ON MISCONCEPTIONS ABOUT BEHAVIOR ANALYSIS AMONG UNIVERSITY STUDENTS AND TEACHERS

Erik Arntzen Akershus University College

Jon Lokke and Gunn Lokke Ostfold University College

Dag-Erik Eilertsen University of Oslo

Students frequently show misconceptions regarding scientific psychology in general and basic concepts in behavior analysis in particular. We wanted to replicate the study by Lamal (1995) and to expand the study by including some additional statements. In the current study, the focus was on misconceptions about behavior analysis held by undergraduates, by students in a master program in behavior analysis, by teachers in university colleges, and by a group of students without any formal training in psychology. The results showed that participants in all groups showed misconceptions. Students in the master program held the fewest misconceptions, while traditional psychology students showed most misconceptions about behavior analysis. Factors that might influence number and resistance of misconceptions are discussed.

Key words: misconceptions, behavior analysis, students, teaching strategies

Misconceptions can be regarded as "beliefs that are held contrary to known evidence" (Taylor & Kowalski, 2004, p. 15). Misconceptions in science-related education seem to be present in all sciences, including natural sciences (Fletcher & Francis, 2004). Comins (2001), for example, listed more than 1,700 misconceptions regarding astronomy. However, not all incorrect beliefs are misconceptions. Thus, it is important to distinguish misconceptions from incorrect remembering, as for example in remembering the order of the planets from the sun. Hardy, Jonen, Moller, and Stern (2006) studied misconceptions related to the concepts of density and buoyancy force in 161 third-grade students and found that the number of misconceptions was reduced as a function of instructional support. Two other examples are misconceptions in the comprehension of hierarchical graphs (Korner, 2005) and in the areas of politics and law (Janicki, 2006).

Some of the results were presented as a poster at the Association for Behavior Analysis conference in Atlanta, 2006.

Correspondence concerning this manuscript should be addressed to Erik Arntzen, Akershus University College, PO Box 423, 2001 Lillestrom, Norway. E-Mail: erik.arntzen@equivalence.net.

In the general field of psychology (Stanovich, 2007), as well as in the field of behavioral analysis, misconceptions have been widespread in both students and scholars (Gardner & Hund, 1983). Tests for misconceptions among students are found in the early psychological literature (e.g., Holley & Buxton, 1950), and misconceptions have been found not only among students but also among writers of textbooks in English (Morris, 1985; Todd & Morris, 1983) and Norwegian (Reichelt & Skjerve, 1983). It is important to unveil students' misconceptions as soon as possible, and several researchers have argued that one important task of psychology teachers is to change students' opinions/knowledge about basic terms in psychology (Lamal, 1995; McKeachie, 1960; Shields & Gredler, 2003). However, misconceptions among students seem to be persistent regardless of the subject matter of psychology courses. Vaughan (1977) claimed that an introductory course in psychology "has little influence on their erroneous beliefs" (p. 140).

Comins (2001) outlined a strategy to identify the origins of misconceptions. An analysis of those origins might be helpful in understanding the functions of misconceptions, and in the development of techniques to prevent misconceptions in the future. The sources of misconceptions are diverse (Stanovich, 2007). Inaccurate information in textbooks and lectures, biased information due to conflicts of interest in academia, and the assumption that enough exemplars and facts will induce fewer errors are important sources. Furthermore, too little focus has been on critical thinking skills (Benassi & Goldstein, 2006), and lecturers have seldom addressed misconceptions directly. This might enhance beliefs contradicted by evidence. Taylor and Kowalski (2004) reported that participants in their study attributed 30% of their misconceptions to ignorance about the source, 20% to the media, 19% to personal experience, 16% to reading, and 15% to classroom learning.

Logically, one would assume that there is a correlation between grades and number of misconceptions. Vaughan (1977) introduced the Test of Common Beliefs (TCB) and found that the course had little effect on different misconceptions. She also examined the relation between misconceptions and course performance and found no such relation. In contrast, Gutman (1979) found that A-students changed their beliefs more often than F-students did. Thus, the correlation between grades and change in beliefs should be studied more systematically. Kowalski and Taylor (2004) suggested that critical thinking is the important factor in changing misconceptions.

Misconceptions About Behavior Analysis

Due to a widespread use of technical terms and widespread misinterpretations within the field of behavior analysis (Todd & Morris, 1992), changing students' misconceptions or myths has been considered important. In the mid-1980s, Morris (1985) argued that the behavior-analytic community had not been active enough in disseminating unbiased information about behavior analysis, and that there are three primary sources of misunderstandings about behavior analysis: the media, educational materials, and professional materials.

One early example from the educational material source is a philosophical essay on Skinner's science by Puligandla (1974). Puligandla's essay was published the same year that Skinner (1974) presented a list of 20 issues commonly, but wrongly, held true about behaviorism. The first misunderstanding was that behaviorism ignores consciousness, feelings, and states of mind (see also Wyatt, 2001). Puligandla presented radical behaviorism as a school of psychology that eschewed all inner states and "in short, anything that is supposedly accessible only to the subject and goes under his skin and hence not open to objective inspection and analysis" (p. 2). This statement is in contrast to the established fact that radical behaviorists do take private events into consideration but methodological behaviorists do not (Skinner, 1945). Puligandla's introduction is a veritable overview, including several misunderstandings and misconceptions mentioned by Skinner (1974) and others (Wyatt, 2001). Puligandla wrote in his preface that the purpose of the book "is to critically examine B. F. Skinner's science of behavior and behavioral utopia" (p. ix). In his conclusion, Puligandla emphasized that Skinner's work was not unimportant, but was only adequate for the modification of behavior in a "limited sphere" (p. 96).

DeBell and Harless (1992) described five general areas of misconceptions regarding Skinner's writings: Skinner (a) discarded the role of physiological processes and genes in the understanding of behavior, (b) believed any behavior can be conditioned, (c) neglected the uniqueness of the individual, (d) viewed punishment as a preferred method of behavior control, and (e) denied the existence of internal states. DeBell and Harless found that participants at all levels of education showed numerous misconceptions concerning Skinner's work. At all levels there were more errors on items that covered the myths (e.g., Skinner believes that genes play an important role in shaping behavior) than on general items (e.g., according to Skinner, *negative reinforcement* is another term for *punishment*). Lamal (1995) changed the questionnaire used by DeBell and Harless so that all items referring to Skinner were changed to behavior analysis or behavior analysts. The results showed that only 3 of 13 misconceptions were widely held, and these misconceptions were resistant to change.

Sheldon (2002) argued that there would be a correlation between misrepresentation in textbooks and students' reporting of misconceptions. He also argued that students' misconceptions often are related to key terms within behavior analysis, for instance, the distinction between *negative reinforcement* and *punishment*. The effect, that is, a change in response rate as a result of an environmental consequence, is often not described in textbooks (Sheldon, 2002; Todd & Morris, 1983). Furthermore, textbooks often do not take into account the relativity of reinforcers or punishers (Sheldon, 2002).

An interest in discovering and changing misconceptions in the field of behavioral analysis might be defended with the following argument: Misconceptions can interfere with the generally accepted goals of psychology: description, understanding causes, prediction, and influencing behavior via controlling causes. Inaccurate descriptions of causes may lead to harmful treatments, ineffective treatments, low treatment integrity, and other negative consequences for the client.

Accordingly, Lamal (1995) called for results from other universities to give a more accurate picture of the extent of misconceptions about behavior analysis. The main purpose of the current study was to replicate the Lamal (1995) study on misconceptions about behavior analysis among students and staff at different universities in Norway. In addition, we included a group of naïve participants with no formal training in psychology or behavior analysis. Furthermore, we wanted to extend the knowledge by including some new items according to the specific areas mentioned in DeBell and Harless (1992) and one item from the research on empirically supported treatments.

Method

Participants

The sample comprised 306 participants from five different populations. The first group was made up of students naïve to psychology, that is, undergraduate bioengineering students (n = 36); the second group contained students in traditional introductory psychology courses at two different universities (n = 50); the third group comprised undergraduate students attending a social education program at two different university colleges (n = 154); the fourth group was teachers in nursing education at two different university colleges (n = 40); and the fifth was students attending a master's program in behavior analysis (n = 26).

Procedure

A 22-item true-false questionnaire was used. The items are shown in Table 1. Thirteen of the items were taken from the instrument by Lamal (1995). In Item 4, the term *genetics* was changed to *genes*, and in Item 13, *American society* was changed to *Norway*. Nine new items were included, most of them inspired by Skinner (1974). Item 18 was inspired by the research on empirically supported or validated treatments. Seven items were formulated as "true" and 15 items as "false." The questionnaire was administrated both as a paper-and-pencil test and as a survey on the Internet: http://www.equivalence.net/Research.html. Students in the master's program were tested after 1 year (T1) and after they had completed the courses (T2). The correct answer to any item was not directly taught during any course in any program.

Statistical Analyses

The items were divided into four different categories: "application" (Items 1, 8, 9, 10, 11, and 12), "beliefs" (Items 2, 3, 4, 5, 6, 15, and 17), "theory" (Items 14, 16, 19, 20, 21, and 22), and "knowledge" (Items 7, 13, and 18). For each category, an additive overall performance score was constructed, with higher scores indicating more correct answers. Data were analyzed with one-way ANOVAs for overall knowledge and for the four subscales. To simplify interpretation, mean scores with 95% confidence intervals were plotted for all scales.

Results

Participants in all groups showed some misconceptions about behavior analysis. One-way ANOVAs showed statistically significant overall effects of group for the main measure of overall knowledge, as well as for all subscales. Results are presented in Table 2.

Table 1	
Questionnaire Items	

ltem No.	ltem	True/False
1	According to behavior analysis, negative reinforcement is another form of punishment	F
2	Behavior analysts believe that any behavior can be conditioned	F
3	Behavior analysts believe that theories that attempt to explain psychological constructs are useful to psychology	F
4	Behavior analysts believe that genes play an important role in shaping behavior	т
5	Behavior analysts use rigorous statistical analyses in examining data from their studies	F
6	Behavior analysts recognize the uniqueness of individuals	т
7	Behavior analysts have shown that principles of learning apply more to animals than to humans	F
8	Behavior analysts support the use of physical punishment in controlling human behavior	F
9	Behavior analysts have demonstrated that shaping has minimal impact in teaching new behavior	F
10	In general, behavior analysts believe that positive reinforcement is more effective than punishment	Т
11	Behavior analysts focus on behavior that is observable and measurable	т
12	Behavior analysts discuss secondary reinforcers; one example of this is money	т
13	Behavior analysis is a popular viewpoint in Norway	F
14	Behavior analysis denies private events	F
15	Behavior analysts compare humans with machines when explaining behavior	F
16	Behavior analysts treat humans as infinitely changeable organisms	F
17	Behavior analysts argue that almost every behavior is elicited by preceding stimuli	F
18	Very few effective modern treatment methods have been based on behavior analysis	F
19	Behavior analysis has no place for thinking and feeling, as thinking and feeling cannot be observed by anyone other than the behaving organism	F
20	Behavior analysis cannot explain creative achievements, such as art	F
21	Behavior analysis can explain phenomena that are usually described as cognitive, such as problem solving and remembering	F
22	Behavior analysis includes descriptions that in other parts of psychology have been referred to as "the self" or "sense of the self"	Т

Analysis of Variance for Overan Knowledge and Subscales								
Scales	SS	df	MS	F	р			
Overall knowledge								
Between groups	1.30	4	.326	27.11	.000			
Within groups	3.62	301	.012					
Total	4.92	305						
Applied								
Between groups	2.03	4	.508	25.84	.000			
Within groups	5.92	301	.020					
Total	7.95	305						
Beliefs								
Between groups	2.21	4	.553	16.98	.000			
Within groups	9.81	301	.033					
Total	12.02	305						
Theory								
Between groups	1.39	4	.348	6.59	.000			
Within groups	15.89	301	.053					
Total	17.28	305						
Knowledge								
Between groups	1.80	4	.451	7.64	.000			
Within groups	17.76	301	.059					
Total	19.56	305						

Table 2 Analysis of Variance for Overall Knowledge and Subscales

Note. In the first column, the labels of the different scales are listed. In the second to seventh column, variance sources, Sums of Squares (*SS*), degrees of freedom (df), Mean Sums of Squares (*MS*), *F* values, and *p* values are presented, respectively.

The results showed that the mean scores were lowest for the traditional psychology students and the naïve participants; that is, these groups showed the highest number of misconceptions, whereas students in the master's program in behavior analysis had the highest mean scores (see Figure 1).



Figure 1. Overall proportion of correct responses by group. Mean scores and 95% CI for the means.

Statistical analyses showed that students in the master's program scored significantly higher than all the other groups. The teacher group scored

significantly higher than the social education students, the traditional psychology students, and the bioengineering students, while the group of social education students scored significantly higher than the traditional psychology students and the bioengineers. No statistically significant difference between the traditional psychology student group and the bioengineering group could be demonstrated.

The most noteworthy difference between the master's group and the rest of the groups is for items categorized as "beliefs" (see Figure 2). On these items, the bioengineers, psychology students, and social education students scored significantly lower than teachers and master's students, and the teachers scored significantly lower than the master's students. On items categorized as "application," the bioengineers scored significantly lower than all the other groups. Furthermore, psychology students and social education students scored significantly lower than master's students. On items categorized as "theory," the psychology students and the social education students scored significantly lower than the master's students. Among the rest of the groups there were only small and nonsignificant differences. On items categorized as "knowledge," the naïve group scored lower than all other groups. Participants in all groups scored relatively low on Items 2 and 16 and high on Items 9 and 11.



Figure 2. Mean proportion of correct responses for all subscales by group. Mean scores and 95% CI for the means. In the upper left panel, we have presented results from the applied subscale. In the upper right panel, we have presented results from the beliefs subscale. In the lower left panel, we have presented results from the theory subscale. In the lower right panel, we have presented results from the theory subscale. In the lower right panel, we have presented results from the theory subscale.

As shown in Figure 3, the students in the master's program in behavior analysis scored 100% correct on 7 items (6, 7, 8, 9, 11, 14, and 20), at both T1 and T2. For 10 items (1, 3, 5, 12, 14, 16, 18, 19, 21, and 22), the scores increased from T1 to T2. The most remarkable increase was on Items 16 and 2. For 6 items (1, 3, 5, 12, 18, and 21), the scores increased up to 100% correct on the second administration. For Items 2, 4, 13, 17, and 22, the scores were approximately 50% correct. For 4 items (2, 4, 13, and 17), the score decreased from T1 to T2, even though the decreases for Items 4 and 17 were very small. Thus, the greatest differences were obtained on items categorized as "beliefs."



Figure 3. Scores at T1 and T2 for all items for the master's students. The dark gray bars are scores at T1, while the light gray bars are scores at T2.

Discussion

The purpose of the present study was to determine how widespread misconceptions about behavior analysis were at different universities and university colleges in Norway. The main findings showed that misconceptions prevailed in all groups of students and also in teachers in the university college departments. However, the results showed that students in the master's program in behavior analysis held significantly fewer misconceptions in comparison to the other groups. Furthermore, there was no difference in the number of misconceptions held by the naïve group of participants and the traditional psychology students. Finally, for the students in the master's program, the number of correct scores increased from the first to the second test.

We replicated the findings from Lamal (1995) with respect to the extent of misconceptions. In contrast to several other researchers (e.g., Brown, 1983; Kowalski & Taylor, 2004), Lamal reported that students did not show as many misconceptions as reported in some of the earlier studies. Brown (1983) found that 51% of the items were missed by most of the participants. We will argue that such numbers are quite high and could be related to the content of the items. For example, one of the items in the Brown study was "Associations between responses and the consequences they produce come about through classical conditioning." The item is categorized as incorrect due to the use of the term *classical conditioning* instead of the correct term: *operant conditioning*. One problem with this statement is the use of "associations"—a term conceptually related to classical conditioning.

Furthermore, the results in the present study on resistance to change of misconceptions are similar to Lamal's (1995). In the present study, students in the master's program scored lower on 5 out of 27 items at T2. For most of the items, the decrease is quite marginal, but for Item 2, the decrease is 8%. In Lamal's study, 7 of 14 items had a lower score on the second test compared to the first test. Furthermore, McKeachie (1960) found that many misconceptions show resistance to change. Many of the items on which students showed little progress were seen as unimportant, but the same lack of progress was also present for items seen as important. The findings on resistance to change were also pronounced for psychology students in the report by Vaughan (1977).

This is in accordance with other reports (e.g., Miller, Wozniak, Rust, Miller, & Slezak, 1996) finding that misconceptions were resistant to change and that even different instructional materials (lectures and text) made no difference. Only when the students were asked to write a counterattitudinal essay did the number of misconceptions decrease. Several reports have shown that introductory courses in psychology are not very effective in changing students' misconceptions (Gutman, 1979; Lamal, 1979; McKeachie, 1960; Vaughan, 1977).

We extended the Lamal (1995) study by including a group of teachers at the university level. It has been argued that teachers and students have similar misconceptions (Gardner & Hund, 1983). The present study showed that the teachers' misconceptions were fewer than those of the students in the undergraduate programs, but more than those of the students in the master's program. In any case, there are some discrepancies in the results in research literature on staff responding with respect to quantities of misconceptions in teachers. For example, the studies by DeBell and Harless (1992) found that the teachers missed fewer than 1 of the general items, but missed significantly more on items covering myths. Students, graduates, and teachers missed the same number of items on myths. The results of the teachers' responses in the present study may be due to the fact that at the university college level in Norway, many of the teachers have master's or doctoral degrees. Furthermore, some of the teachers are trained within another scientific background (e.g., sociology).

Ruble (1986) argued that some of the true-false questions used to identify misconceptions about psychology were too ambiguous, and that this could be related to the fact that many of the items used in misconceptions tests are taken from different textbooks. This could be a problem, as knowledge in

different scientific areas evolves quickly and therefore may not be captured in textbooks (Buskist, Miller, Ecott, & Critchfield, 1999). However, Brown (1984) and Barnett (1986) have pointed out that because psychology is so complex, simple statements are sometimes difficult to compose. For example, Lamal (1979) found that instructors disagreed with several of the questions. With respect to the current study, it is also important to note that some of the statements could be a matter of discussion, for example, "Behavior analysis includes descriptions that in other parts of psychology have been called the self, or sense of the self." The "self" might be considered a mentalistic term and thus might be excluded as an entity in behavior analysis. However, Skinner (1953, 1989) defined the term "self" as the internal states accompanying a repertoire of behaviors, defined as a "person." This uncommon use of the term *self* by Skinner may be the subject of discussion due to its ambiguity. Furthermore, we will argue that items scored as misconceptions in the current study are not the result of a "lack in remembering" (Comins, 2001).

In the study by DeBell and Harless (1992), the statements "Skinner believes that any behavior can be conditioned" and "Skinner believes genetics play an important role in shaping behavior" were missed most frequently. These items were also among the most frequently missed in the present study (we have changed *genetics* to *genes*). The misconceptions were most pronounced among the traditional psychology students, perhaps because they read traditional textbooks, which very often are biased in the presentation of Skinner and behavior analysis.

We think that some useful changes could be made in the questionnaire, with respect both to the content and to the form. In some studies, the *don't know/no opinion* option has been used (e.g., Gardner & Dalsing, 1986; Griggs & Ransdell, 1987). The argument for including this option is that it helps distinguish between participants who merely guess and participants who actually have no opinion. Other studies have used rating scales (Gardner & Hund, 1983). Both options seem to warrant more systematic studies. One could argue that the true-false format does not discriminate between strongly held misconceptions on the one hand and guessing on the other. This could result in a congestion of the number of *don't know* answers. The same phenomenon might be observed with rating scales in which participants tend to use middle values.

Furthermore, because of the high number of misconceptions, it is important to discuss possible consequences for organizing teaching of students. For example, Chew (2006) presented strategies for changing misconceptions. Among psychology students, the behavior-analytic term *negative reinforcement* is often misunderstood. Tauber (1988) suggested six strategies for teaching psychology students to understand and use the concept of negative reinforcement correctly. In a more recent study, Shields and Gredler (2003) described 14 problem-solving situations that involved positive reinforcement, negative reinforcement, and punishment to help distinguish among the more basic terms. They found a significant increase in students' understanding of these concepts.

In sum, the results showed that misconception items were missed by traditional psychology students, undergraduate students in educational nursing, master's students in behavior analysis, and members of the faculty. We believe that assessment of misconceptions early in introductory courses, an emphasis on active participation by students, opportunities for frequent responding, and presentation of many reinforcers will reduce misconceptions by students (Arntzen, Lokke, & Lokke, 2006; Boyce & Hineline, 2002).

References

- ARNTZEN, E., LOKKE, J., & LOKKE, G. (2006, May). Interteaching in Norwegian university college settings: Application and conceptual considerations.
 Poster presented at the annual meeting of the Association for Behavior Analysis International, Atlanta, GA.
- BARNETT, M. A. (1986). Commonsense and research findings in personality *Teaching of Psychology*, *13*, 62–64.
- BENASSI, V. A., & GOLDSTEIN, G. S. (2006). Students' beliefs about paranormal claims: Implications for teaching introductory psychology. In D. S. Dunn & S. L. Chew (Eds.), *Best practices for teaching introduction to psychology* (pp. 225–243). Mahwah, NJ: Erlbaum.
- BOYCE, T. E., & HINELINE, P. N. (2002). Interteaching: A strategy of enhancing the user-friendliness of behavioral arrangements in the college classroom. *The Behavior Analyst, 25,* 215–226.
- BROWN, L. T. (1983). Some more misconceptions about psychology among introductory psychology students. *Teaching of Psychology*, *10*, 207-210.
- BROWN, L. T. (1984). Misconceptions about psychology aren't always what they seem. *Teaching of Psychology*, *11*, 75–78.
- BUSKIST, W., MILLER, E., ECOTT, C., & CRITCHFIELD, T. S. (1999). Updating coverage of operant conditioning in introductory psychology. *Teaching of Psychology*, 26, 280–283.
- CHEW, S. L. (2006). Seldom in doubt but often wrong: Addressing tenacious student misconceptions. In D. S. Dunn & S. L. Chew (Eds.), *Best practices for teaching introduction to psychology* (pp. 211–223). Mahwah, NJ: Erlbaum.
- COMINS, N. E. (2001). *Heavenly errors: Misconceptions about the real nature of the universe*. New York: Columbia University Press.
- DEBELL, C. S., & HARLESS, D. K. (1992). B. F. Skinner: Myth and misperception. *Teaching of Psychology*, *19*, 68–73.
- FLETCHER, J. M., & FRANCIS, D. J. (2004). Scientifically based educational research: Questions, designs, and methods. In P. McCardle & V. Chhabra (Eds.), *The voice of evidence in reading research* (pp. 59–80). Baltimore: Brookes.
- GARDNER, R. M., & DALSING, S. (1986). Misconceptions about psychology among college students. *Teaching of Psychology*, *13*, 32–34.
- GARDNER, R. M., & HUND, R. M. (1983). Misconceptions of psychology among academicians. *Teaching of Psychology*, *10*, 20–22.
- GRIGGS, R. A., & RANSDELL, S. E. (1987). Misconceptions tests or misconceived tests? *Teaching of Psychology*, *14*, 210–214.
- GUTMAN, A. (1979). Misconceptions of psychology and performance in the introductory course. *Teaching of Psychology*, *6*, 159–161.
- HARDY, I., JONEN, A., MOLLER, K., & STERN, E. (2006). Effects of instructional support within constructivist learning environments for elementary school students' understanding of "floating and sinking." *Journal of Educational Psychology*, *98*, 307–326.
- HOLLEY, J., & BUXTON, C. A. (1950). Factorial study of beliefs. *Educational and Psychological Measurement*, *10*, 400–410.
- JANICKI, K. (2006). *Language misconceived: Arguing for applied cognitive sociolinguistics*. Mahwah, NJ: Erlbaum.

- KORNER, C. (2005). Concepts and misconceptions in comprehension of hierarchical graphs. *Learning and Instruction, 15*, 281-296.
- KOWALSKI, P., & TAYLOR, A. K. (2004). Ability and critical thinking as predictors of change in students' psychological misconceptions. *Journal of Instructional Psychology*, 31, 297–303.
- LAMAL, P. A. (1979). College students' common beliefs about psychology. *Teaching of Psychology*, *6*, 155–158.
- LAMAL, P. A. (1995). College students' misconceptions about behavior analysis. *Teaching of Psychology, 22,* 177–179.
- MCKEACHIE, W. J. (1960). Changes in scores on the Northwestern Misconceptions Test in six elementary psychology courses. *Journal of Educational Psychology*, *51*, 240-244.
- MILLER, R. L., WOZNIAK, W. J., RUST, M. R., MILLER, B. R., & SLEZAK, J. (1996). Counterattitudinal advocacy as a means of enhancing instructional effectiveness: How to teach students what they do not want to know. *Teaching of Psychology, 23*, 215–219.
- MORRIS, E. K. (1985). Public information, dissemination, and behavior analysis. *The Behavior Analyst, 8,* 95–110.
- PULIGANDLA, R. (1974). Fact and fiction in B. F. Skinner's science & utopia. An essay on philosophy of psychology. St. Louis, MO: Warren H. Green.
- REICHELT, S., & SKJERVE, J. (1983). *Målvalg i atferdsterapi med barn og familier*. Oslo: Universitetsforlaget.
- RUBLE, R. (1986). Ambiguous psychological misconceptions. *Teaching of Psychology*, *13*, 34-36.
- SHELDON, J. P. (2002). Operant conditioning concepts in introductory psychology textbooks and their companion Web sites. *Teaching of Psychology, 29*, 281–285.
- SHIELDS, C., & GREDLER, M. (2003). A problem-solving approach to teaching operant conditioning. *Teaching of Psychology*, *30*, 114-116.
- SKINNER, B. F. (1945). The operational analysis of psychological terms. *Psychological Review*, *52*, 270–277.
- SKINNER, B. F. (1953). Science and human behavior. New York: Free Press.
- SKINNER, B. F. (1974). About behaviorism. New York: Alfred A. Knopf.
- SKINNER, B. F. (1989). *Recent issues in the analysis of behavior.* Columbus, OH: Merrill.
- STANOVICH, K. E. (2007). *How to think straight about psychology*. Boston: Allyn & Bacon.
- TAUBER, R. T. (1988). Overcoming misunderstanding about the concept of negative reinforcement. *Teaching of Psychology*, *15*, 152–153.
- TAYLOR, A. K., & KOWALSKI, P. (2004). Naïve psychological science: The prevalence, strength, and source of misconceptions. *The Psychological Record*, *54*, 15–25.
- TODD, J. T., & MORRIS, E. K. (1983). Misconception and miseducation: Presentation of radical behaviorism in psychology textbooks. *The Behavior Analyst*, 6, 153–160.
- TODD, J. T., & MORRIS, E. K. (1992). Case histories in the great power of steady misrepresentation. *American Psychologist, 47*, 1441-1453.
- VAUGHAN, E. D. (1977). Misconceptions about psychology among introductory psychology students. *Teaching of Psychology*, *4*, 138–141.
- WYATT, W. J. (2001). *B. F. Skinner from A to Z.* Hurricane, WV: Third Millennium Press.