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A new measure of psychological misconceptions: Relations with academic background, critical thinking, and acceptance of paranormal and pseudoscientific claims

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ABSTRACT

Many studies of psychological misconceptions have used tests with methodological and psychometric shortcomings, creating problems for interpreting individual differences related to misconceptions. To address these problems, we developed the Test of Psychological Knowledge and Misconceptions (TOPKAM), administering it to two samples of psychology students. Results from the first study ($N = 162$) supported the TOPKAM's internal consistency and showed that the number correct on the TOPKAM was significantly predicted by measures of paranormal belief, faith in intuition, the ability to distinguish scientific fields and practices from pseudoscientific ones, and SAT scores. Also, scores on a measure of critical thinking dispositions in psychology predicted TOPKAM scores. A second study ($N = 178$) supported the TOPKAM's test–retest reliability at four weeks and showed that TOPKAM scores were significantly predicted by the same critical thinking dispositions measure and also by scores on a test of critical thinking, argument analysis skill.

1. Introduction

1.1. Overview of psychological misconceptions

The study of misconceptions has become an important and frequently researched topic, partly because of the hope that science education can contribute to the rejection of incorrect but popular ideas. Several studies have shown that misconceptions regarding scientific issues are prevalent (e.g., Crowe & Miura, 1995; Swami et al., 2012). Of particular interest are the many studies suggesting that students are highly susceptible to psychological misconceptions (e.g., Brown, 1983; Kowalski & Taylor, 2009; Lamal, 1979; McKeachie, 1960; Standing & Huber, 2003; Vaughan, 1977). For example, students often believe incorrectly that people with schizophrenia have split personalities and that opposites tend to attract in romantic relationships. Because misconceptions are often resistant to traditional instruction (Best, 1982; Gardner & Dalsing, 1986; McKeachie, 1960; Vaughan, 1977), they are potentially an important obstacle to effective science teaching. Yet, the actual frequency of misconceptions and our understanding of them are limited because most studies assessing misconceptions have used tests with methodological and psychometric shortcomings.

The purpose of the present investigation is to report on the development and initial validation of a new psychological misconceptions test designed to remedy some of these problems. As part of its development, we investigated its relationship to several measures expected to be related to individual differences in learning that might further inform us about the nature of psychological misconceptions.

Taylor and Kowalski (2004, p. 15) defined misconceptions as "beliefs that are held contrary to known evidence." In the case of psychological misconceptions, the relevant known evidence is high quality research that supports well-established data and theories about human behavior and mental processes. As such, psychological misconceptions are widely-held beliefs, contrary to the well-replicated findings of psychological science. For example, a recent book discusses many misconceptions based on commonsense psychology including but not limited to such paranormal claims as extrasensory perception, the claim that the mind leaves the body during an out-of-body experience, and other false beliefs commonly associated with pseudoscience (Lilienfeld, Lynn, Ruscio, & Beyerstein, 2010).

Failure to reject these incorrect ideas may be due to a lack of (a) knowledge, (b) skills, or both needed to think scientifically about such questions. An alternative hypothesis is that individuals possess thinking styles and other enduring dispositions that dispose them to endorse poorly-supported claims. They may lack the interest or willingness

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to engage in the effortful processing and open-minded thinking needed to revise their incorrect beliefs. Or, they may be less willing than other individuals to rely upon a rational, scientific approach to evidence.

A third hypothesis is that both critical thinking (CT) knowledge/skills and thinking style/dispositions are related to endorsement of misconceptions. This view is consistent with cognitive-experiential self-theory (CEST), a dual-process theory proposed by Epstein (2008; Pacini & Epstein, 1999). According to CEST, people have an intuitive-experiential system that automatically learns from experience and is largely unconscious, and a second rational-analytic system for engaging in verbal reasoning that is conscious, deliberate, and analytic. The knowledge acquired through the intuitive-experiential system is tacit and more resistant to change than the knowledge acquired through rational-analytic thinking. Some dual-process theories associate intuitive thinking with processing in a heuristic-driven cognitive system called "System 1" and reflective thinking with an analytic system called "System 2" (Stanovich & West, 2000), see also Evans (2010), Evans and Stanovich (2013), and Kahneman (2011).

From the perspective of CEST, we might expect people who endorse unsubstantiated claims to be more intuitively-oriented, acquiring their misconceptions through experience and relying more on their tacit knowledge. They may also be less interested in seeking out new information that could disconfirm their experience-based knowledge and less inclined to analyze and reflect upon their misconceptions.

The differences in intuitive-experiential thinking and rational-analytic thinking seem to parallel the origins of misconceptions versus scientifically-supported beliefs. Misconceptions typically originate from such informal knowledge sources as everyday conversation, the media, works of fiction, and rumors (Lewandowsky, Ecker, Seifert, Schwarz, & Cook, 2012) and in other cases derive from misinterpretations of personal experience (Hughes, Lyddy, & Lambe, 2013). This information is seldom supported by high-quality evidence and is tacitly accepted because it seems familiar or intuitively true. In contrast, claims that achieve the status of scientific knowledge usually develop through careful analysis of systematically-collected observations, passing the effortful, deliberate scrutiny of researchers.

Indeed, some research shows that people who hold beliefs that lack empirical support tend to adopt an intuitive approach in their thinking. Saher and Lindeman (2005) found that people who endorsed greater belief in complementary and alternative medicine (CAM), the paranormal, and in magical food and health-related practices showed more faith in intuition. In contrast, those with a more rational thinking style showed less belief in the paranormal and in magical food- and health-related practices, but not less belief in CAM. These findings are consistent with a dual-process explanation, but no study has examined whether such explanations also apply to psychological misconceptions.

Nevertheless, a full understanding of psychological misconceptions is not possible without a reliable and valid test that is free from problematic response biases (see the next section). To this end, we report on the development and preliminary validation of a new measure called the Test of Psychological Knowledge and Misconceptions (TOPKAM), designed to avoid some of the shortcomings of previous tests. We also investigate individual differences in CT skills and dispositions, belief in pseudoscientific and unsubstantiated claims, as well as academic background variables potentially related to belief in psychological misconceptions.

1.2. Review of misconceptions tests and their problems

Since the seminal psychological misconceptions test of Nixon (1925), most tests have employed a true–false (T/F) response format (e.g., Brown, 1983; Gardner & Dalsing, 1986; Griggs & Ransdell, 1987; Gutman, 1979; Kuhle, Barber, & Bristol, 2009; Lamal, 1979; McKeachie, 1960; Taylor & Kowalski, 2004; Vaughan, 1977). Many using the T/F format have used the Test of Common Beliefs (TCB) of Vaughan (1977) or items from it to assess introductory psychology students' psychological misconceptions (e.g., Gardner & Dalsing, 1986; Griggs & Ransdell, 1987; Gutman, 1979; Kuhle et al., 2009; Landau & Bavaria, 2003). Each of the 80 T/F items on the TCB is scored as correct when answered false.

The use of T/F response format in misconceptions tests, especially in which true responses are scored as misconceptions, can create problems when interpreting scores. For example, a yea-saying response style (acquiescence) could lead to inflated estimates of their susceptibility to misconceptions; whereas, nay-saying (counteracquiescence) could deflate estimates. Conversely, negatively keyed items could induce a response set in which some respondents who are biased in their responding to appear more positive or agreeable would produce inaccurate estimates of knowledge. In addition, T/F format with correct items always keyed false could make it easier to guess correctly when respondents discerned the pattern of correct answers in the format of the test.

Other researchers have criticized misconception items with the T/F format on the grounds that they constrain responses to be completely true or completely false, a position that does not accurately capture the difference between most misconceptions and scientifically-supported ideas in psychology. For example, Brown (1984) provided several examples of misconception items written in language that allowed them to be interpreted as at least partly true. Ruble (1986) argued that because some items are too ambiguous to be answered as completely true or false, qualifiers should sometimes be used. Supporting this objection, Hughes, Lyddy, and Kaplan (2013) found that the language and response format of items in a misconceptions test affected the level of endorsement of misconceptions, with ambiguously phrased items yielding higher levels of misconceptions than non-ambiguously-phrased items. Moreover, the T/F format used in many misconceptions tests is inconsistent with the provisional status of knowledge in science. Specifically, the inductive and informal reasoning used to build scientific theories is defeasible, often resulting in conclusions that are only tentative and qualified. Indeed, many psychological misconceptions contain a kernel of truth (Hughes, Lyddy, & Lambe, 2013; Lilienfeld et al., 2010). For example, although the claim that some people are exclusively "left-brained" and others "right-brained" is false, it is at least partly true that the brain's two hemispheres subserve somewhat different functions.

Yet another criticism of most T/F format tests is that they do not allow respondents to indicate that they do not know an answer. To control for this limitation, Gardner and Dalsing (1986) administered a 60-item version of the TCB to 531 college students in T/F format but added a third option of "don't know/no opinion." They found that students chose this option 12.2% of the time. After discarding these responses and calculating misconceptions only from the remaining responses, they found that this change reduced the level of misconceptions by 8% on 14 common items. Although this strategy may control for guessing, it produces total test scores that are based on an unequal number of responses to items. Moreover, judging that one does not know an answer or has no opinion about a question is not necessarily equivalent to the more continuously varying judgment of one's ability to provide a correct answer. The ability to accurately assess the veracity of one's own knowledge is better viewed as a metacognitive dimension in which respondents judge the certainty of the correctness of their answers. Another potential problem is that responding with "no opinion" about a question might indicate a lack of motivation to answer the question. This ambiguity suggests the need to separate the assessment of a knowledge dimension underlying misconceptions from the metacognitive dimension reflected by confidence or certainty in a knowledge response.

One study, conducted by Landau and Bavaria (2003), has assessed confidence on a continuous scale, asking respondents to rate their confidence after answering each question using a 5-point Likert scale. They found that respondents were significantly more confident on incorrect items (misconceptions) than on items they got correct, consistent with the hypothesis that most people are not aware that they are endorsing misconceptions.