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Analysis of Students' Misconceptions of Research Methods in Relation to Thinking Style

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Faculty Sponsor: Professor Robert LaForge, Psychology

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INTRODUCTION

Abstract

This study explores college students' misconceptions about scientific research methods and their predisposition for rational-analytic thinking or experiential-intuitive thinking. The measures used in assessing misconceptions and thinking style were a seven-item version of Students' Conceptions of Research Methods Inventory (SCoRI), specifically the misconceptions of research methods subscale (Meyer et al.(2005), and Epstein's Rational-Experiential Inventory (REI) Scale (1996), respectively. The REI Scale consists of two subscales adapted from the Need for Cognition scale (NFC, J. T. Cacioppo & R. E. Petty, 1982) and Epstein's Faith in Intuition (FI) scale, each with five questions; REI-NFC measures rational-analytic thinking, while the REI-FI measures experiential-intuitive thinking. 371 students (67% females) enrolled in either introductory Psychology or Communications at the University of Rhode Island completed a survey regarding their attitudes towards scientific research methods. Students were given course credit for completing the online survey. Results demonstrate a negative relationship between misconceptions of research methods and rational-analytic thinking, whereas experiential-intuitive thinking was unrelated to misconceptions of research methods.

Purpose

The aim of this study was to investigate how college students' misconceptions about scientific research methods are related to their tendency to be either rational-analytic thinkers or experiential-intuitive thinkers.

Background

Few scientific studies have focused on students' perceptions of research methods. Investigating possible relationships between misconceptions of research methods and thinking style as a barrier to learning and understanding scientific research methods is essential. Identifying such a relationship may help to draw out students' misconceptions and distinguish those with a higher risk factor for being affected by preexisting ideas and misconceptions. Gaining insight into the way in which students view research methods may help better inform students and teachers about such attitudinal and cognitive barriers. Results acquired by this study may assist in better preparing students to further advance their academic and professional careers. This study, and research like it, may lead to findings that will inspire new approaches to the teaching and learning processes of understanding, as well as conducting, scientific research.

Study hypotheses state that rational-analytic thinking will be negatively related to misconceptions of scientific research methods, and that experiential-intuitive thinking will be positively related to misconceptions of research methods.

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METHODS

Participants

A total of 371 college students (67% female) enrolled in introductory courses at the University of Rhode Island participated in an online survey measuring ideas and attitudes towards scientific education and research methods. Of the participating 371 students, ranging in age from 17 to 26 (*mean 18.5*), 70% are currently freshmen, and 85% are Caucasian.

Recruitment

Participants were informed of, and recruited for, the study during class time. Students received extra credit from their professors upon completion of the study. Participating students agreed to study consent by completing the survey, as a written consent form was displayed before students were able to view and carry out the survey. Study participation is anonymous, providing researchers with access only to anonymous data analysis files. Randomly assigned identification codes were used for each participant, with no identifiable information associated to the student. All study procedures were reviewed and approved by the University of Rhode Islands' Institutional Review Board (IRB).

Measures

The Rational Experiential Inventory (REI) Scale was created to measure two independent approaches to thinking, one being rational-analytic thinking, the REI-NFC, and the other being experiential-intuitive thinking, the REI-FI. The two subscales are used in this study.

REI-NFC Scale

- The REI-NFC measures rational-analytic thinking. According to Epstein, the rational system functions primarily at the conscious level; it is intentional, analytic, predominantly verbal, and comparatively affect free. Rational-analytic thinkers err on the side of justification by logic and evidentiary facts.
- In constructing the REI-NFC, Epstein used a modified, five-item Need for Cognition Scale (NFC, J. T. Cacioppo & R. E. Petty, 1982) applying to rational-analytic thinking. NFC, an already established and validated scale, has an internal consistency of $\alpha .87$.
- Example items include, "I do not like to do a lot of thinking," and "I prefer to do something that challenges my thinking abilities rather than something that requires little thought." Internal consistency for this study presents $\alpha = .53$.

REI-FI Scale

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- The REI-FI measures experiential-intuitive thinking. Epstein describes the experiential system as being more automatic, preconscious, holistic, and association-based. It is primarily nonverbal, and intimately associated with affect. Experiential-intuitive thinkers validate based upon self evidence, typically adhering to the notion that believing something is to have experienced it.
- In keeping consistent, Epstein used a modified, five-item version of his own Faith in Intuition Scale, $\alpha = .77$.
- Sample items include, "My initial impressions of people are almost always right," and "I can usually feel when a person is right or wrong even if I can't explain how I know." Internal consistency for this scale in this study is $\alpha = .81$.

The 7-item modified Meyer Misconceptions of Research Methods scale

- This study used a seven-item version of the Misconceptions subscale developed by Meyer and colleagues as part of a larger measure on Students' Conceptions of Research Methods Inventory (SCoRI) (Meyer et al. 2005). In developing the SCoRI, Meyer et al., conducted both qualitative and quantitative analyses in order to construct an empirically sound scale. Meyer et al. (2005) described the eight item Misconception subscale as expressing a...

"view that research is about gathering data that support preconceived ideas or that will back a particular argument, that correctly followed research procedures will always yield positive results, that when qualified people do research the results are always unbiased, that it is acceptable to modify research data if it does not look exactly right, that research becomes true after it is published, that if research is properly conducted then contradictory findings will never occur, and that there is generally only one way to interpret research findings (p.236)."

- In our study, one item from this scale, "There is generally only one way to interpret research findings," was inadvertently omitted from our questionnaire. Therefore this analysis used the following a modified seven-item scale of student misconceptions about research methods.
- The seven-item misconceptions measure in this study has internal consistency reliability of $\alpha = .75$.

1. Good research specifically gathers data that will support the researcher's preconceived ideas
2. Research becomes true after it is published
3. If followed correctly research procedures will always yield positive results
4. When qualified people do research the results are always unbiased
5. Research is about collecting data which back your argument
6. It is quite acceptable to modify research data if it does not look exactly right

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7. If research is properly conducted then contradictory research findings will never occur

ANALYSIS

Descriptive statistics for all variables were examined, and regression analysis was conducted to evaluate the relationship of the REI subscales as predictors of the misconceptions scale score. Residual analysis identified one case whose responses were all extreme, and after exclusion of that case the regression residuals were normally distributed.

RESULTS

Multiple regression analysis revealed that rational analytic thinking is negatively related to misconceptions of research methods (See Table 1). This finding is consistent with our hypothesis predicting a negative relationship of rational-analytic thinking with misconceptions. In contrast, no evidence was found indicating experiential-intuitive thinking was related to misconceptions of research methods, which is contrary to our hypothesis that the two measures would be negatively related.

Table 1. Regression results predicting Misconception of Research Methods

Model		β	Std. Error	t
1	(Constant)	25.346	1.522	16.654
	REI-NFC	-.372	.066	-5.638
	REI-FI	.030	.065	.462

Dependent Variable: The 7-item modified Misconceptions of Research Methods scale

DISCUSSION

The major aim of this study was to examine the association of students' misconceptions of research methods with rational-analytic or experiential-intuitive thinking style. Results found that rational-analytic thinking was negatively related to misconceptions, indicating that students with higher scores on rational thinking also endorse more misconceptions about research

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methods. Additionally, inconsistent with our study hypothesis, results indicate that there is no relationship between experiential-intuitive thinking and misconceptions of research methods. Further analysis is needed to explore misconceptions as related to other scales associated with Faith and Intuition, for example scales measuring pseudoscience, among others, in order to better test the construct validity of this measure.

CONCLUSION

This study is a stepping stone for further research, as it has only just begun to scratch the surface of possible relationships between thinking styles and processes in relation to misconceptions and preconceived notions of scientific research methods. Results provide an interesting look at helping to understand cognitive dispositions in relation to misconceptions of research methods and thinking processes. In the future, it would be interesting to administer the survey to a more diverse and wider range of participants, for example including more upper level undergraduate students, as well as graduate students in multiple concentrations.

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