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TOPICAL ARTICLES

Assessing Students' Perceptions of Psychology as a Science: Validation of a Self-Report Measure

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Training in psychology emphasizes the scientific method as the basis for knowledge claims about thought and behavior. Students are regularly evaluated in terms of their mastery of methodological and statistical principles, but little attention has been paid to assessing the degree to which students endorse the notion that psychology is, indeed, a science. Several studies are reported that validate a self-report measure of this construct. The Psychology as Science Scale is shown to be a reliable measure that predicts a range of construct-relevant attitudinal and performance criteria. Possible research uses of the measure, as well as broader issues surrounding the general public's epistemological assumptions concerning psychology, are discussed.

Psychology occupies a unique position as a discipline, addressing basic questions of meaning and value normally associated with the humanities but approaching the study of thought and behavior from the methodological perspective of the natural sciences. Whether psychologists' work focuses on basic knowledge acquisition and theory development or on problem solution through behavioral technology, psychologists are distinguished from other professionals by their systematic grounding in the science of behavior (Fishman & Neigher, 1982). This grounding in the scientific method is reinforced in virtually every undergraduate psychology course, with topics in research design and the logic of science most often addressed in the earliest chapters of standard texts. Courses in methodology and statistics are among the few classes recommended as requirements across all thematic variations of the undergraduate psychology major (McGovern, Furumoto, Halpern, Kimble, & McKeachie, 1991).

Given the prominent role that the scientific method plays in psychology, it is unsurprising that teachers routinely evaluate the extent to which students understand scientific logic and the subtleties of research design and analysis. What is surprising, however, is that so little attention is paid to assessing whether students believe in what is being taught. Students may dutifully master such content as the differences between true experiments and correlational designs or the reasoning behind the use of placebo treatments, but they may fail to perceive psychology as a truly scientific enterprise—instead behaving as if informal observation and common sense provided adequate tests of psychological truth claims.

Perceiving Psychology as a Science

Do we really need to be so concerned with people's beliefs about the scientific nature of psychology? Even professionals within the field are not entirely in agreement on psychology's status. Kimble (1984) discussed psychology's "two cultures," documenting a scientist–humanist split within the field concerning issues such as behavioral determinism and systematic observation versus intuition as sources of basic knowledge. Korn (1985) lamented psychologists' tendency, in their preoccupation with scientific methodology, to ignore alternative ways of understanding human nature drawn from the humanities. Yet, Kimble also noted that, despite the diversity of views on certain disciplinary values and goals, psychologists nonetheless tend to align themselves on the deterministic side of the continuum. In addition, Korn observed that the view of psychology as a science is so widely shared among the professional membership that advancement of this view is stated as a goal in the American Psychological Association's bylaws.

At times, our students must think that we are overly concerned. The redundancy of methodology chapters in various courses and the repeated lectures about why psychology really is a science most likely communicate to students a certain defensiveness on our part. Yet, ample data suggest that the lay public continues to hold ambivalent views about psychology's scientific status. Wood, Jones, and Benjamin (1986) noted several surveys assessing psychology's public image in which only about half of all respondents characterized psychology as a scientific enterprise or believed that the scientific method would lead to a more accurate understanding of human behavior. In their own more recent survey of a demographically diverse sample of American respondents (approximately half of whom claimed to have taken one or more psychology courses), Wood et al. reported that 84% agreed strongly or somewhat that psychology is a science. Nevertheless, 83% also believed that day-to-day life provides training in psychology. Webb and Speer (1985) asked urban and rural Texans to write brief descriptive essays about psychologists, psychiatrists, physicians, counselors, teachers, and scientists. An analysis of descriptors extracted from the essays revealed that *psychologist* was most highly correlated with *psychiatrist* and most weakly associated with *scientist*. Psychologists appeared to be classified as "tender-minded" professionals dealing with "abnormal" phenomena, whereas scientists were seen as "tough-minded" professionals dealing with "normal" phenomena.

Considerable consensus exists among these and other authors (e.g., McCall, 1988) that effectively communicating psychology's status as a science is a critical concern for the discipline, but little attention has been paid to assessing

student beliefs and monitoring changes in the context of the college classroom. In one study explicitly addressing this issue, Friedrich (1990) hypothesized that students who engaged in more systematic and effortful processing of arguments supporting psychology's status as a science would adopt more proempirical views of the discipline (cf. Petty & Cacioppo, 1986). At the end of an introductory psychology course's methodology section, processing was manipulated by having half the students write an essay on the empirical nature of psychology and the importance of using the scientific method. The other half, having experienced the same lectures and readings on methodology, wrote essays on a course topic unrelated to psychology's scientific status. Later in the term, students in the proempirical essay condition were more likely to conduct an experiment of their own when given a choice of assignment, and they more strongly endorsed a view of psychology as a science on a face-valid self-report measure administered at the end of the term.

Educators' relative neglect of students' attitudes toward the scientific status of psychology may stem from several factors. One factor may be the mistaken assumption that once the technical aspects of research design and analysis are understood, belief in and endorsement of psychology's scientific approach necessarily follow. A second, and perhaps more pragmatic, factor is the absence of a psychometrically sound measure of how students perceive psychology as a science.

This article reports on a series of investigations designed to develop and validate such a self-report measure—the Psychology as Science (PAS) Scale. The attitude measure used in the persuasion study discussed earlier (Friedrich, 1990) consisted of a collection of face-valid items that intercorrelated highly in the study sample. The research presented herein represents a systematic effort to develop a similar self-report measure with more clearly established psychometric qualities. The assessment of course-induced attitude change illustrates one of several potential uses for a reliable and valid scale that addresses perceptions of psychology as a science. Beyond its potential use as an outcome measure for attitude change studies, such a scale may be informative as a correlate of other educational outcomes of interest, such as satisfaction with and performance in empirically focused psychology courses. The following studies address these issues in the context of establishing the measure's construct validity (Cronbach, 1988).

Pilot Work

Work on the PAS Scale began by establishing a conceptual domain to guide the generation of items. One of the primary concerns was to develop a measure that captured students' perceptions of psychology in their own terms (i.e., one that tapped the beliefs they may express if they viewed psychology as a legitimately scientific approach to understanding behavior). The scale was not designed to assess students' understanding of the more formal properties associated with particular philosophies of science (e.g., Popper, 1961) or to distinguish between perceptions of psychology as a basic or applied science (Fishman & Neigher, 1982). The resulting analysis suggests that students perceiving psychology as a science may be expected to (a) place psychology in their own subjectively defined category of science; (b) view psychology as similar to the natural sciences of biology, chemistry, and physics; (c) believe in the lawfulness and predictability of behavior; (d) perceive psychological research as a valuable and useful activity; (e) critically distinguish between popular psychology and more formal, research-based knowledge sources; (f) define the field in terms of research on behavior, not merely in terms of service orientation; and (g) view empirically oriented readings and course activities as appropriate, central content for psychology courses.

Items written to reflect these conceptual elements were pilot tested with samples of introductory psychology students and junior and senior psychology majors. The goal was to produce a unidimensional scale; therefore, items were retained in successive revisions based on the size of their item–total correlations and their contributions to the scale's internal consistency as measured by Cronbach's alpha (see Nunnally, 1978, for a discussion of this strategy). Initial validity concerns were addressed by preferentially retaining items that also (a) maintained a balance of positive and negative phrasings, (b) sampled broadly from the conceptual domain, and (c) tended to discriminate between introductory psychology students and upper level majors (a group presumably more steeped in an empirical outlook through their coursework).

The final pilot testing produced an alpha reliability of .74 and item–total correlations greater than or equal to .20 for a 15-item scale composed of 8 positively keyed and 7 negatively keyed questions (see Table 1). Although an item–total correlation of .20 is fairly low for a scale item, setting this as the lower threshold for retention preserved all items that contributed positively to alpha for the total scale and further served to maintain the balance of keying and content heterogeneity in the item pool (see Murphy & Davidshofer, 1994, for a brief discussion of bandwidth vs. fidelity concerns). As expected, junior and senior psychology majors had significantly higher overall scores on the measure than did introductory psychology students. The sequential, smaller samples used throughout the pilot testing did not permit a factor analysis of the scale's final version before the studies began. However, a factor analysis based on the sizable aggregate sample of respondents participating in these studies is reported in the Additional Studies section.

Validation Study 1

To provide empirical evidence of construct validity, PAS Scale scores for a sample of introductory psychology students were correlated with several criterion measures written to assess, in a less direct manner than the PAS Scale itself, students' views of psychology and the value they placed on its scientific methodology. In addition, the scale's discriminant validity was evaluated by assessing whether its scores may be contaminated by socially desirable responding.

Method

Participants. Eighty-seven students (36 men and 51 women) in my introductory psychology course participated during two regularly scheduled class sessions in the latter

Table 1. Items and Factor Loadings for the Psychology as Science (PAS) Scale

Items[a]	Factors I	II	III
3. An undergraduate degree in psychology should be a Bachelor of Science rather than a Bachelor of Arts degree.	.81	—	—
4. It's just as important for psychology students to do experiments as it is for students in chemistry and biology.	.60	—	—
12. Government funding of experimentation is as necessary for expanding what we know about psychology as it is for gaining knowledge in areas like chemistry and physics.	.60	—	—
13. The study of psychology should be seen primarily as a science.	.78	—	—
10. Psychological advice given in popular books and magazines is often as useful as more research-based claims.	—	.64	—
14. Courses in psychology place too much emphasis on research and experimentation.	—	.59	—
17. Psychologists working as counseling professionals don't need to be so concerned with research findings.	—	.67	—
18. Psychological theories presented in the media should not be trusted unless they are supported by experiments.	—	.40	—
20. Students get little benefit from learning about procedures for conducting psychology experiments.	—	.62	—
6. Research conducted in controlled laboratory settings is essential for understanding everyday behavior.	—	—	.40
7. Even though each person is unique, it is possible for science to find general laws explaining human behavior.	—	—	.62
8. Carefully controlled research is not likely to be useful in solving psychological problems.	—	—	.63
9. Our ability as humans to behave in any way we choose makes our attempts to predict behavior ineffective.	—	—	.53
16. Psychological research can enable us to anticipate people's behavior with a high degree of accuracy.	—	—	.68
19. Psychology will never be a true science because its predictions of individual behavior are seldom exact or certain.	—	—	.46
1. A psychology course is an important part of any person's college education. (filler)			
2. The different areas within psychology seem very unrelated to each other. (filler)			
5. An introductory psychology course should cover as broad a range of topics as possible. (filler)			
11. Studying specific examples of how psychology is used is the most interesting part of a psychology course. (filler)			
15. Psychology courses should spend time covering various job possibilities for people with psychology degrees. (filler)			

Note. Responses to each item were on a scale ranging from *strongly disagree* (1) to *strongly agree* (7). Total scores were calculated as sums after reversing appropriate items for scoring, with higher totals indicating greater inclination to perceive psychology as a science. For clarity of presentation, factor loadings < .40 are omitted.
[a]Items 8, 9, 10, 14, 17, 19, and 20 are reversed for scoring.

part of the semester. For each session, students received credit toward their course research participation requirement. Students were orally debriefed after the second testing session and received feedback on the results of the study later in the term.

Materials and procedure. Students were given a copy of the PAS Scale containing the 15 items, along with 5 fillers intended to make the scale's focus less transparent (see Table 1). The items were prefaced by the following written instructions:

> Listed below are a number of statements. Each represents an opinion regarding some aspect of psychology. You will probably agree with some of these statements and disagree with others; there are no correct or incorrect answers. Read each statement carefully and indicate the extent to which you agree or disagree by circling the appropriate number in front of each statement. For example:
>
> strongly disagree — strongly agree
>
> 1 2 3 4 5 6 7 Psychology should be a required course for college students.
>
> If you disagreed slightly with the above statement, you would circle the number 3. If you agreed strongly with the statement, you would circle the number 7. Be sure to give your opinion on every statement.

All students were told that their responses would be anonymous. Each provided a unique identification code used later for matching responses from the criterion measures.

After finishing the PAS Scale, students completed a 13-item version of the Marlowe–Crowne Social Desirability Scale (Crowne & Marlowe, 1964), a reliable and valid short form of the full scale (Reynolds, 1982). The Marlowe–Crowne assesses individual differences in the tendency to distort responses on self-report measures in socially desirable ways. Ideally, scores on the PAS Scale would be uncontaminated by a tendency for students more concerned with self-presentation to shift answers in the proscience direction presumably favored by an instructor or researcher.

During a class session 2 weeks later, 81 of the 87 students who participated in the first session completed a second survey that contained additional criterion measures for the study. This two-page survey was introduced as a set of questions and problems of interest to psychology majors who were doing research for a course. Students were again informed that responses would be anonymous, and no connection between this and the previous class survey was mentioned.

The first item asked students to put themselves in a position of making a decision about whether to use a lie detector test for evaluating courtroom testimony. They read that personal communications from five practicing psychologists had indicated that such tests are not valid or accurate; in contrast, experimental research from respected journals indicated that the tests are actually very good at detecting deceivers. Based only on this information, they were asked to provide a 9-point scale rating of their confidence that the tests are accurate measures of deception.

Evidence of construct validity for the PAS Scale was expected in the form of a positive correlation between perceiving psychology as a science and higher confidence scores (presumably due to a relatively greater emphasis placed on research evidence as opposed to personal testimony).

The next section of the survey noted that "people vary widely in their opinions about how effective they believe psychology-based therapy is in solving personal or emotional problems." Then, students answered two questions: "Overall, how effective do you believe psychology-based treatment is in solving the broad range of psychological difficulties people experience?" and "Personally, how willing would you be to see a psychologist for therapy if you were experiencing significant and continuing emotional distress?" Students indicated their responses on a scale ranging from *not at all effective/willing* (1) to *extremely effective/willing* (10). Introductory psychology students were presumed to be relatively unfamiliar with research on psychotherapy outcomes (e.g., Prioleau, Murdock, & Brody, 1983; Robinson, Berman, & Neimeyer, 1990), a topic not yet covered in the course. The rationale for including these outcomes as criterion measures was that, in a relatively naive population, greater belief in the scientific nature of the discipline should be associated with greater certainty that interventions based on accumulated knowledge would have their intended effects.

Next, students responded to two questions about curricular issues in psychology. The first asked students to rank the various categories of the university's general education requirements in terms of where the as-yet-uncategorized introductory psychology course should be placed. Specifically, the question sought to evaluate whether higher scores on the PAS Scale were associated with a greater preference for placing the course in the natural science category (along with other courses, e.g., chemistry, physics, and biology). The second question noted that a psychology major generally offers more specialized courses in the areas typically covered in the chapters of an introductory psychology text. Then, students were asked, "If 10 such courses were required to meet the major, how many of those 10 courses do you feel should have required labs (complete with once per week lab periods) where students must conduct and write reports on their own experiments?" PAS Scale scores were expected to correlate positively with the recommended number of required laboratory courses.

The survey concluded with a note stating that most of the respondents had already participated in several experiments as part of the research participation component of the introductory course. Students were then asked to indicate their level of agreement on a scale ranging from *strongly disagree* (1) to *strongly agree* (7), with each of three statements concerning their research participation experience. The statements were (a) "Overall, I have found participating in the experiments to be a worthwhile activity in the course," (b) "I feel as though I learned something valuable about the field of psychology by participating in these experiments," and (c) "What students gain by participating as subjects in experiments is important enough to justify keeping this component of the course as part of future introductory psychology classes." The tendency to view psychology as a science was expected to be associated with more favorable evaluations of their experience as research participants.

Results and Discussion

For my sample, the 15 items of the PAS Scale generated a coefficient alpha of .67; the Marlowe–Crowne short form produced an alpha of .72. As expected, these two measures were uncorrelated, $r(85) = .02$, ns, indicating that scores on the PAS Scale were not significantly contaminated by individual differences in the tendency to provide socially desirable responses.

As predicted, higher scores on the PAS Scale were associated with greater belief in the efficacy of psychotherapy, $r(79) = .36$, $p < .01$, and greater expressed willingness to seek therapy for important personal problems, $r(79) = .29$, $p < .01$. (Given the directional nature of these and other validity predictions, all reported significance levels reflect one-tailed tests unless otherwise indicated.) Contrary to predictions, PAS Scale scores were unrelated to students' tendency to give relatively greater weight to research articles over professional experience in estimating the likely validity of the hypothetical lie detector test, $r(79) = .01$, ns. This lie detector problem had been constructed to pit anecdotal information against more rigorous empirical evidence. However, phrasing the problem so that psychologists were the source of the anecdotal information may have placed respondents, particularly high scorers on the PAS Scale, in the awkward position of deciding between trusting science and trusting the word of experienced scientists.

As predicted, higher scores on the PAS Scale were correlated with recommending larger numbers of required laboratory courses for psychology majors, $r(78) = .20$, $p < .05$. However, PAS Scale scores were unrelated to students' preferences for placing the introductory psychology course in the natural science category of the university's core curriculum. This fact may reflect certain entrenched (and not necessarily unreasonable) beliefs that content rather than methodology should guide the classification of distribution requirements.

Finally, as expected, PAS Scale scores predicted students' reactions to their involvement in psychological research as part of the course's research participation component. Because the three items assessing students' reactions to their involvement were highly intercorrelated, they were combined into a single composite scale for which higher scores indicated more favorable responses. This measure was positively related to PAS Scale scores, $r(79) = .39$, $p < .001$. Thus, students expressing greater belief in the scientific nature of psychology judged the class's research participation component to be more personally worthwhile, educational, and worthy of inclusion in future sections of the course.

Validation Study 2

Additional validity data were collected from a sample of junior and senior psychology majors. For this population, PAS Scale scores were expected to correlate with students' enjoyment of and performance in their required courses in the psychology major. The curriculum required for these majors had a strong empirical and quantitative emphasis. Of the six required core courses—Research Design and Sta-

tistics I and II, Psychological Measurement, Sensation and Perception, Learning Theory, and Senior Seminar—all but the Senior Seminar had a required laboratory. The PAS Scale was also expected to demonstrate that it measured a construct distinct from general mental ability, enjoyment of critical thinking, or enjoyment of academic coursework in general; it was, however, expected to correlate positively with a measure of more general scientific interests.

Method

Participants. Fifty-two junior and senior psychology majors (9 men and 43 women) participated during regular classroom and laboratory sessions. The sample consisted of all students enrolled in the fall semester ($n = 22$) and spring semester ($n = 30$) sections of my senior-level course in Psychological Measurement. This course was a requirement for all department majors; thus, the sample included virtually the entire class of graduating majors along with a number of advanced juniors. Sample sizes associated with the statistics reported later reflect variations in attrition and attendance during the various testing sessions. Debriefing occurred after all relevant measures were collected, and the results served as a basis for class discussions and writing assignments.

Materials and procedure. Students completed the PAS Scale during a regular class session at the beginning of each term. No link between this and subsequent data collection was mentioned, and responses were matched by a code name that guaranteed student anonymity and appropriate experimenter blinding.

Fall semester students later completed Petty and Cacioppo's (1982) Need for Cognition Scale, a measure of people's tendency to engage spontaneously in and enjoy thinking. These students also completed the Multidimensional Aptitude Battery (MAB; Jackson, 1984), a paper-and-pencil, group-administered test of general mental ability designed to parallel the various subscales of the Wechsler Adult Intelligence Scale–Revised (WAIS–R; Wechsler, 1981). Full scale (Verbal + Performance) scores on the MAB have been found to correlate .91 with full scale scores on the WAIS–R (Jackson, 1984). Spring semester students provided self-calculated estimates of their grade point average (GPA) in the major based on the psychology courses these predominantly second-semester seniors had already completed. Given that these data were collected as part of an ongoing course, self-calculations were used to avoid any concerns about the experimenter (the course instructor) having direct access to students' official academic records.

Students in both sections also completed the Strong Interest Inventory (Hansen & Campbell, 1985), a general measure of occupational and vocational interests organized around Holland's (1973) theory of careers. Holland's typology of occupational interests consists of six general occupational themes—Realistic, Investigative, Artistic, Social, Enterprising, and Conventional—that are assessed by the Strong Interest Inventory through internally consistent sets of logically keyed items. Of particular relevance to this study, high Investigative theme scores are generally interpreted as indicating a strong scientific orientation and an interest in analytical activity; high Social theme scores are interpreted as indicating a humanistic outlook and an interest in working with people (Hansen & Campbell, 1985).

The Strong Interest Inventory also contains a series of occupational scales, including ones for psychologists, guidance counselors, and social workers. In contrast to the general occupational theme scales, the occupational scales are empirically keyed and consist of interest items that discriminate, for example, between doctoral psychologists and the general normative sample. Another empirically keyed scale on the Strong Interest Inventory is the Academic Comfort scale. Based on items that differentiate between academically strong and weak undergraduates, the scale is normed so that higher scores are associated with higher educational attainment in terms of school level and degree completed. It purports to measure people's tendency to see academic work as an enjoyable end in itself as opposed to a necessary means for achieving some other goal (Hansen & Campbell, 1985). For this study, students used machine-scored reports to record their Investigative and Social theme scores; their occupational scale scores for psychologist, guidance counselor, and social worker; and their Academic Comfort score.

Finally, approximately three quarters of the way through the semester, all students responded anonymously to a series of 9-point Likert-type course evaluation items. Specifically, students were asked to indicate their level of interest in the course material and (separately) their perceptions of how well the courses were taught for (a) the required courses in the major, considered collectively, and (b) the set of courses they had completed to fulfill the university's general education requirements (nonpsychology courses self-selected from a list of approved courses within various categories).

Results and Discussion

Only total scores on the PAS Scale were available for the fall semester students (due to a record-keeping error). For the spring semester students for whom individual item response data were available ($n = 27$), the PAS Scale produced a coefficient alpha of .71.

Ideally, perceptions of psychology as a science should be independent of mental ability or general interest in cognitive activity. One would, however, expect such perceptions to be related to performance in the major, possibly because such attitudes facilitate success in quantitative and empirical courses or because success in such courses makes students more receptive to this viewpoint. In support of these predictions, PAS Scale scores did not correlate significantly with either MAB scores, $r(19) = .06$, ns, or Need for Cognition scale scores, $r(20) = .22$, ns. PAS Scale scores did, however, show a significant positive correlation, $r(28) = .35$, $p < .05$, with self-calculated GPA in the major.

Students' tendency to view psychology as a science was expected to correlate with a more general tendency to express strong interests in things scientific as measured by the Strong's Investigative theme scale—generally the highest theme score among doctoral psychologists (Hansen & Campbell, 1985). PAS Scale scores were, in fact, positively correlated with scores on the Investigative scale, $r(41) = .28$, $p < .05$. To verify that the PAS Scale was not merely

tapping a tendency to score high on any theme related to psychology, the PAS Scale was also correlated with scores on the Social theme—the dominant theme for guidance counselors and social workers and one of the top three themes for psychologists (Hansen & Campbell, 1985). As expected, PAS Scale scores were unrelated to scores on the Social scale, $r(41) = .03$, ns.

Inspection of PAS Scale correlations with the occupational scale scores provides further evidence that the PAS Scale is not merely tapping interest similarity to people in psychology-related careers. Psychologist scores, $r(41) = .17$, guidance counselor scores, $r(41) = -.03$, and social worker scores, $r(41) = .00$, were all unrelated to the PAS Scale (all $ps > .10$). One may have expected a correlation with the psychologist scale, given doctoral psychologists' tendency toward high Investigative scale scores. However, the scale's underlying empirical-keying approach means that the scale includes any items clearly differentiating psychologists from others, not simply those items dealing with a liking for science. Similarly, the empirically keyed Academic Comfort scale has no obvious thematic content. It does, however, appear to reflect a positive weighting of Investigative theme scale items found to differentiate between students in terms of academic success and level of degree achievement (Hansen & Campbell, 1985). Interestingly, PAS Scale scores and Academic Comfort scale scores were positively correlated in this sample, $r(41) = .30$, $p < .05$.

The validity of the PAS Scale was further explored for the combined sample by examining its correlations with the course evaluation measures. PAS Scale scores should, in general, be positively correlated with interest in the material for the required psychology courses, given the courses' strong quantitative and empirical emphasis. Teachers' performance in these courses should also be viewed more positively as PAS Scale scores increase, given students' greater receptiveness to such content. These predictions were supported. PAS Scale scores correlated positively with interest in the material, $r(38) = .51$, $p < .001$, and with ratings of teacher performance for the set of core courses, $r(38) = .47$, $p = .001$. PAS Scale scores were expected to show weaker relations with interest in nonpsychology, general education courses (although science and mathematics courses still figured prominently in that set), as well as with ratings of how well those courses were taught. PAS Scale scores did, in fact, correlate only modestly with interest in general university core courses, $r(40) = .28$, $p < .05$, and were unrelated to ratings of teaching performance, $r(38) = .07$, ns.

Additional Studies

The studies described earlier provide considerable evidence of reliability and validity for the PAS Scale. Two other brief studies providing reliability and construct validity data are discussed next, along with a factor analysis of the PAS Scale based on the combined samples from these investigations.

In one study, a student experimenter presented 90 introductory psychology students with an anonymous questionnaire on "views about psychology" (the PAS Scale). Students completed the scale during a regularly scheduled Friday class period approximately 2 weeks into the term, near the end of the course's first unit that integrated the chapters on research methodology and social psychology. The student experimenter returned the following Monday and readministered the PAS Scale to 83 of the original respondents (all those in attendance). She noted that people's opinions on various issues can fluctuate somewhat and that students should simply respond as they felt at that time. The PAS produced a test–retest reliability of $r(81) = .76$, $p < .001$. Two days later, students took a regularly scheduled multiple-choice exam over this first unit of the course. For students in the sample who supplied anonymous ID codes for matching purposes, exam performance (total correct) was positively correlated with initial PAS scores, $r(76) = .28$, $p < .05$, and retest scores, $r(77) = .35$, $p < .01$.

In another study, PAS scores were obtained from two instructors' sections of the department's elementary statistics and research design course, which is taken almost exclusively by aspiring majors. Students were tested under explicit conditions of anonymity during regular class sessions at the beginning ($n = 45$, coefficient alpha = .72) and the end ($n = 37$, coefficient alpha = .79) of the semester. A 2 × 2 (Course Section × Time of Semester) analysis of variance on PAS Scale scores produced only a main effect for time of semester, $F(1, 35) = 4.59$, $p < .05$. As expected, given the nature of the course, mean PAS Scale scores increased from 79.6 at the beginning of the term to 83.2 at the end.

No placebo comparison group of randomly assigned participants was available. However, 62 introductory psychology students, enrolled in a class taught by a different instructor, provided PAS Scale scores during a regularly scheduled class session near the end of the preceding term (coefficient alpha = .81, $M = 76.7$). PAS Scale scores for the methodology students completing both testings ($n = 37$) were then compared to PAS Scale scores obtained from these late-term introductory psychology students. As expected, beginning-of-course scores for the methodology students did not differ significantly from those of late-semester introductory students, $t(97) = 1.42$, $p > .1$, two-tailed. Their end-of-term scores, however, were significantly higher than the introductory psychology students' scores, $t(97) = 3.03$, $p < .01$, two-tailed.

Throughout all the studies described thus far, the goal was to develop and evaluate the PAS Scale as a unidimensional measure of students' tendency to view psychology as a science. Such a measure may, nevertheless, have an underlying factor structure that deserves exploration. A large sample size suitable for factor analysis was obtained by combining PAS Scale data from all of the smaller studies discussed earlier. This aggregate data set included the PAS Scale responses of all student participants for whom individual item responses were available, and it included only the first testing for students who completed the PAS Scale more than once. The result was a sample of 311 respondents (99 men and 212 women) consisting of 239 introductory students and 72 upper level psychology majors or likely majors.

A principal components analysis produced three factors with eigenvalues greater than 1.1, accounting for 45% of the variance. A scree test supported retaining these first three factors; item loadings, based on a varimax rotation, are reported in Table 1. Factor 1 consists of items that

primarily address respondents' willingness to place psychology in the same conceptual or functional category as hard sciences, such as physics, chemistry, and biology. Factor 2 is composed of items that address beliefs in the need for psychological research and the value of methodological training. Factor 3 is composed of items that generally tap views of determinism and belief in the predictability of behavior. Separate factor analyses for introductory psychology students and upper level psychology students yielded similar factor solutions.

Although the PAS Scale appears to have an underlying factor structure, it is unclear whether the associated PAS subscales are differentially predictive. A reanalysis of the main findings from the first two validation studies revealed occasional but small differences in the magnitude of criterion relations for the three scales. Overall, the strongest and most consistent relations with criterion measures were obtained with PAS Scale total scores. However, sample sizes were quite small for addressing questions of differential predictiveness, and criterion measures had been chosen because of their presumed relevance to composite scores, not to the subsequently identified subscales. Thus, the practical and conceptual importance of the PAS Scale's factor structure remains to be clarified.

In terms of normative data for total scores on the PAS Scale, the aggregate sample of introductory psychology students ($n = 239$) had a mean of 77.8, a standard deviation of 10.0, and a coefficient alpha of .77. Also for the introductory psychology sample, for which sample sizes permitted a more meaningful comparison, women tended to obtain higher average scores ($M = 78.8$) than did men ($M = 75.9$). The smaller sample of upper level psychology students ($n = 72$) had a slightly higher mean of 79.3, a standard deviation of 9.3, and a coefficient alpha of .71. Note, however, that these scores reflect the beginning-of-term rather than end-of-term testings for the introductory methodology students in the sample.

General Discussion

My studies provide consistent evidence supporting the psychometric quality of the PAS Scale as a measure of student belief in the scientific nature of psychology. In terms of reliability, the PAS Scale demonstrated short-term test–retest stability ($r = .76$) and levels of internal consistency (coefficient alphas in the .70 to .80 range) appropriate for research purposes. PAS Scale scores for introductory psychology students were positively correlated with their belief in the efficacy of psychotherapy, recommendations for more required laboratory courses in the psychology major, greater satisfaction with the course's research participation requirement, and enhanced exam performance on material integrating topics in methodology and social psychology. Among upper level psychology students, PAS Scale scores were positively correlated with responsiveness to the department's empirically oriented major requirements as measured by (a) perceptions of teaching quality, (b) interest in course material, and (c) graded academic performance. In addition, PAS Scale scores were positively correlated with scores on a science-related occupational interest measure and demonstrated expected increases over the duration of a semester-long course in elementary statistics and research design. In terms of discriminant validity, scores on the PAS Scale were unrelated to measures of socially desirable response tendencies, general mental ability, need for cognition, instructional satisfaction with nonpsychology courses, and scores on occupational interest dimensions common to psychology majors but unrelated to scientific interests.

The PAS Scale is not intended to measure whether students associate psychology with the formal properties specified by various philosophies of science (e.g., Popper, 1961). It is instead designed to assess students' tendency to view psychology as the natural sciences are more generally viewed (i.e., as deriving authority from an empirical research base addressing lawful, predictable phenomena). The PAS Scale does not treat scientific psychology as an exclusively laboratory-based, theory-driven enterprise. Rather, items are included that also reflect psychology's role as a behavioral technology in applied contexts. No implicit assumptions are made about the relative value of treating psychological science as an end in itself versus a practical tool for promoting human welfare (cf. Fishman & Neigher, 1982), thus avoiding some of the conflicts that have separated psychology's more scientific and humanistic cultures (Kimble, 1984).

Items on the PAS Scale are also not intended to assess factual knowledge (e.g., several items address the issue of behavioral predictability and lawfulness). Given the modest effect sizes reported in most psychological research, it would be inaccurate to perceive behavior as highly predictable in most real-world contexts. But to the extent that such items assess underlying assumptions that behavior is (in principle) predictable and that experimental findings should somehow be replicable, they accurately tap epistemological beliefs normally associated with other established sciences (cf. Hedges, 1987).

Results of the validation studies suggest various uses for the PAS Scale beyond an outcome measure for course-related attitude change. For example, the observed links between PAS Scale scores and both student performance and teaching evaluation measures raise several questions. Many instructors of methodologically intensive courses struggle to produce high levels of student achievement and favorable evaluations of teaching performance. Are some of the difficulties in achieving these goals simultaneously a function of students' receptiveness to a scientific perspective on behavior and not simply a consequence of the alleged "dryness" or conceptual difficulty of the material? Would addressing the underlying belief system have a greater impact on student responsiveness than changing other pedagogical elements (e.g., lecture vs. discussion and simulated vs. live data) for these courses?

Despite the fact that the PAS Scale has been validated on and is intended to be used with a college student population, my findings also have implications for psychology's broader public image. As Wood et al. (1986) noted, the public has an ambivalent and often mistaken view of psychology as a scientific discipline. Psychologists have long been concerned with the misperceptions with which students often enter, and sometimes leave, their psychology courses (e.g., Gardner & Dalsing, 1986). These misperception studies, however, have focused largely on knowledge

of research conclusions and terminology, ignoring possible misperceptions linked to the epistemological underpinnings of the field.

Shaffer (1977) suggested that these epistemological issues may be critical for psychology's continued support, not only among the general populace but also among elected officials representing public interests in the funding of psychological research. In her analysis of Senator William Proxmire's famous "golden fleece" awards, bestowed on what he perceived to be silly or wasteful research projects receiving government support, Shaffer challenged the assumption that resistance to social science research funding represents blatant anti-intellectualism. Instead, she argued that hostility to social science research emerges at least in part from a failure of the public and elected officials to share in the epistemological assumptions of social scientists. Human behavior is often seen as mysterious; at other times, it is seen as transparent, with the "wisdom of the ages" and casual observation serving as adequate tests of truth claims. Given such epistemological assumptions, research in psychology and related social science disciplines is often judged to be, at best, an unnecessary expenditure of energy and funds and, at worst, a meddlesome, reformist political agenda (Shaffer, 1977).

The shaping of public attitudes concerning psychology's scientific status goes well beyond the scope of this article. Nevertheless, the college classroom is one of the primary places in which psychology can be presented as a true science of behavior committed to research and practice. How students come to share in this perspective is an educational outcome that should concern teachers, for whom public opinion "begins at home." Development of the PAS Scale is a first step toward stimulating further research on students' epistemological orientation to the field.

References

Cronbach, L. J. (1988). Five perspectives on the validity argument. In H. Wainer & H. Braun (Eds.), *Test validity* (pp. 3–17). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Crowne, D., & Marlowe, D. (1964). *The approval motive*. New York: Wiley.

Fishman, D. B., & Neipher, W. D. (1982). American psychology in the eighties: Who will buy? *American Psychologist, 37*, 533–546.

Friedrich, J. (1990). Learning to view psychology as a science: Self-persuasion through writing. *Teaching of Psychology, 17*, 33–37.

Gardner, R. M., & Dalsing, S. (1986). Misperceptions about psychology among college students. *Teaching of Psychology, 13*, 32–34.

Hansen, J. C., & Campbell, D. P. (1985). *Manual for the SVIB SCII* (4th ed.). Palo Alto, CA: Consulting Psychologists Press.

Hedges, L. V. (1987). How hard is hard science, how soft is soft science?: The empirical cumulativeness of research. *American Psychologist, 42*, 443–455.

Holland, J. L. (1973). *Making vocational choices: A theory of careers*. Englewood Cliffs, NJ: Prentice Hall.

Jackson, D. N. (1984). *Multidimensional Aptitude Battery manual*. Port Huron, MI: Research Psychologists Press.

Kimble, G. A. (1984). Psychology's two cultures. *American Psychologist, 39*, 833–839.

Korn, J. H. (1985). Psychology as a humanity. *Teaching of Psychology, 12*, 188–193.

McCall, R. B. (1988). Science and the press: Like oil and water? *American Psychologist, 43*, 87–94.

McGovern, T. V., Furumoto, L., Halpern, D. F., Kimble, G. A., & McKeachie, W. J. (1991). Liberal education, study in depth, and the arts and sciences major—Psychology. *American Psychologist, 46*, 598–605.

Murphy, K. R., & Davidshofer, C. O. (1994). *Psychological testing: Principles and applications* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.

Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.

Petty, R. E., & Cacioppo, J. T. (1982). The need for cognition. *Journal of Personality and Social Psychology, 42*, 116–131.

Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 19, pp. 123–205). New York: Academic.

Popper, K. R. (1961). *The logic of scientific inquiry*. New York: Basic Books.

Prioleau, L., Murdock, M., & Brody, N. (1983). An analysis of psychotherapy versus placebo studies. *Behavioral and Brain Sciences, 6*, 275–310.

Reynolds, W. M. (1982). Development of reliable and valid short forms of the Marlowe–Crowne Social Desirability Scale. *Journal of Clinical Psychology, 38*, 199–225.

Robinson, L. A., Berman, J. S., & Neimeyer, R. A. (1990). Psychotherapy for the treatment of depression: A comprehensive review of the controlled outcome research. *Psychological Bulletin, 108*, 30–49.

Shaffer, L. S. (1977). The golden fleece: Anti-intellectualism and social science. *American Psychologist, 32*, 814–823.

Webb, A. R., & Speer, J. R. (1985). The public image of psychologists. *American Psychologist, 40*, 1063–1064.

Wechsler, D. (1981). *Manual for the Wechsler Adult Intelligence Scale–Revised*. New York: Psychological Corporation.

Wood, W., Jones, M., & Benjamin, L. T. Jr. (1986). Surveying psychology's public image. *American Psychologist, 41*, 947–953.

Notes

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