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Initial Validation of an Instrument Measuring Psychology-Specific Epistemological Beliefs

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Abstract

Psychology-specific epistemological beliefs are believed to influence students' approach to and performance in psychology courses. However, empirical research on this topic is limited due in part to a lack of well-validated instruments measuring this construct. The primary objective of the current research was to develop and validate the Psychology-Specific Epistemological Belief Scale (Psych-SEBS), a short self-report instrument measuring psychology-specific epistemological beliefs. Study 1 addresses the structural validity, internal consistency, test-retest reliability, and convergent validity of the Psych-SEBS. Study 2 addresses the criterion-related and incremental validity of the Psych-SEBS. Findings indicated acceptable psychometric properties of this instrument and its 3 subscales: significance of psychology research, subjective nature of psychology knowledge, and predictability of human behavior. Scores on Psych-SEBS scales were significantly associated with construct-relevant outcomes, including student interest and performance in psychology courses, and explained unique variance in these outcomes beyond that explained by existing instruments.

Initial Validation of an Instrument Measuring Psychology-Specific Epistemological Beliefs

A wide range of metacognitive activities and reasoning abilities contribute to undergraduate learning and outcomes. For the most part, these activities and abilities (e.g., critical thinking, argument evaluation, inquiry) center on students' beliefs about the nature of knowledge and knowing, a construct referred to as epistemological beliefs (EBs; see Kuhn, 1991; Kuhn, Cheney, & Weinstock, 2000). Theoretical and empirical consideration of EBs has been grounded in two general frameworks (Franco, Muis, Kendeou, Ranellucci, & Sampasivam, 2012; Stathopoulou & Vosniadou, 2007). On one hand, some researchers have considered EBs from a domain-general, or domain-independent, framework (Hofer, 2006; Schommer, 1990; Tsai & Liu, 2005). According to this approach, an individual's epistemological beliefs are expected to apply across all, or most, knowledge. On the other hand, more recent research has focused on the domain-specificity of EBs (c.f., Estes, Chandler, Horvath, & Backus, 2003), and results suggest that individuals' EBs may differ depending on the domain of knowledge in question (e.g., math, history, etc.; Buehl, Alexander, & Murphy, 2002).

Empirically investigating EBs represents an important area of inquiry in psychology and education, as these beliefs have been found to relate to student strategy use for acquisition of knowledge (Ryan, 1984), comprehension of material (Schommer, Crouse, & Rhodes, 1992), and academic performance and achievement (Lodewyk, 2007; Schommer, 1993). In short, beliefs about the nature of knowledge and knowing within a given domain impact knowledge acquisition processes and, in turn, comprehension of material and performance within relevant academic environments (see Buehl &

Alexander, 2001). Research examining the effects of psychology-specific EBs on academic performance within psychology courses would thus seem to be of particular import to those teaching psychology and psychological science. To date, however, a limited amount of research has examined associations between psychology-specific EBs and academic performance.

Existing empirical support for the prediction that psychology-specific EBs may influence academic functioning comes from research conducted by Friedrich (1996) that found scores on the Psychology as Science Scale (PAS), a scale measuring student beliefs regarding psychology's status as a science, to be associated with a range of attitudinal and student performance criteria, including objective indicators of academic performance (e.g., exam scores), self-reported GPA, and preference for research-oriented course content. These findings suggest that EBs specific to the manner in which psychological knowledge is acquired (e.g., through scientific methods) may impact how students approach and perform in their psychology courses. However, more recent research examining associations between scores on the PAS and other seemingly construct-relevant variables has yielded mixed results (e.g., Holmes & Beins, 2009; Lyddy & Hughes, 2011; Provost, Martin, Peacock, Lipp, Bath, & Hannan, 2011), thus throwing into question the criterion-related validity of the PAS and obfuscating the association between psychology-specific EBs and student outcomes. Additional empirical research is thus necessary to clarify the nature of the relationship between psychology-specific EBs and academic functioning.

One factor that has likely contributed to the limited amount of research examining the relationship between psychology-specific EBs and academic functioning is that, while

validated instruments measuring beliefs specific to "hard sciences" exist (e.g., physics), there are few comparable validated self-report assessments of psychology-specific EBs (Elby, Frederiksen, Schwarz, & White, 2001). Moreover, little research has addressed the content and structure of psychology-specific EBs, and important dimensions of this construct have yet to be identified. This is despite evidence that regardless of undergraduate psychology training, students often note qualitative differences between psychology and other disciplines and, in particular, misidentify psychology as less scientific than disciplines like biology or physics (e.g., Estes et al., 2003). These findings suggest different EBs regarding psychological knowledge, when compared to other academic domains, and bring into relief the need for additional research regarding psychology-specific EBs using well-validated measures. To address this issue, the overarching goal of the current research was to develop a psychometrically strong measure of psychology-specific EBs and to provide initial evidence regarding associations between this construct and indicators of student interest and performance in psychology courses.

Assessing and understanding psychology students' EBs may bear on the field of psychology as a science itself (Simonton, 2009) and influence how educators approach the teaching of psychology and psychological science. Developing a useful instrument measuring psychology-specific EBs thus represents an important first step toward elucidating the structure and development of personal epistemologies across science disciplines and the potential impact of psychology-specific EBs on knowledge acquisition, comprehension, and performance within psychology-related academic domains. Accordingly, the primary objectives of the current research were to investigate

the structure of psychology-specific EBs and to develop and provide initial validation of the Psychology-Specific Epistemological Belief Scale (Psych-SEBS), a short self-report instrument measuring psychology-specific EBs.

Study 1

Initial development and validation of the Psych-SEBS was completed during Study 1. Exploratory factor analysis was used to identify underlying dimensions of psychology-specific EBs and to refine an item pool for use in the Psych-SEBS (Study 1a). Following this, confirmatory factor analyses were used to address the structural validity of the Psych-SEBS, and the convergent validity, internal consistency, and test-retest reliability of the Psych-SEBS were also examined (Study 1b).

Study 1a

The main objective of Study 1a was to identify important underlying dimensions of psychology-specific EBs and to create and refine an item pool for the development of the Psych-SEBS. The authors initially drafted 39 items for potential use in this scale. Items were derived largely from previous theoretical and empirical work on EBs, and then modified to refer specifically to beliefs about psychology domains. Items were generated to oversample content relevant to EBs, and the authors evaluated all items of the current study for clarity, specificity, and lack of repetition with other items (see Clark & Watson, 1995; Reise, Waller, & Comrey, 2000). The items were then administered to a sample of undergraduate students, and exploratory factor analysis was used to identify the factor structure of the initial iteration of the Psych-SEBS and to provide initial evidence concerning the psychometric quality of the Psych-SEBS.

Method.

Participants. Participants were 304 students (216 female) sampled from the undergraduate population of a large public university in the Southeastern United States. Ages ranged from 18 to 50 (M = 21.28; SD = 5.02). Thirty-seven percent of the sample was African American, 36% was White, 16% was Asian American, and 11% reported other ethnicities. Participants were enrolled in a general introductory psychology or human development course. All participants were remunerated with partial course credit for participation.

Materials and procedure. Participants completed a multi-section questionnaire administered using an online testing system. Participants could respond to the questionnaire at their own pace and typically took about 15 minutes to complete all sections. Included in the questionnaire was a brief demographics survey and, as described in more detail below, the initial 39-item version of the Psych-SEBS.

The initial iteration of the Psych-SEBS included 39 items assessing psychology-specific EBs. Items were derived from previous theory on EBs and existing instruments measuring similar constructs, including the Scientific Epistemological Views Scale (SEV; Tsai & Liu, 2005), Epistemological Belief Assessment for Physical Science (EBAPS; Elby et al., 2001), and the PAS (Friedrich, 1996). All items were modified to use psychology-specific language. For example, an item from the SEV scale, "The theories scientists hold do not have effects on the process of their exploration in science," was modified to "The theories psychologists hold do not have effects on the process of their exploration in psychology." Items were excluded if they could not be easily translated into the psychology domain. Respondents indicated their agreement with each

item using a 7-point Likert-type scale (1 = ‘disagree very strongly’ through 7 = ‘agree very strongly’).

Results.

Factor identification and initial scale revision. A principle-axis factor analysis (PFA) using oblique, direct oblimin rotation (delta = 0) was performed on the 39-item version of the Psych-SEBS. Twelve factors emerged with eigenvalues greater than 1, but scree-plot analyses suggested three dominant factors. How to accurately determine the number of factors to retain in exploratory factor analytic procedures has been a source of debate in previous research (e.g., Fava & Velicer, 1992; Reise, Waller, & Comrey, 2000; Wood, Tataryn, & Gorsuch, 1996), and no strategy is entirely satisfactory. Many of the 12 identified factors were uninterpretable and several were composed of only a single item. Accordingly, to get clearer results, items that seemed to be problematic were identified and dropped from further analyses. Specifically, items that did not load on a single factor, items that fully composed a single factor, and items that indicated high cross-factor loadings (defined as loading above .40 on two or more factors) were excluded. After removing items based on the above criteria, 14 items were retained.

The revised 14-item measure was then subjected to a second PFA with direct oblimin rotation (delta = 0). Three factors emerged with eigenvalues greater than 1 (3.33, 1.48, 1.33), and scree-plot analyses similarly suggested three factors. The rotated pattern matrix of the item pool was examined to address whether the extracted factors focused on theoretically meaningful aspects of psychology-specific EBs. The first factor (6 items) clearly addressed the practical significance/importance of psychological research (e.g., ‘Psychological advice given in popular books and magazines is often as useful as more

research-based claims'). The second factor (5 items) addressed the context-dependent and subjective nature of psychological knowledge (e.g., 'Some psychological knowledge proposed earlier is opposite to the contemporary knowledge'). Finally, the third factor (3 items) addressed beliefs concerning the predictability of human behavior (e.g., 'Psychological research can enable us to anticipate people's behavior with a high degree of accuracy'). Each of the above-listed factors thus represents theoretically relevant components of psychology-specific EBs. Accordingly, each of the factors were retained and labeled, respectively, (1) significance of psychological research, (2) subjective nature of psychological knowledge, and (3) predictability of human behavior.

Discussion.

The results of Study 1a provide initial evidence concerning the factor structure of the Psych-SEBS. Using exploratory factor analytic procedures, three factors were identified representing (1) beliefs concerning the significance, or importance, of psychological research, (2) the context-dependent and subjective nature of psychological knowledge and research, and (3) the inherent predictability of human behavior. Notably, the Psych-SEBS underwent a significant amount of revision, including reduction from 39 items to 14 items in Study 1a. Additional research addressing the psychometric quality of the revised version is described below.

Study 1b

The main objectives of Study 1b were (1) to confirm the factor structure of the Psych-SEBS using confirmatory factor analysis, (2) to examine the test-retest reliability of the scale, and (3) to establish the convergent validity of the scale. This was a two-phase study, with participants completing the Psych-SEBS twice within one month (range

= 20-29 days). Time 1 responses were used to test the previously identified three-factor structure of the scale and to examine the convergent validity of the scale. At Time 2, a subset of participants again completed the Psych-SEBS, and responses were correlated with Time 1 responses to provide evidence of test-retest reliability.

Method.

Participants. Time 1 participants were 194 students (M_{age} = 25.51; SD_{age} = 4.89; 152 female) sampled from the undergraduate population of two large public universities in the Southeastern and the Northwestern United States. Thirty-nine percent of the sample was White, 30% was African-American, 19% was Asian American, and 12% reported other ethnicities. A subset of these participants (n = 92; M_{age} = 24.26; SD_{age} = 4.01; 61 female) completed the Psych-SEBS again at Time 2. Forty-four percent of Time 2 participants were White, 32% were African-American, 15% were Asian American, and 9% reported other ethnicities. All participants were currently enrolled in a psychology or human development course and remunerated with partial course credit for participation.

Materials and procedure. At Time 1, all participants completed a multi-section questionnaire administered using an online surveying system. Included in the questionnaire was a brief demographics survey, the modified Psych-SEBS, and, as described in more detail below, two additional instruments used to assess the convergent validity of the Psych-SEBS. These measures were randomly counterbalanced across participants. Participants had to complete this questionnaire prior to participating in the second phase of the study. At Time 2, participants completed a second set of instruments online, including the Psych-SEBS.

The modified 14-item Psych-SEBS used the same response format as in Study 1. A fifteenth item implicitly related to the predictability of human behavior factor was added to the scale in an attempt to improve internal consistency of this subscale. Items were presented interspersed across factors and not in factor clusters.

The Scientific Epistemological Views (SEV) scale (Tsai & Liu, 2005) was used to establish to convergent validity of the Psych-SEBS. In the current study, the SEV was modified to include only dimensions theoretically relevant to those measured by the Psych-SEBS. The modified SEV thus included 14 domain-independent items with responses indicated on a 5-point Likert-type scale (1 = 'strongly disagree' through 5 = 'strongly agree'). The items address epistemological views about science in general. The dimensions of this instrument include: The Invented and Creative Nature of Science (SEV-IC; e.g., "Scientists intuition plays an important role in the development of science"), the Changing and Tentative Feature of Science Knowledge (SEV-CT; e.g., "The development of scientific knowledge often involves the change of concepts"), and the Theory-Laden Exploration (SEV-TL; e.g., "Scientists research activities will be affected by their existing theories"). The original SEV (Tsai & Liu, 2005) was designed for high school students, but this instrument has displayed acceptable validity and reliability in samples of college students in subsequent studies (e.g., Liu, Lin, & Tsai, 2011; Liu & Tsai, 2008). Internal consistency of the SEV subscales in the present sample was acceptable ($range_{\alpha}$ = .71-.76).

An instrument designed to assess the perceived scientific nature of psychology (Martin, Sadler, & Baluch, 1997) was also used to establish the convergent validity of the Psych-SEBS. This 3-item instrument assesses the degree to which participants view

psychology as (1) common sense, (2) science, and (3) social science using a 5-point Likert-type scale (1 = 'true' through 5 = 'untrue'). Responses on this measure were reverse coded, such that higher scores indicated stronger beliefs concerning psychology's status as commonsense, science, and social science.

Results.

Model fit, internal consistency, and test-retest reliability. The three-factor oblique structure of the Psych-SEBS was examined using confirmatory factor analysis on Time 1 responses. These analyses indicated a lack of model fit to the data ($\chi^2 = 168.54$, $p < .01$; RMSEA = .07; CFI = .81; IFI = .82; TLI = .78). Examination of modification indices suggested high cross-factor loadings for Psych-SEBS items 1 and 15. Accordingly, these items were dropped from subsequent analyses. The modified 13-item Psych-SEBS was then subjected to a second confirmatory factor analysis, and results generally indicated an acceptable fit to the data ($\chi^2 = 90.65$, $p < .05$; RMSEA = .05; CFI = .92; IFI = .93; TLI = .90). Table 1 displays the three-factor model, including standardized regression weights and factor covariance estimates. Descriptive statistics for the Psych-SEBS scale are displayed in Table 2. As shown, internal consistency of the Psych-SEBS subscales was low at Time 1 and somewhat more acceptable at Time 2. Also shown in Table 2 are substantial test-retest correlations for each of the Psych-SEB subscales across Time 1 and Time 2, indicating excellent test-retest reliability.

Convergent validity. Correlations between the Psych-SEBS subscales and the other instruments used in the current study are displayed in Table 3. To avoid confusion, scores on the significance subscale of the Psych-SEBS were reverse coded for this set of

analyses, such that higher scores indicate greater belief in the significance of psychological research.

In general, these analyses provide evidence of acceptable convergent validity. The significance subscale of the Psych-SEBS was negatively associated with the SEV-TL and the SEV-CT, and a marginally significant negative association was observed between the significance subscale and the SEV-IC. The subjective subscale of the Psych-SEBS was positively associated with the SEV-TL and the SEV-CT, and the predictability of human behavior subscale was positively associated with the SEV-TL and the SEV-CT. Scores on the Psych-SEBS were also found to be associated with beliefs concerning psychology's status as commonsense, science, and social science. Specifically, scores on the significance subscale of the Psych-SEBS were negatively associated with believing psychology was commonsense and positively associated with believing psychology was a science and social science. Scores on the subjective subscale of the Psych-SEBS were positively associated with believing psychology was commonsense. Finally, scores on the inherent predictability of human behavior subscale were positively associated with believing that psychology is a science and a social science.

Discussion.

Taken together, the above findings provide initial evidence suggesting acceptable psychometric quality of the Psych-SEBS (see Appendix A for the full scale). The three-factor structure of the Psych-SEBS was confirmed, the scale was found to have acceptable test-retest reliability, and the Psych-SEBS indicated acceptable convergent validity. However, additional research addressing the criterion-related and incremental validity of the Psych-SEBS is needed to provide evidence concerning the potential utility

of this instrument in predicting relevant external criteria such as student interest and performance in psychology courses. This research was conducted in Study 2.

Study 2

The primary objective of Study 2 was to assess the criterion-related validity of the Psych-SEBS by examining whether the Psych-SEBS subscales are associated with external criteria such as students' psychology-based knowledge, interest in psychology, and expected and actual performance in psychology courses. We also aimed to assess the incremental validity of the Psych-SEBS on student knowledge, interest, and course performance over a similar and previously established measure of students' beliefs regarding psychology's status as a science, namely the PAS (Friedrich, 1996). To address these objectives, participants completed a large multi-section questionnaire including the 13-item Psych-SEBS and several other relevant surveys and questions of interest. Bivariate correlations were used to test the criterion-related validity of the Psych-SEBS by addressing whether scores on the Psych-SEBS subscales were significantly associated with students' psychological knowledge, interest, and expected and actual performance in psychology courses. Regression analyses were used to test the incremental validity of the Psych-SEBS by addressing whether the Psych-SEBS predicted unique variance in student knowledge, interest, and performance when controlling for scores on the PAS.

Method

Participants. Participants were 89 students (60 female) sampled from the undergraduate population of two large public universities in the Southeastern and the Northwestern United States. Ages ranged from 19 to 58 (M = 24.39, SD = 6.85). Fifty-five percent of the sample was White, 19% was African-American, 10% was Asian

American, and 16% reported other ethnicities. All participants were currently enrolled in a psychology or human development course and remunerated with partial course credit for participation. Students participating in Study 2 had not participated in Study 1a or b previously.

Materials and procedure. Participants completed a multi-section questionnaire administered using an online testing system. Participants could respond to the questionnaire at their own pace and typically took about 15 minutes to complete all sections. Included in the questionnaire was a brief demographics survey, the Psych-SEBS, and, as described in more detail below, several additional instruments used to assess the criterion-related and incremental validity of the Psych-SEBS. These instruments were randomly counterbalanced across participants.

The 13-item Psych-SEBS used the same response format as in Study 1. Items were presented interspersed across factors and not in factor clusters. Scores on the significance subscale of the Psych-SEBS were again reverse-coded, such that higher scores indicate greater belief in the significance of psychological research. Internal consistency of the Psych-SEBS subscales in the present study was acceptable for the significance and subjective subscales (α = .70 and .71, respectively), with lower internal consistency observed for the inherent predictability of human behavior subscale (α = .60).

Several items were used to assess student knowledge of psychology, interest in psychology, and performance in psychology courses. Psychological knowledge was assessed by having participants respond to eleven statements expressing common misconceptions in psychology (e.g., “The right half of the brain is the creative side”; see Lilienfeld, Lynn, Ruscio, & Beyerstein, 2010). Participants indicated whether or not they

believed these statements using a true or false response format (coded: 1 and 0, respectively). Responses to these statements were then summed, with higher scores indicating greater endorsement of psychological misconceptions and, correspondingly, less accurate psychological knowledge. Interest in psychology was assessed by having participants respond to a single item stating "How interested are you in the field of psychology?" using a 5-point Likert-type scale (1 = 'not at all' through 5 = 'very interested'). Performance in psychology courses was assessed by having participants respond to two items. First, expected performance in psychology courses was assessed by having participants respond to the item "What grade do you expect to get in the psychology courses you take?" Responses to this item were scored using numerical weights for each letter grade, with higher scores reflecting with better grades (e.g., 4 = 'A', 3 = 'B', 2 = 'C', etc.). Second, actual performance in psychology courses was assessed by having students self-report their current GPA across all psychology courses.

To provide evidence concerning the incremental validity of the Psych-SEBS, the PAS (Friedrich, 1996) was included in the questionnaire. The PAS contains 15 items (plus five filler items) measuring the degree to which respondents view psychology as a science (e.g., "Research conducted in controlled laboratory settings is essential for understanding everyday behavior"). Responses are collected using a 7-point Likert-type scale (1 = 'strongly disagree' through 7 = 'strongly agree), with higher scores indicating

greater endorsement of the view that psychology is a science. Internal consistency of this scale in the present study was acceptable ($\alpha = .74$).[1]

Results

Criterion-related validity. Descriptive statistics for each variable included in the present study are listed in Table 4. Also shown in Table 4 are the bivariate correlations addressing associations between each of the Psych-SEBS subscales and student knowledge, interest in psychology courses, and performance in psychology courses. Results of this set of analyses indicated that the significance subscale of the Psych-SEBS was negatively associated with psychology misconceptions and positively associated self-reported interest in psychology courses and psychology GPA. The subjective nature of psychological research subscale was positively associated with self-reported interest in psychology courses. A marginally significant negative association was observed between the inherent predictability of human behavior subscale of the Psych-SEBS and psychology misconceptions, and this subscale was also positively associated with self-

[1] Initial psychometric evaluation of the PAS indicated that this scale may have an underlying three-factor structure with significant conceptual overlap to the Psych-SEBS (see Friedrich, 1996). To our knowledge, however, the factor structure of the PAS has not been confirmed through additional psychometric evaluation, and the vast majority of research subsequent to the initial psychometric evaluation of this scale has utilized overall composite scores instead of subscale scores (e.g., Herstein Gervasio, Wendorf, & Yoder, 2010; Holmes & Beins, 2009). Accordingly, we chose to use composite PAS scores for all analyses in the present study.

reported interest in psychology courses. Notably, moderate to strong positive associations were also observed between each of the Psych-SEBS subscales and the PAS, suggesting considerable overlap between the Psych-SEBS and the PAS.

Incremental validity. To examine whether the Psych-SEBS accounted for significant variance in student knowledge, interest, and performance beyond that which is accounted for by the PAS, we conducted a series of hierarchical regression analyses. For these analyses, PAS scores were entered in Step 1, and each of the Psych-SEBS subscales was entered in Step 2. Three separate analyses were conducted with psychology misconceptions, interest in psychology courses, and self-reported GPA as outcome variables. Because previous correlational analyses indicated that neither the PAS nor any of the Psych-SEBS subscales were associated with expected performance in psychology courses, no analyses with expected performance as an outcome variable were conducted.[2] To determine whether the Psych-SEBS had incremental validity, we examined the significance of the individual subscales in predicting the outcomes, the significance of the ΔR^2 coefficients, and the magnitude of the semipartial correlations of the ΔR^2 coefficients. The semipartial correlations of the ΔR^2 coefficients serve as an absolute metric of the validity increment and are calculated by computing the square root of the ΔR^2 from the regression analysis. Semipartial *r*-values that meet or exceed .15 to .20 indicate a

[2] As shown in Table 4, almost all participants indicated that they expect to receive an 'A' or a 'B' in psychology courses (M = 3.44, SD = .60). Note this is in contrast to self-reported GPA of 2.85 (M = 1.07). Participants' inflated expectations are most likely responsible for this measure being less meaningful than others.

reasonable contribution of explained variance by conventional standards for incremental validity estimates (see Hunsley & Meyer, 2003).

As shown in Table 5, results of these analyses indicated that the significance subscale of the Psych-SEBS was negatively associated with psychology misconceptions when controlling for scores on the PAS. According to the ΔR^2 coefficient, the addition of the Psych-SEBS did not produce a significant change in the amount of variance in psychology misconceptions explained ($\Delta R^2 = .06$, $p = ns$); yet a relatively high semipartial *r*-value (semipartial $r = .24$) indicated an acceptable contribution of explained variance. Both the significance subscale and the subjective nature of psychological knowledge subscale were positively associated with interest in psychology courses when controlling for scores on the PAS. The Psych-SEBS also accounted for a significant increase in explained variance beyond that explained by the PAS ($\Delta R^2 = .17$, $p < .01$, semipartial $r = .41$). Finally, the significance subscale and the predictability of human behavior subscale were positively associated with self-reported psychology GPA when controlling for the PAS, and the Psych-SEBS accounted for a significant increase in explained variance beyond that explained by the PAS ($\Delta R^2 = .15$, $p < .01$, semipartial $r = .39$).

Discussion

In general, the findings of Study 2 indicate acceptable criterion-related and incremental validity of the Psych-SEBS. The subscales of the Psych-SEBS were found to be associated with several construct-relevant student performance criteria, including psychology knowledge, interest in psychology courses, and GPA across psychology courses. Additionally, initial evidence concerning the incremental validity of the Psych-

SEBS indicated that this scale accounted for significant variance over and above the PAS for psychological misconceptions, interest in psychology courses, and GPA in psychology courses. These findings thus provide evidence supporting the utility of the Psych-SEBS in predicting student knowledge, interest, and performance in psychology courses beyond that which is predicted by an existing similar measure.

General Discussion

The findings of the current research provide valuable information regarding the content, measurement, and potential importance of psychology-specific EBs. Primary dimensions of psychology-specific EBs were identified, and the subscales of the Psych-SEBS seem to represent reliable, structurally-sound indices of these dimensions. Additionally, the Psych-SEBS was found to be associated with external criteria such as student interest and performance in psychology courses, supporting the utility of this instrument in predicting student outcomes and, more broadly, suggesting that psychology-specific EBs may impact academic interest and functioning in psychology-related domains. Each of these points is discussed in more detail below.

Using a factor analytic approach, the results of Study 1 suggest that psychology-specific EBs are composed of three primary dimensions representing: (1) the significance, or importance, of psychological research, (2) the context-dependent and subjective nature of psychological knowledge, and (3) the inherent predictability of behavior. Finding psychology-specific EBs to be multidimensional is consistent with previous theory and research on the structure of EBs (see Alexander, Schallert, & Hare, 1991), and the above dimensions are largely consistent with those found in other research examining non-psychological and domain-independent EBs (see Buehl & Alexander,

2001). Findings further indicated acceptable structural validity, convergent validity, and test-retest reliability of the Psych-SEBS, suggesting that this instrument is a psychometrically strong measure of the above dimensions.

Findings from Study 2 indicated acceptable criterion-related and incremental validity of the Psych-SEBS. Each of the Psych-SEBS subscales were related to at least one of the outcome variables measured in Study 2, and the Psych-SEBS was found to predict substantial unique variance in psychology knowledge, interest in psychology courses, and self-reported psychology GPA above and beyond that predicted by the previously established PAS. These findings are of clear import to and supportive of the current research's primary objectives regarding instrument validation. More broadly, however, these findings also add to the existing literature regarding the relationship between EBs and academic performance and outcomes (e.g., Friedrich, 1996; Lodewyk, 2007; Ryan, 1984; Schommer et al., 1992) by indicating that psychology-specific EBs regarding the significance and subjective nature of psychological research and knowledge and the inherent predictability of human behavior are variously associated with relevant student outcomes. Predictions concerning the underlying mechanisms that may account for these relationships are speculative at this point, and empirically investigating these mechanisms will likely be a fruitful avenue for future research. We expect relevant mechanisms to branch across cognitive, affective, motivational, and behavioral dimensions.

As a relatively short and economical index of psychology-specific EBs, the Psych-SEBS may be particularly useful in educational and research contexts that require quick measurement of this construct. Notably, previous research examining EBs has

relied heavily on qualitative interview-based assessments of EBs (Beuhl & Alexander, 2001), an approach that is relatively time consuming and often precludes quantitative comparisons with other constructs of interest (e.g., academic performance). In addition, existing self-report instruments measuring EBs have either (1) focused on other academic domains (e.g., physics, math) or (2) are domain-independent (e.g., the SEV; Tsai & Liu, 2005). Given previous research indicating the domain-specificity of EBs (e.g., Buehl & Alexander, 2001; Buehl, Alexander, & Murphy, 2002), it would seem likely that instruments designed to measure psychology-specific EBs in particular would yield more accurate measurements of this construct than those measuring non-psychological or domain-independent EBs.

Despite the benefits of developing a measure to assess psychology-specific epistemological beliefs, the current study is not without limitations. First, the findings for the Psych-SEBS measure are drawn from a population of undergraduate students, and it is thus difficult to generalize the results to other populations such as adolescents or younger children. Future work should address this limitation by including samples drawn from several different age groups. An additional limitation of the current research is that all participants had taken or were currently enrolled in a psychology course at the time of their participation and, in result, had previously been exposed to course content describing the scientific and research-oriented nature of the field. It is therefore unclear whether the findings of the current research would generalize to those with limited exposure to and knowledge of the field of psychology. Future research should address this issue by examining the psychometric properties of the Psych-SEBS and the nature of psychology-specific EBs in those without any formal academic training in psychology.

Conclusions

As psychology research continues to advance in its relevance to and importance for interdisciplinary research, policy, and practice, it is increasingly important that both the general population and especially psychology undergraduate majors understand the nature of psychology knowledge. High regard for the importance of scientific psychological research, the potential for advances via evolving knowledge, and the predictability of psychology's subject matter is the center of a sophisticated psychology-specific personal epistemology. Such sophistication is valuable for the dissemination and subsequent consumption of psychology research findings. Further, understanding the dimensions of a sophisticated epistemology allows educators and researchers to better train students in the field by emphasizing and assessing these dimensions directly.

The development of the Psych-SEB represents an important first step for future research concerned with learning processes that may be affected or moderated by EBs. In addition, the instrument developed here may inform educational approaches and interventions by allowing assessment of changes in EBs in adolescents and emerging adults. Thus, the current research has valuable implications for future cognitive, developmental, and education research, as well as important applications for psychology instructors.

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Appendix A

Psychology-Specific Epistemological Belief Scale

Please respond to each of the following items by indicating your **level of agreement** on the following scale:

1	Disagree very strongly
2	Disagree strongly
3	Disagree
4	Neutral
5	Agree
6	Agree strongly
7	Agree very strongly

1. Currently acceptable psychological knowledge may be changed or totally discarded in the future.
2. Understanding psychology is important, but not for politicians.
3. Even though each person is unique, it is possible for psychologists to find general laws explaining human behavior.
4. Psychologists in different eras may use different theories and methods to interpret the same natural phenomenon.
5. Courses in psychology place too much emphasis on research and experimentation.
6. Carefully controlled research is not likely to be useful in solving psychological problems.
7. When learning psychology, people can understand the material better if they relate it to their own ideas.
8. Some psychological knowledge proposed earlier is opposite to the contemporary knowledge.
9. Our ability as humans to behave in any way we choose makes our attempts to predict behavior ineffective.
10. Psychologists' research activities will be affected by their existing ideas, thoughts, and beliefs.
11. Psychological research can enable us to anticipate people's behavior with a high degree of accuracy.
12. Computer simulations can also help psychologists estimate things involving the thoughts and behaviors of people, such as how children learn to solve math problems.
13. Students get little benefit from learning about procedures for conducting psychology experiments.

Table 1. CFA results - Standardized regression weights and factor covariance estimates for three-factor oblique model (n = 194)

Items	Factor (1)	(2)	(3)
Carefully controlled research is not likely to be useful in solving psychological problems.	.70		
Students get little benefit from learning about procedures for conducting psychology experiments.	.62		
Our ability as humans to behave in any way we choose makes our attempts to predict behavior ineffective.	.54		
Understanding psychology is important, but not for politicians.	.51		
Courses in psychology place too much emphasis on research and experimentation.	.39		
Some psychological knowledge proposed earlier is opposite to the contemporary knowledge.		.69	
Psychologists in different eras may use different theories and methods to interpret the same natural phenomenon.		.55	
When learning psychology, people can understand the material better if they relate it to their own ideas.		.53	
Currently acceptable psychological knowledge may be changed or totally discarded in the future.		.45	
Psychologists' research activities will be affected by their existing ideas, thoughts, and beliefs.		.45	
Psychological research can enable us to anticipate people's behavior with a high degree of accuracy.			.67
Even though each person is unique, it is possible for psychologists to find general laws explaining human behavior.			.59
Obviously, computer simulations can predict the behavior of physical objects like comets. But simulations can also help psychologists estimate things involving the thoughts and behaviors of people, such as how children learn to solve math problems.			.37
Psych-SEBS Factor			
(1) Significance of psychological research	1.00		
(2) Subjective nature of psychological knowledge	-.46	1.00	
(3) Predictability of human behavior	-.41	.55	1.00

Table 2. Psych-SEBS means, standard deviations, internal reliability estimates, and test-retest correlations for Time 1 (n = 194) and Time 2 (n = 92)

	Time 1			Time 2			
Psych-SEBS Subscale	*M*	*SD*	α	*M*	*SD*	α	Test-retest correlation
(1) Significance of psychological research	2.84	.85	.69	2.72	.95	.80	.76**
(2) Subjective nature of psychological knowledge	5.13	.78	.65	5.22	.80	.70	.65**
(3) Predictability of human behavior	4.92	.86	.54	5.08	.83	.61	.59**

Table 3. Bivariate correlations between Psych-SEBS subscales, SEV subscales, and 3 psychology as commonsense/science items (n = 194)

Psych-SEBS Subscale	SEV-IC	SEV-TL	SEV-CT	PS1	PS2	PS3
(1) Significance of psychological research	-.13†	-.34**	-.32**	-.22**	.28**	.22**
(2) Subjective nature of psychological knowledge	.11	.37**	.53**	.17*	-.10	-.10
(3) Predictability of human behavior	-.11	.17*	.30**	.05	.29**	.16*

NOTE: SEV-IC = Invented and created nature of science subscale of SEV. SEV-TL = Theory-laden exploration subscale of SEV. SEV-CT = Changing and tentative feature of science knowledge subscale of SEV. PS1 = Psychology is common sense. PS2 = Psychology is a science. PS3 = Psychology is a social science.

† $p < .10$, * $p < .05$, ** $p < .01$

Table 4. Descriptive statistics and bivariate correlations between Psych-SEBS subscales, the PAS, psychology misconceptions, interest in psychology courses, and self-reported expected and actual performance in psychology courses (n = 89)

	Mean	*SD*	1	2	3	4	5	6	7	8
1. SEBS-SI	5.06	.82	1							
2. SEBS-SN	4.88	.84	.35**	1						
3. SEBS-PH	4.91	.81	.39**	.46**	1					
4. PAS	4.95	.62	.72**	.51**	.49**	1				
5. Psych-Misc	2.51	1.82	-.28**	-.12	-.18†	-.18†	1			
6. Psych-Interest	4.00	1.13	.42**	.39**	.34**	.32**	-.07	1		
7. Psych-Grades	3.44	.60	.09	.00	.17	.02	-.13	.11	1	
8. Psych-GPA	2.85	1.07	.29**	.04	.17	.19†	-.14	.13	.56**	1

Note: SEBS-SI = Significance of psychological research subscale of the Psych-SEBS. SEBS-SN = Subjective nature of psychological knowledge subscale of the Psych-SEBS. SEBS-PH = Predictability of human behavior subscale of Psych-SEBS. PAS = Psychology as Science scale. Psych-Misc = Psychology misconceptions. Psych-Interest = Interest in psychology. Psych-Grades = Expected grade in psychology courses. Psych-GPA = Current GPA in psychology courses.
† $p < .10$, * $p < .05$, ** $p < .01$

Table 5. Incremental validity of the Psych-SEBS for psychology misconceptions, interest in the field of psychology, and GPA in psychology courses (n = 89)

	Psych-Misc	Psych-Interest	Psych-GPA
Step 1			
PAS	-.18†	.32**	.19†
Step 1 R^2	.03†	.11**	.04†
(Adjusted R^2)	(.02)	(.09)	(.03)
Step 2			
SEBS-SI	-.31*	.43**	.34*
SEBS-SN	-.01	.27*	.07
SEBS-PH	-.11	.17	.35**
Step 2 R^2	.09†	.27**	.19**
(Adjusted R^2)	(.05)	(.24)	(.15)
ΔR^2	.06	.17**	.15**

Note: Standardized regression coefficients are reported. PAS = Psychology as science scale. SEBS-SI = Significance of psychological research subscale of the Psych-SEBS. SEBS-SN = Subjective nature of psychological knowledge subscale of the Psych-SEBS. SEBS-PH = Predictability of human behavior subscale of Psych-SEBS. Psych-Misc = Psychology misconceptions. Psych-Interest = Interest in psychology. Psych-GPA = Current GPA in psychology courses.
† $p < .10$, * $p < .05$, ** $p < .01$