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item loadings on the factors make them representative of overall factor scores. Because others labeled the factors "Skill" and "Rapport" we did not believe that item content per se was the focus of our study and thus did not include individual items in the report. Nevertheless, the three items were—Skill-1: Instructor had an effective and clear presentation style, Skill-2: Lecture material was coherently organized, and Rapport: Instructor welcomed questions and comments.

6. The correlations of Skill items with the overall instructor rating ($r = .50$ and $r = .69$, respectively, in our data) are much larger than is the correlation of the factor score with the overall instructor rating ($r = .39$) from the study that generated these factors. Pasnak's implication that by using more items factor measurement will become more reliable and predictive validity may increase is not supported by these data. The factor score showed less correlation with the overall instructor rating than did the individual Skill items.

7. Pasnak made the point that additional variables that contribute to a factor should be included. Now he wants to exclude variables that also correlate with factors. He cannot have it both ways. The fact that the correlations are small, but significant, suggests that they accounted for some variance. Our purpose was to disentangle student ratings from confounding emotional factors that may limit their interpretation. This question is still worthy of further study.

8. The point at issue here is not the power of MANOVA or the small correlations we found, but rather whether design flaws might exaggerate those effects. However, it is possible that those "flaws" may have suppressed the size of the correlations. It is important to recognize that more variables than emotional and grade variables relate to student ratings. We proposed a model to adjust for confounding variables thereby improving the interpretation of student ratings.

9. We do not wish to argue semantics with Pasnak. We used the word *direction* to describe the fact that from sample to sample the correlations reversed their relative magnitude. His suggested explanation of this reversal, sample bias, is not tenable because the data are similar for all classes. He inferred a difference among instructors not from the measures used here, but from a single summary item from a different scale used in past semesters. In any case, instructors were not the unit of analysis in this study. The 95 students who participated in the study constituted the unit of analysis. Pasnak's last point is not based on any evidence. It could be argued equally well that the correlational structure should be robust enough to withstand small variations among instructors. It is his assumption that instructors caused the differences. Perhaps other factors caused this correlational pattern. It seems that Pasnak wants to interpret cause and effect from correlation!

Pasnak raises two additional questions about assumptions. We address each in turn.

First, Pasnak clearly misunderstood the relationship between emotional states and student ratings. We tested a null hypothesis of no difference in emotional state. Our alternative hypothesis was that emotional state would have some relation to student evaluations. We found such a relation and then attempted to adjust ratings for its influence.

Again, it is Pasnak who attempts an interpretation of that relationship that implies cause and effect. If, as he contends, there is little cause for concern, then why does he insist on reinterpreting our results?

Second, the simple dichotomy that Pasnak sets up separating good and poor instructors is absurd. Most readers can recall instructors who had great rapport, yet taught students nothing, or instructors with poor rapport, from whom students learned significant amounts. Also they can recall a greater majority that fell between the extremes Pasnak described. His final comment in this section reflects Pasnak's misunderstanding of both our paper and factor analysis. Nowhere do we imply that skill and rapport are orthogonal constructs. Skill and Rapport are labels of orthogonal factors found in prior analyses of student ratings. Pasnak appears to believe that factor labels are isomorphic with constructs. We think his position here is unrealistic.

Our finding that hostile, anxious, depressed students, at the end of a course, rated instructors poorly is worthy of controlled study using one of the general designs suggested by Pasnak. We believe, however, that a more critical issue than design choice is the measurement issue to detect student emotional states. Further researchers would be well-advised to focus attention on improved assessment techniques that are more sensitive to student emotional states and changes in emotional states. We are not convinced that the small significant correlations we detected accurately reflect the true effect size of emotional state variables but, rather, represent a limitation of the particular measuring device employed.

Pasnak is worried that our conclusions will be remembered rather than the problems with our evidence. Yet, he repeatedly wishes to offer new interpretations of the same evidence. Thus, aren't his comments subject to the same "sleeper" effect?

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Note

Requests for reprints should be sent to Albert R. Hollenbeck or Arnold C. Small, Department of Psychology, George Mason University, 4400 University Drive, Fairfax, VA 22030.

Misconceptions About Psychology Among College Students

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A questionnaire consisting of 60 false statements related to psychology was administered to 531 students at 2 universities.

Students marked each statement as true, false, or don't know/no opinion. Analysis of true responses indicated a decreasing level of misconceptions as students accumulated college credit hours in general and psychology credit hours specifically. Implications for teachers of psychology are discussed.

Several studies during the last 3 decades have indicated that college students hold many mistaken beliefs about psychology (Brown, 1983; Gutman, 1979; Holley & Buxton, 1950; McKeachie, 1960; Vaughan, 1977). Furthermore, McKeachie (1960) and Vaughan (1977) reported that such misconceptions are reduced only slightly after students have completed the introductory psychology course. These studies used either the Vaughan Test of Common Beliefs (TCB), which consists of 80 false statements, or a similar true-false test of frequently held misconceptions about psychology. Answers on these tests are limited to true or false. It is possible, therefore, that students marked some statements true (or false) simply because they had no other choice.

To remedy this problem we constructed a test in which the students could mark a series of statements as true, false, or don't know/no opinion. This last category was intended as an escape clause that would reduce the statements marked true to those about which the students actually held an opinion or belief. In addition, we collected other data in order to determine what effect students' total college credit hours in general and total credit hours in psychology might have on the number of their misconceptions.

Procedure

The subjects were 531 students, 451 at the University of Southern Colorado (USC) and 80 at Colorado State University (CSU). The test was administered during the first 4 weeks of the semester to CSU students in Introductory Psychology class and to USC students in a variety of undergraduate psychology courses, including Introductory Psychology.

A modified form of Vaughan's (1977) TCB test was constructed. The number of items was reduced from 80 to 60 by removing those that previous studies had shown few students considered to be true or that the present authors considered to be unclear. The resulting test consisted of 60 false statements about psychology that students could mark true, false, or don't know/no opinion. For example, two of the statements were: "Good hypnotists can force you to do anything they want you to do" and "Genius is closely akin to insanity." Students were told that the items represented controversial statements about psychology and that we were interested in their opinions about them. Students also reported the total number of college credit hours and the number of credit hours in psychology they had earned.

Results and Discussion

The percentage of students marking each item as true was calculated. Because we were interested in misconceptions, no analysis was conducted on percentages marked false or don't know/no opinion. Incidentally, students marked the

don't know/no opinion choice a mean of 12.18% of the time.

We compared true responses (i.e., misconceptions) in the present study with 14 identical statements from Vaughan's (1977) study for which she provided data on the percentage of true responses. For these 14 common statements the true response rate was lower for 12 (85.71%) of the statements in our study. The average reduction for the 14 common questions was 7.98%. As expected, the option of responding don't know/no opinion had the effect of lowering the indicated level of misconceptions and probably gives a more accurate representation of the true level of misconceptions for each item. We believe that providing no option but stating true or false inflates these levels by forcing opinions on each item, even if the student has no knowledge or strong opinion related to the statement. It is also possible that the reduced number might be due to changes in students' attitudes since Vaughan's study in 1977 or to differences in the populations sampled in the two studies.

For all students, an average of only 22.70% of the 60 false statements were held to be true as compared to Vaughan (1977) who found 39.46% of her 80 statements were held to be true. A comparison between the two universities was not feasible because of the small sample of CSU students and because of demographic differences between the samples.

Figure 1 shows the percentage of all students marking items true at five different levels of total college marking hours earned. The five levels correspond to what is typically freshman, sophomore, junior, senior, and postgraduate standing. The figure shows a slight increase between freshman and sophomore standing and then a steady decline through the senior year with a small increase at the postgraduate level. An analysis of variance indicated this main effect to be highly significant, $F(4,463) = 6.28, p < .0001$. A Tukey honestly significant difference (HSD) post hoc multiple-comparison analysis indicated that the only significant dif-

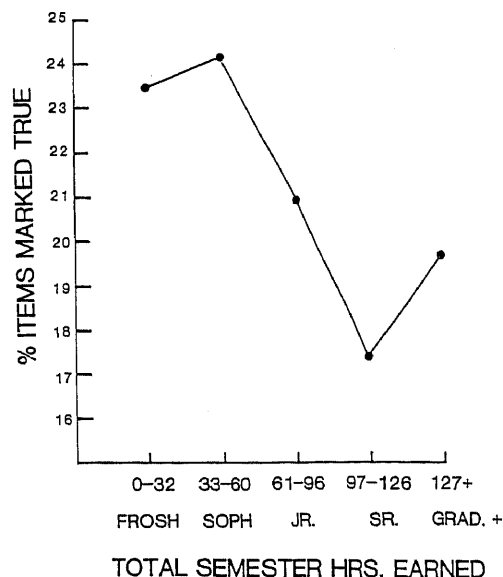


Figure 1. Level of misconceptions about psychology at five categories of total credit hours earned in college. Sample included 243 freshmen, 97 sophomores, 58 juniors, 36 seniors, and 34 graduate students.

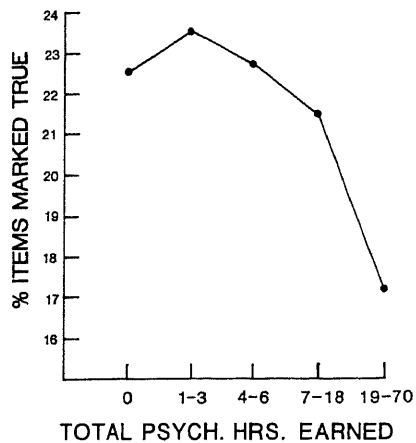


Figure 2. Level of misconceptions about psychology at five categories of total psychology credit hours earned. The number of subjects for each category was 121 for 0 credit hours, 154 for 1-3 hours, 87 for 4-6 hours, 47 for 7-18 hours, and 44 for 19-70 hours.

ferences at the .05 level were between the freshman-senior and sophomore-senior groups. Thus, the data indicate an overall decreasing level of misconceptions as students progress through their college career.

Figure 2 shows the level of misconceptions for all students at five categories of different credit hours earned in psychology. The categories correspond to credit hours generally completed with no psychology courses (0 hours), one course (1-3 hours), two courses (4-6 hours), a few courses (7-18 hours), and several courses (19-70 hours). Figure 2 shows a generally declining level of misconceptions with increasing number of hours completed, $F(4,348) = 4.37$, $p = .0018$. A Tukey HSD comparisons test revealed the students with several courses (19-70 hours) to be significantly different from those with none, one, or two courses, with all other comparisons not significant. McKeachie (1960) and Vaughan (1977) have shown that the level of misconceptions declines only slightly after completion of the introductory course and the present data confirm no significant change until several courses have been completed. It is reassuring, however, to see a steady decline as increasing numbers of credit hours are completed in psychology.

It should be noted that Figures 1 and 2 overlap to some extent. Total college hours (Figure 1) and total psychology credit hours (Figure 2) are overlapping in that the two occur simultaneously to a certain extent. The nature of the sampling procedure prevented the use of a complex analysis of variance that would have allowed a delineation of any interaction.

Overall, the results show a general decline in the level of misconceptions as students progress through college. Additional college training in general, and psychology training specifically, apparently aids students in recognizing the falsity of these common misconceptions.

Studies of misconceptions are valuable because they allow a determination of what false impressions about psychology are particularly impervious to change and allow teachers to focus additional attention on those areas. Although it is encouraging that the present data indicate a steady decline in misconceptions with increasing educa-

tional levels, it is discouraging that even after several courses in psychology, 30% still believe a schizophrenic is someone with a split personality and that nearly one half believe children's IQ scores have little relationship to school performance.

The observation that such misconceptions are reduced only slightly after students have completed the introductory psychology course indicates that such beliefs are strongly held. Apparently not enough time is devoted to debunking these myths in the introductory or lower-level courses. Many of these beliefs are not based on factual information but rather are a part of the "conventional wisdom" that students bring with them to the college setting. These beliefs probably derive from parental influences and the acquisition of misleading information from the mass media. Whatever the source, such beliefs are tenaciously held and can, perhaps, be dislodged through greater emphasis in the lower-level courses.

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Notes

1. This research was supported by a grant from the Research Advisory Committee at the University of Southern Colorado.
2. The individual items and percentage of true responses for each item are available from the authors.
3. We thank Reneé Hund and Ron Dehn for their assistance in this project. We also thank Richard Suinn for collecting data at Colorado State University.
4. Requests for reprints should be sent to Rick M. Gardner, Center for Psychology and Mental Health, University of Southern Colorado, Pueblo, CO 81001.

Ambiguous Psychological Misconceptions

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True/false test questions have been used to identify misconceptions about psychology (e.g., Vaughan, 1977). Brown (1984) examined nine such questions and found that the "correct" answers were misleading. In this article seven additional true/false test questions are examined and shown to be too ambiguous to be used in measuring students' understanding of psychology.

Beginning psychology students hold some misconceptions about psychology as shown through studies that use objective test questions about topics in psychology (Gutman, 1979; Lamal, 1979; Vaughan, 1977). Sometimes the questions used in these studies are ambiguous. Brown (1984) examined nine of the questions used in tests to identify misconceptions and found that the "correct" answers were misleading. Brown concluded that because the findings of psychology are complex, they frequently cannot be summarized in simple, objective statements. Lamal (1979) had psychology instructors evaluate a set of items used to measure psychological misconceptions and found that the answers to nine of the questions were disputed by at least one instructor.

Many of the statements used in these tests of students' understanding of psychology are too ambiguous. The following seven true/false statements are examples of this ambiguity. According to the tests, each statement is false. However, the correct answer depends on which way the statement is interpreted.

1. "The human being has five senses" (Brown, 1983, p. 208).

Does this statement mean "The human being has a maximum of five senses" or "The human being has at least five senses"? If the first possibility is meant, then the answer is false because it does not allow for such senses as the vestibular and kinesthetic. However, if the second possibility is meant, then the answer is true because humans do indeed have five senses. To say that a car has three wheels is not to deny that it has four.

2. "The nose is the primary olfactory organ" (Brown, 1983, p. 208).

Does this statement mean "The nose, excluding its four cavities, is the primary olfactory organ" or "The nose, including its four cavities, is the primary olfactory organ"? If the first possibility is meant, then the answer is false because olfaction occurs primarily in the four chambers. However, if the second possibility is meant, then the answer is true because olfaction occurs through the olfactory epithelium, which is confined to areas on the walls of the olfactory cleft, one of the four cavities of the nose (Cohen, 1969).

3. "Research has shown that in general some form of therapy is no more effective than no therapy at all" (Brown, 1983, p. 208).

I showed this statement to three college professors (of music, English, and psychology) and none of them understood it. The confusion seems to arise because of the double negatives and the ambiguous "in general." The issue seems to be whether most research supports the effectiveness of psychotherapy. Some research has shown therapy to be effective (Bergin, 1966, 1971; Meltzoff & Kornreich, 1970; Smith & Glass, 1977) and some has shown therapy to be ineffective (Bandura, 1969; Eysenck, 1952; Truax & Carkhuff, 1967). I suspect that more research has shown psychotherapy to be effective than ineffective, but to find out whether the student knows this, the item needs clarification.

4. "Children's IQ scores have little relationship with how well they do in school" (Vaughan, 1977, p. 139).

Does this statement mean "Children's IQ scores have little relationship with how well they do in school in academics" or "Children's IQ scores have little relationship with

how well they do in school in creativity or social skills"? If the first possibility is meant, then the answer is false because IQ scores correlate with academic success in school (Cronbach, 1970). However, if the second possibility is meant, then the answer is true because scores from tests of children's creativity and social maturity do not correlate well with scores from traditional IQ tests (Anastasi, 1982; Wallach & Kogan, 1965).

5. "The basis of the baby's love for his mother is the fact that his mother fills his physiological needs for food, etc." (Vaughan, 1977, p. 139).

Does this statement mean "The primary basis of the baby's love for his mother is the fact that his mother fills his physiological needs for food" or "The primary basis of the baby's love for his mother is the fact that his mother fills his physiological needs for food, and other needs"? If the first possibility is meant, then the evidence indicates that the answer is false because Harlow and Harlow (1966) showed that baby monkeys spend more time on surrogate mothers that provide physical contact (sometimes called "contact comfort" or "tactual comfort") than on surrogate mothers who provide food. Love, in this instance, is defined as time spent on the surrogate monkey. Presumably, this finding can be generalized to humans. However, if the second possibility is meant, then the answer is true because physical contact can be included in "other needs" as provided for in the statement by the "etc." Kagan and Havemann (1968) list physical contact as a stimulus need for organisms and Coon (1985) suggests that early stimulation of infants through contact comfort contributes to their physical and psychological health. Also, Harlow (1958) found that the baby monkeys spent more time on the surrogate mothers that provided both food and physical contact than on surrogate mothers that provided only physical contact, which indicates that love of babies for their mothers is based partly on the fact that the mothers provide food. Furthermore, would it occur to a beginning psychology student that a mother would supply food to a baby, especially a young one, without providing physical contact at the same time?

6. "A schizophrenic is someone with a split personality" (Vaughan, 1977, p. 139).

Does this statement mean "A schizophrenic is someone with a multiple personality" or "A schizophrenic is someone with a personality split off from reality"? If the first possibility is meant, then the answer is false because, according to the *DSM-III* (American Psychiatric Association, 1980), schizophrenia, a psychosis, is distinguished from multiple personality, a dissociative disorder. However, if the second possibility is meant, the answer is true because schizophrenia means literally splitting of the mind so that "the personality has been detached from reality" (Kendler, 1968, p. 512) and the schizophrenic experiences a "loss of contact with reality" (Lahey & Ciminero, 1980, p. 263). The splitting of the mind from reality involves psychological processes that fragment thought, perception, and emotion (Hassett, 1984).

7. "Women are more likely than men to say they are lonely" (Brown, 1983, p. 208).

Does this statement mean "In general, women are more likely than men to say they are lonely" or "Among students, women are more likely than men to say they are lonely"? If