational-scientific thinking (Bensley, in press), and the Faith in Intuition scale (Pacini & Epstein, 1999), which measures endorsement of an intuitive-experiential approach to thinking. They found that higher scores on both measures significantly predicted the number of psychological misconceptions. Specifically, higher scores on the CT argumentation skills test and on the CT disposition measure of open-minded, commitment to a rational scientific approach to psychology predicted fewer psychological misconceptions. In contrast, higher scores on the Faith in Intuition scale significantly predicted endorsement of more misconceptions.

These findings are broadly consistent with dual process theories of cognition (Epstein, 2008; Evans & Stanovich, 2013; Kahneman, 2011), which posit that people engage in two modes of thinking: Type 1, a fast, intuitive mode that relies on experience and heuristics (mental shortcuts or rules of thumb), and Type 2, a slower, deliberate, more effortful mode that relies on a rational, analytic approach. In dual process theory terms, higher scores on a CT skills test and on CT dispositions measures, such as the Inventory of Thinking Dispositions in Psychology, largely reflect rational-analytic, Type 2 thinking. Lower scores on the CT skills test and higher Faith in Intuition scores reflect greater reliance on intuitive, Type 1 thinking. Recently, we have replicated these findings with a new sample, showing a negative correlation between Faith in Intuition scores and TOPKAM number correct and a positive correlation between TOPKAM correct and scores on a measure of skepticism, a CT disposition, ostensibly linked to Type 2 thinking (Bensley & Lilienfeld, 2016).

Evaluating claims requires not only reasoning skills and the disposition to use them but also the metacognitive ability to recognize when beliefs may be wrong and require revision. If rejecting misconceptions involves effortful, reflective thinking associated with Type 2 thinking, then students' ability to accurately monitor what they know about psychology should significantly predict their endorsement of misconceptions. Bensley and Lilienfeld (2015) found that students in the lowest quartile on TOPKAM number correct were the least accurate and showed the greatest overestimation of their number of correct answers on the TOPKAM. Their overconfidence and deficient metacognitive monitoring accuracy could also reflect a greater reliance on experience and intuition in assessing their knowledge (Thompson, Turner, & Pennycock, 2011). If so, then frequently endorsed misconceptions should seem more familiar and have been encountered more often (Ecker, Swire, & Lewandowsky, 2013), that is, display a greater reliance on the availability heuristic. Heuristics are often associated with Type 1 thinking, and the ability to overcome inappropriately applied heuristics has been associated with CT (West, Toplak, & Stanovich, 2008). Consistent with this possibility, Bensley and Lilienfeld (2016) found that students rated more frequently endorsed misconceptions as more familiar and as having been encountered more often, suggesting that they were relying on the availability heuristic.

Students' overconfidence in the correctness of the most frequently incorrect TOPKAM items may have prevented them from recognizing the need to correct their misconceptions. Alter, Oppenheimer, Epley, and Eyre (2007) found that Type 2 thinking and analytic reasoning are activated when people encounter difficulties. Students' overconfidence on misconception items that seemed more familiar probably failed to signal difficulty in answering those items and consequently failed to activate Type 2 thinking.

Students' continued reliance on incorrect information that is familiar and more readily accessed may, in part,

explain why traditional psychological instruction that does not sufficiently challenge their preconceptions and engage Type 2 thinking tends to be unsuccessful in reducing psychological misconceptions, as is found in many studies of students in classes receiving traditional instruction (Hughes, Lyddy, & Lambe, 2013). This conclusion, in turn, suggests the need for instructional techniques that more effectively activate Type 2 thinking to reduce misconceptions.

Reducing Psychological Misconceptions

Research on efforts to dispel psychological misconceptions suggests that refutational approaches, that is, educational practices that explicitly activate misconceptions and then debunk them with contrary evidence, can be effective in dispelling misconceptions in psychology (Kowalski & Taylor, 2009), as well as in other scientific domains, such as astronomy (Schneps et al., 2014). The discrepancy that people encounter during refutation is likely to engage Type 2 thinking, slowing down their thinking as they are induced to use rational analysis to reflect on their assumptions. Refutation shares features with explicit CT instruction, which has been successful in improving students' CT skills (Abrami et al., 2008; Bensley & Spero, 2014). Nevertheless, studies seldom incorporate long-term follow-ups, so the durability of these effects is unclear, which is a concern because studies suggest that misconceptions are resistant to refutation and resilient, sometimes returning after they have been briefly dispelled (Gregg, Winer, Cottrell, Hedman, & Fournier, 2001). In a recent study that did examine long-term effects of refutation, Kowalski and Taylor (in press) found that psychology students taught with refutation answered more knowledge questions correctly (had fewer misconceptions) than students receiving standard instruction both at the end of their course and three semesters later; however, the number answered correctly by the refutation group did decline significantly when tested three semesters later.

Moreover, at least some evidence raises the possibility that refutational efforts can sometimes result in backfire effects (Lewandowsky et al., 2012), paradoxically strengthening these misconceptions. This effect is likely to occur when misconceptions are repeated multiple times during refutation, leading people to confuse familiarity with veracity (the "familiarity backfire effect") and when people's prior beliefs and preferences lead them to strongly endorse misconceptions, producing the "worldview backfire effect" (Lewandowsky et al., 2012).

Conclusions

People who endorse more psychological misconceptions tend to possess weaker reasoning skills and are less disposed to think critically. In terms of dual process theory, people who endorse more misconceptions tend to rely more on Type 1 thinking. They are prone to adopt a more unreflective, intuitive approach to psychological questions and are frequently overconfident of their endorsement when those false beliefs are more psychologically available and familiar. Psychology courses taught in the standard fashion tend to be largely ineffective in reducing misconceptions. In contrast, refutational approaches that activate misconceptions and then explicitly refute them are more effective, at least in the short term. This may be because refutation encourages people to actively reflect on the veracity of misconceptions, forcing them to engage in Type 2 thinking while relying less on intuition and experience.

At the same time, refutational approaches come with certain risks and may even result in backfire effects, especially when people are invested in their false beliefs. These findings highlight the need for researchers to attend more to the content of psychological misconceptions and to how misconceptions are connected to existing knowledge. The knowledge accumulated in psychology is enormously diverse, and its theories often lack coherence, rendering the acquisition of knowledge that raises questions concerning unsupported beliefs particularly challenging. Fortunately, recent approaches to the study of psychological misconceptions are shedding new light on how people acquire accurate psychological knowledge and reject misconceptions.

Recommended Reading

Della Sala, S. (2007). *Tall tales about the mind & brain: Separating fact from fiction*. New York, NY: Oxford University Press. Provides literature reviews authored by experts in the field about many misconceptions in psychology and neuroscience.

Jarrett, C. (2014). *Great myths of the brain*. New York, NY: John Wiley.

Kohn, A. (1990). *You know what they say . . . The truth about popular beliefs*. New York, NY: HarperCollins. Describes many misconceptions and commonsense beliefs about the mind and everyday experience.

Lilienfeld, S. O., Lynn, S., Ruscio, J., & Beyerstein, B. L. (2010). (See References). Offers brief, readable literature reviews on 50 psychological misconceptions for which many psychologists consider the questions to be settled.

Taylor, A. K., & Kowalski, P. (2004). (See References). This review of research on psychological misconceptions discusses their origins and techniques for refuting misconceptions and issues related to teaching and learning about psychological misconceptions.

Declaration of Conflicting Interests

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