

Enhancing the Validity of Self-Reported Alcohol and Marijuana Consumption Using a Bogus Pipeline Procedure: A Meta-Analytic Review

Herman Aguinis

University of Colorado at Denver

Charles A. Pierce and Brian M. Quigley

University at Albany

State University of New York

Two separate meta-analyses were conducted to test whether the use of self-report measures within the bogus pipeline (BPL) paradigm yields more valid responses than the use of self-report measures alone for assessing alcohol and marijuana consumption. Weighted mean effect sizes (*ds*) of 0.01 and -0.12 were obtained for studies using alcohol and marijuana self-reports, respectively. Chi-square tests based on *Ns* of 1,892 for the alcohol sample and 1,425 for the marijuana sample indicated homogeneity of effect sizes for both data bases. Explanations for why a BPL procedure does not improve the validity of self-reported alcohol and marijuana consumption are provided. In addition, alternative methods that may enhance the validity of alcohol and marijuana self-reports are discussed.

The detection, cessation, and prevention of cigarette and marijuana smoking, as well as alcohol ingestion, has long been a goal for researchers and practitioners in the fields of applied psychology (see Viswesvaran & Schmidt, 1992) and public health (see McAlister, Perry, Killen, Slinkard, & Maccoby, 1980). Because of the serious and even potentially lethal consequences associated with the use of these substances (e.g., emphysema, lung

cancer, heart disease, and liver cirrhosis; see Fielding, 1985; Miller, 1991; U.S. Department of Health and Human Services, 1989), investigators are especially interested in accurately detecting the use and misuse of tobacco, marijuana, and alcohol. Researchers and practitioners interested in developing and implementing drug cessation programs need valid measures of drug-related behavior. If the measures of drug consumption are not valid, drug use might be overestimated or underestimated, and the evaluation of interventions could yield misleading results.

The administration of self-reports is a widely utilized method for assessing drug-related behaviors (cf. Oskamp, 1984). Self-reports (i.e., multiresponse items assessing quantity and frequency of drug use) are often used because they are convenient and practical instruments. In addition to their simple administration, self-reports do not require the collection and chemical analysis of blood, saliva, or air specimens. However, as has been recognized for over 20 years, their validity is suspect (e.g., Hesselbrock, Babor, Hesselbrock, & Meyer, 1983; Midanik, 1982; Smart & Jarvis, 1981; Summers, 1970). Subjects may tend to underreport behaviors that are socially defined as undesirable and overreport behaviors that are considered socially desirable (Tedeschi, 1981). Underreporting bias can occur when subjects are asked to respond about sensitive topics such as the consumption of cigarettes, alcohol, and marijuana, which are known to be potentially harmful substances.

An inspection of the drug-related and applied psychological literature indicates that researchers are aware of potential response biases in self-reports of cigarette smoking (see Aguinis, Pierce, & Quigley, 1993), alcohol (see Midanik, 1982), and marijuana use (see Botvin, Botvin, Renick, Filazzola, & Allegrante, 1984). Consequently, because self-reports are known to be imperfect, additional innovative procedures have been proposed to motivate respondents to disclose their behavior, especially when the behavior in question may be perceived as socially undesirable (see Embree & Whitehead, 1993; Goodstadt, Cook, & Gruson, 1978; Murray & Perry, 1987; Needle, McCubbin, Lorence, & Hochhauser, 1983; Smart & Jarvis, 1981; Werch, 1990; Winters, Stinchfield, & Henly, 1993). Werch (1990), for example, reported that using retrospective diary measures can enhance the validity of self-reported alcohol consumption by "modifying demand characteristics" (p. 327) and, thus, reducing response bias. Murray and Perry (1987) found that when an effective anonymity procedure is promised, self-reports of alcohol and marijuana use are more accurate than when anonymity is not assured. Similarly, Goodstadt et al. (1978) determined that a randomized response technique, in which respondents cannot be individually identified, resulted in more valid self-reported alcohol and marijuana use than self-reports alone. Additionally, Embree and Whitehead (1993)

developed vignettes that seemed to alleviate socially desirable responding regarding alcohol consumption.

A seemingly promising method to enhance the validity of self-reports is the use of a bogus pipeline (BPL). The BPL paradigm was originally suggested by Jones and Sigall (1971) to minimize socially desirable responding in social psychological research. Since its inception, it has been used extensively in attempting to motivate more honest self-reported use of a number of harmful substances. The BPL is a set of procedures that leads subjects to believe that their responses on a paper-and-pencil questionnaire will be independently verified by a biochemical or physiologically based apparatus, which is portrayed as a powerful, sophisticated, and practically infallible lie detector. When respondents are convinced that the BPL is effective, they will be faced with a dilemma when asked to report behaviors that may be considered socially undesirable. If they disclose their drug use behavior, they may look bad in the eyes of the experimenter. Alternatively, if they choose to conceal their socially undesirable behavior, and believe that the BPL will detect the lie, they may fear being revealed as not only engaging in a socially undesirable behavior (i.e., drug use), but also as being liars (Tedeschi, Lindskold, & Rosenfeld, 1985). Thus, the threat of being second-guessed by a presupposed infallible lie detector can motivate subjects to provide more veracious self-reports.

Despite the initial enthusiasm for the BPL's methodology (see Roese & Jamieson, 1993, for a review), research on its effectiveness has yielded inconsistent results. Several studies have found that self-report measures within a BPL condition result in a larger proportion of respondents disclosing socially undesirable behaviors as compared to self-reports alone (i.e., a no-BPL condition; e.g., Bauman & Dent, 1982; Evans, Hansen, & Mittlemark, 1977; Murray, O'Connell, Schmid, & Perry, 1987). Investigators have interpreted such a difference between conditions as evidence that the BPL improves the validity or accuracy of self-reports (e.g., Evans et al., 1977). In contrast, others have found that a BPL procedure does not increase the disclosure of self-reported consumption of a number of health-hazardous substances (e.g., Werch, Lundstrum, & Moore, 1989).

Because of the need to summarize the previous inconsistent findings in a quantitative fashion, Aguinis et al. (1993) investigated part of this controversy using meta-analytic procedures. The Aguinis et al. review ascertained, based on a total sample size of nearly 6,500 respondents, that the BPL is effective in enhancing the validity of self-reported *cigarette smoking*. The results reported by Aguinis et al. explain, at least in part, the previous inconsistent findings regarding self-reported cigarette smoking and suggest that the effectiveness of a BPL procedure is influenced by (a) the type of

BPL presentation employed, (b) the type of self-report measure utilized, and (c) whether most participants are smokers (as indicated by a biochemical measure). In a recent *Psychological Bulletin* article, also using meta-analytic procedures, Roese and Jamieson (1993) reviewed social psychological research utilizing the BPL. They concluded that the BPL seems to effectively diminish the socially desirable responding component present in self-reports. However, in spite of the need to improve the validity of self-reported *alcohol* (cf. Midanik, 1982) and *marijuana* (cf. Botvin et al., 1984) consumption, it deserves noting that the question of whether the BPL enhances the validity of self-reported use of these substances was not addressed by either of the two previous meta-analytic reviews. Thus, it is still unclear whether a BPL manipulation improves the veracity of self-reported alcohol and marijuana use.

Researchers interested in improving the validity of self-reported consumption of alcohol and marijuana have often resorted to a BPL procedure, yet such efforts have yielded mixed results. For example, evidence exists suggesting that a BPL procedure enhances the validity of self-reported alcohol use (e.g., Lowe, Windsor, Adams, Morris, & Reese, 1986). In contrast, other researchers have concluded that self-reports alone yield similar disclosure rates of alcohol consumption (e.g., Campanelli, Dielman, & Shope, 1987) and marijuana smoking (e.g., Werch et al., 1989), as compared to self-reports administered within a BPL procedure. A clarification of this unexamined controversy is especially relevant because there are several biochemical markers available to measure tobacco use, but no similar indicators are available to measure alcohol and marijuana use (Murray & Perry, 1987). Thus, it is important to assess whether the BPL improves the validity of self-reports, which are imperfect and yet widely used measurement instruments. More valid self-reports would allow researchers to assess more accurately whether a particular population is at risk and whether cessation programs are successful.

The primary objective of the present study was to examine whether BPL procedures enhance the validity of self-reported alcohol and marijuana consumption, thereby directly evaluating the generalizability of the BPL paradigm to domains other than cigarette smoking (see Aguinis et al., 1993) and social psychological research (see Roese & Jamieson, 1993). Two separate meta-analyses were conducted to integrate and summarize the existing evidence in a systematic and quantitative fashion (Hedges & Olkin, 1985). The major advantage of a quantitative approach is that it permits the computation of an estimate of the population effect size across a large number of subjects and studies, thus increasing statistical and inferential power (Johnson, 1989). In addition, a quantitative approach was adopted because qualitative reviews are more vulnerable to a selective inclusion of studies, differential subjective weighting of studies while interpreting a set

of findings, and misleading interpretations (Eagly, Makhijani, & Klonsky, 1992; Wolf, 1986).

METHOD

Retrieval of Studies

Computer-based searches were conducted using the keywords *bogus pipeline*. These keywords were searched on the following computer data bases: *Psychological Abstracts* (PsycLIT, 1974 to 1993), *Educational Resources Information Center* (ERIC, 1966 to 1993), *Sociological Abstracts* (Sociofile, 1974 to 1993), *Dissertation Abstracts International* (DISS, 1985 to 1993), and MEDLINE (1966 to 1993). These data bases included information available through September 1993. Subsequent to the initial computer-based searches, the reference lists of relevant located articles were also manually inspected for potential studies to include in the analyses.

The criteria for inclusion of studies in the analyses were: (a) A BPL technique was implemented while measuring self-reported alcohol or marijuana consumption; (b) at least two experimental conditions were utilized, one using self-reports with a BPL procedure and the other using self-reports alone (i.e., not using any form of a BPL); and (c) primary statistics were reported. The focal criterion variable was the proportion of subjects in each condition reporting that they frequently (at least on a weekly basis) ingested alcohol or smoked marijuana. Our search located a total of 5 articles satisfying these criteria for study inclusion.

Most of the articles allowed for the computation of multiple effect-size estimates and, as a result, 9 and 7 effect sizes were calculated from the alcohol and marijuana studies, respectively. One assumption of meta-analysis is independence of effect sizes. For these analyses, more than one effect size was often obtainable from a single article. More precisely, multiple effect sizes were computed from an article when two or more independent experimental groups (formed by manipulating different types of BPL procedures; e.g., see Werch et al., 1989) were compared to a no-BPL control group. All the effect sizes were computed from adolescent samples, except for Lowe et al. (1986) who tested a sample of adult pregnant women.

Meta-Analytic Statistics

All the meta-analytic statistics were computed following the Hedges and Olkin (1985) approach to meta-analysis. Two separate meta-analyses were conducted: one combining studies assessing alcohol self-reports, and the

other combining studies examining marijuana self-reports. The procedures for computing and analyzing the effect sizes were identical for both samples. The two analyses were conducted using Johnson's (1989) DSTAT meta-analytic software.

The effect size calculated is g , which is the standardized difference between the proportion of self-reported drinkers (or marijuana smokers) in the BPL and no-BPL groups, divided by the pooled standard deviation. The sign of the difference was positive when the proportion of individuals in the BPL condition reporting alcohol (or marijuana) consumption was greater than the proportion of individuals in the no-BPL condition reporting alcohol (or marijuana) use. In contrast, if the proportion of individuals in the no-BPL condition was greater, then the sign of g was negative. All the study-level effect sizes for both analyses were computed from frequencies or proportions, except for one calculation that was based on group means and standard deviations of the reported frequency of alcohol consumption.

The g s were converted to d s because g s tend to overestimate the population effect size for studies with small sample sizes (see Hedges & Olkin, 1985). The study-level d s were then combined by calculating both an unweighted and a weighted (by the reciprocal of the effect-size variance) mean effect size. A homogeneity statistic Q , which approximates a chi-square distribution with $k - 1$ degrees of freedom (where k is the number of effect sizes), was calculated to determine whether the study-level d s estimate a common population effect size (i.e., are consistent across studies).

RESULTS

Alcohol Meta-Analysis

Table 1 includes the authors, sample size, and proportion of self-reported drinkers in a BPL and no-BPL group, and effect-size estimates for studies used in the alcohol analysis. The overall unweighted mean d was 0.01. The weighted mean d was also 0.01, and its 95% confidence interval (CI) included zero (95% CI = -0.08 to 0.10). Homogeneity of d s was obtained, $\chi^2(8, N = 1,892) = 14.00, p = .082$. Therefore, the unweighted and weighted mean effect sizes estimate a common population effect size, indicating that the study-level estimates are consistent across studies.

Marijuana Meta-Analysis

Table 2 lists the authors, sample size, and proportion of self-reported marijuana smokers in a BPL and a no-BPL group, and effect-size estimates

TABLE 1

Authors, Sample Size, and Proportion of Self-Reported Drinkers in a BPL and No-BPL Group, and Effect-Size Estimates for Studies Used in the Alcohol Meta-Analysis

Authors	BPL		No BPL		<i>d</i>
	<i>n</i>	Proportion of Self-Reported Drinkers	<i>n</i>	Proportion of Self-Reported Drinkers	
Botvin, Botvin, Renick, Filazzola, & Allegrante (1984)	143	.09	162	.17	-0.23
Werch, Lundstrum, & Moore (1989)	50	.44	52	.54	-0.20
Botvin, Botvin, Renick, Filazzola, & Allegrante (1984)	152	.13	162	.17	-0.12
Werch, Gorman, Marty, Forbess, & Brown (1987)	59	.07	63	.08	-0.04
Werch, Lundstrum, & Moore (1989)	50	.54	52	.54	0.00
Campanelli, Dielman, & Shope (1987)	159		108		0.05 ^a
Werch, Gorman, Marty, Forbess, & Brown (1987)	62	.11	63	.08	0.11
Botvin, Botvin, Renick, Filazzola, & Allegrante (1984)	173	.23	162	.17	0.16
Lowe, Windsor, Adams, Morris, & Reese (1986)	108	.27	112	.14	0.31
Unweighted mean effect size					0.01
Weighted mean effect size					0.01

Note. The effect size (*d*) is the standardized difference between the proportion of self-reported drinkers in the BPL group and the no-BPL group, divided by the pooled standard deviation.

^a*d* computed from group means (BPL = .64, no-BPL = .60) and standard deviations.

for studies used in the marijuana analysis. The overall unweighted mean *d* was -0.07. The weighted mean *d* was -0.12, and its 95% confidence interval did not include zero (95% CI = -0.22 to -0.01). The negative weighted mean *d* indicates that the mean proportion of self-reported marijuana users is greater in the no-BPL than in the BPL condition. Homogeneity of *ds* was observed, $\chi^2(6, N = 1,425) = 3.16, p = .789$. Thus, the unweighted and weighted mean effect sizes are based on consistent study-level estimates.

TABLE 2

Authors, Sample Size, and Proportion of Self-Reported Smokers in a BPL and No-BPL Group, and Effect-Size Estimates for Studies Used in the Marijuana Meta-Analysis

Authors	BPL		No BPL		d
	n	Proportion of Self-Reported Smokers	n	Proportion of Self-Reported Smokers	
Botvin, Botvin, Renick, Filazzola, & Allegrante (1984)	154	.02	162	.06	-0.19
Botvin, Botvin, Renick, Filazzola, & Allegrante (1984)	153	.02	162	.06	-0.19
Botvin, Botvin, Renick, Filazzola, & Allegrante (1984)	174	.03	162	.06	-0.13
Werch, Gorman, Marty, Forbess, & Brown (1987)	64	.05	64	.06	-0.07
Werch, Gorman, Marty, Forbess, & Brown (1987)	62	.05	64	.06	-0.06
Werch, Lundstrum, & Moore (1989)	50	.08	52	.08	0.01
Werch, Lundstrum, & Moore (1989)	50	.12	52	.08	0.14
Unweighted mean effect size					-0.07
Weighted mean effect size					-0.12

Note. The effect size (d) is the standardized difference between the proportion of self-reported marijuana smokers in the BPL group and the no-BPL group, divided by the pooled standard deviation.

DISCUSSION

From samples of nearly 1,900 (alcohol) and 1,500 (marijuana) cases, the meta-analytic integrations indicate that a BPL procedure does not increase the disclosure of self-reported alcohol or marijuana consumption. In both meta-analyses, the study-level effect sizes were homogeneous, indicating consistency across studies. Thus, even though it appeared in some studies that a BPL procedure improved the validity of self-reports, our analyses suggest that the evidence accumulated thus far is highly consistent: Implementing a BPL procedure *does not* increase the validity of self-reported alcohol or marijuana consumption. Stated differently, the effectiveness of the BPL paradigm does not seem to generalize to the domains of alcohol and marijuana consumption.

Despite apparent methodological dissimilarities between the studies integrated in each of the two data bases, both analyses indicate that the study-level effect sizes estimate a common population effect size. Lowe et al. (1986), for example, conducted their research in urban maternity-care clinics with pregnant women, whereas other studies used adolescents (e.g., Botvin et al., 1984; Campanelli et al., 1987; Werch, Gorman, Marty, Forbess, & Brown, 1987) and college students (e.g., Werch et al., 1989) in school-related settings. Furthermore, some investigators actually collected blood and urine samples to detect substance use (Lowe et al., 1986), whereas others led participants to believe that their saliva samples would be tested (e.g., Botvin et al., 1984; Campanelli et al., 1987; Werch et al., 1987, 1989), and still others used modified BPL conditions where subjects were informed that their saliva might be obtained and tested in the future (Werch et al., 1987, who also used an unmodified BPL condition). These methodological variations did not, however, have an impact on the homogeneity of study-level effect sizes. Thus, the effect of the BPL is consistent in both the alcohol and marijuana analyses and does not appear to be influenced by various individual study characteristics or other potential moderator variables.

The first meta-analysis indicates that the proportion of subjects reporting frequent alcohol use was nearly identical for the BPL and no-BPL conditions. This finding is inconsistent with previous meta-analytic investigations concluding that the BPL enhances the validity of self-reports (Aguinis et al., 1993; Roese & Jamieson, 1993). Nevertheless, the BPL did not seem to elicit a more accurate disclosure rate of self-reported alcohol consumption.

Jones and Sigall (1971) originally predicted that the BPL paradigm would enhance the validity of self-reports only if the behavior in question was perceived as socially undesirable. If subjects are asked about behaviors that are not perceived as socially undesirable, they will not feel pressured to conceal their behavior. Previous research has suggested that ingesting alcohol is more socially approved than the consumption of other substances (Murray & Perry, 1987); therefore, subjects may not expect to be negatively evaluated if they honestly disclose their behavior (Botvin et al., 1984). Thus, the present alcohol findings can be explained if, for the samples considered in the meta-analysis, the consumption of alcohol was not perceived as being socially undesirable. Consistent with this hypothesis, there is evidence indicating that a judicious use of alcohol may not be perceived as creating serious social or medical risks (Brecher, 1972). A BPL procedure would only motivate more honest self-reports for those populations that consider alcohol intake to be socially undesirable.

Even if consuming alcohol is defined as socially undesirable, when a BPL manipulation is not credible, the validity of self-reports will not be enhanced. Subjects must believe that their self-reports can and will be

independently verified by a sophisticated lie detector (Jones & Sigall, 1971). Aguinis et al. (1993) determined that a more vivid and detailed explanation of the BPL enhances the validity of self-reported cigarette smoking. However, even though the first meta-analysis included studies that used various types of BPL manipulations such as verbal and cartoon (e.g., Botvin et al., 1984), all the study-level effect sizes consistently indicated that the BPL did not enhance the validity of alcohol self-reports. Thus, it seems that even in the presence of BPL presentation techniques that have been found to be more effective (e.g., live and video; Murray, O'Connell, Schmid, & Perry, 1987), the BPL did not improve the validity of self-reported alcohol use. An alternative explanation for the apparent failure of the BPL is that the tendency to underreport alcohol consumption (see Smart, 1975) may be the result of forgetting, rather than conscious underreporting (Embree & Whitehead, 1993; Poikolainen & Kärkkäinen, 1983). This hypothesis might also account for the failure of the BPL to enhance the validity of alcohol self-reports.

A seemingly surprising finding of the second meta-analysis is that the proportion of self-reported marijuana smokers was larger in the no-BPL than in the BPL group. Although the population-effect-size estimate is small (weighted mean $d = -0.12$; see Cohen, 1988), subjects may be inclined to consciously overreport marijuana consumption on self-report questionnaires used in a no-BPL condition (cf. Botvin et al., 1984). Botvin et al. contended that among adolescent samples, marijuana use may be perceived as socially desirable, which can motivate subjects to overreport its use. When the BPL threatens to second-guess subjects' responses, however, they tend to be more honest, thereby reducing the overreporting of marijuana consumption. Future research should investigate whether marijuana use is defined as socially desirable among people of various age ranges.

The absence of a BPL effect observed in the alcohol analysis, and the small negative effect observed in the marijuana analysis, should not necessarily be taken as evidence that the BPL is, in general, ineffective (cf. Roese & Jamieson, 1993). Although BPL manipulation checks are typically not conducted in drug-related research, Roese and Jamieson stated that a null BPL effect "more likely reflects the weakness of social desirability biases" (p. 373) within the domain being tested. Their meta-analysis resulted in a weighted mean BPL effect size (BPL group vs. no-BPL control group) of .41, indicating that a BPL procedure substantially reduces socially desirable responding. Based on the present findings, further research is needed to determine whether self-reported alcohol and marijuana consumption is truly susceptible to social desirability biases.

In sum, the two meta-analyses of the evidence accrued thus far indicate that the broad application of BPL procedures to assess self-reported alcohol and marijuana use does not provide any advantages beyond using self-

reports alone. This conclusion, however, is not necessarily generalizable to adult populations because the studies included in the analyses tested primarily adolescents. Consequently, future BPL manipulations attempting to improve the veracity of alcohol and marijuana self-reports should consider using adult samples.

Given the need to improve the validity of self-reported drug use, other techniques in addition to the BPL have been suggested. Hill, Dill, and Davenport (1988), for example, argued that self-reports will be more valid if anonymity is assured (see also Murray & Perry, 1987). In addition, a method that seems to be effective for protecting respondents' identities is the randomized response technique (Goodstadt et al., 1978) and, furthermore, there is evidence that it may be effective in motivating more accurate disclosure rates of socially undesirable behaviors (see Aguinis et al., 1993). Also, unobtrusive interviews, mailed questionnaires (Smart & Jarvis, 1981), and diaries (Poikolainen & Kärkkäinen, 1983; Werch, 1990) seem to be promising techniques. The question of whether these methods improve the validity of self-reported alcohol and marijuana use needs to be further scrutinized, however, because of the limited amount of research that has evaluated these alternatives to the BPL paradigm.

ACKNOWLEDGMENTS

Portions of this article were presented at the meeting of the Eastern Psychological Association, April 15, 1994, Providence, RI.

We thank Donn Byrne, James T. Tedeschi, and two anonymous reviewers for their helpful comments on a previous version of this article.

REFERENCES

- Aguinis, H., Pierce, C. A., & Quigley, B. M. (1993). Conditions under which a bogus pipeline procedure enhances the validity of self-reported cigarette smoking: A meta-analytic review. *Journal of Applied Social Psychology, 23*, 352-373.
- Bauman, K. E., & Dent, C. W. (1982). Influence of an objective measure on self-reports of behavior. *Journal of Applied Psychology, 67*, 623-628.
- Botvin, E. M., Botvin, G. J., Renick, N. L., Filazzola, A. D., & Allegrante, J. P. (1984). Adolescents' self-reports of tobacco, alcohol, and marijuana use: Examining the comparability of video tape, cartoon and verbal bogus-pipeline procedures. *Psychological Reports, 55*, 379-386.
- Brecher, E. M. (1972). *Licit and illicit drugs*. Boston: Little, Brown.
- Campanelli, P. C., Dielman, T. E., & Shope, J. T. (1987). Validity of adolescents' self-reports of alcohol use and misuse using a bogus pipeline procedure. *Adolescence, 22*, 7-22.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

- Eagly, A. H., Makhijani, M. G., & Klonsky, B. G. (1992). Gender and the evaluation of leaders: A meta-analysis. *Psychological Bulletin*, *111*, 3-22.
- Embree, B. G., & Whitehead, P. C. (1993). Validity and reliability of self-reported drinking behavior: Dealing with the problem of response bias. *Journal of Studies on Alcohol*, *54*, 334-344.
- Evans, R. I., Hansen, W. B., & Mittlemark, M. B. (1977). Increasing the validity of self-reports of smoking behavior in children. *Journal of Applied Psychology*, *62*, 521-523.
- Fielding, J. (1985). Smoking: Health effects and control. Part I. *New England Journal of Medicine*, *313*, 491-498.
- Goodstadt, M. S., Cook, G., & Gruson, V. (1978). The validity of reported drug use: The randomized response technique. *International Journal of the Addictions*, *13*, 359-367.
- Hedges, L. V., & Olkin, I. (1985). *Statistical methods for meta-analysis*. Orlando, FL: Academic.
- Hesselbrock, M., Babor, T. F., Hesselbrock, V., & Meyer, R. E. (1983). "Never believe an alcoholic"? On the validity of self-report measures of alcohol dependence and related constructs. *International Journal of the Addictions*, *18*, 593-609.
- Hill, P. C., Dill, C. A., & Davenport, E. C. (1988). A reexamination of the bogus pipeline. *Educational and Psychological Measurement*, *48*, 587-601.
- Johnson, B. T. (1989). *Software for the meta-analytic review of research literatures*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.
- Jones, E. E., & Sigall, H. (1971). The bogus pipeline: A new paradigm for measuring affect and attitude. *Psychological Bulletin*, *76*, 349-364.
- Lowe, J. B., Windsor, R. A., Adams, B., Morris, J., & Reese, Y. (1986). Use of a bogus pipeline method to increase accuracy of self-reported alcohol consumption among pregnant women. *Journal of Studies on Alcohol*, *47*, 173-175.
- McAlister, A., Perry, C., Killen, J., Slinkard, L. A., & Maccoby, N. (1980). Pilot study of smoking, alcohol and drug abuse prevention. *American Journal of Public Health*, *70*, 719-721.
- Midanik, L. T. (1982). The validity of self-reported alcohol consumption and alcohol problems: A literature review. *British Journal of Addiction*, *77*, 357-382.
- Miller, N. S. (Ed.). (1991). *Comprehensive handbook of drug and alcohol addiction*. New York: Marcel Dekker.
- Murray, D. M., O'Connell, C. M., Schmid, L. A., & Perry, C. L. (1987). The validity of smoking self-reports by adolescents: A reexamination of the bogus pipeline procedure. *Addictive Behaviors*, *12*, 7-15.
- Murray, D. M., & Perry, C. L. (1987). The measurement of substance use among adolescents: When is the "bogus pipeline" method needed? *Addictive Behaviors*, *12*, 225-233.
- Needle, R., McCubbin, H., Lorence, J., & Hochhauser, M. (1983). Reliability and validity of adolescent self-reported drug use in a family-based study: A methodological report. *International Journal of the Addictions*, *18*, 901-912.
- Oskamp, S. (1984). *Applied social psychology*. Englewood Cliffs, NJ: Prentice-Hall.
- Poikolainen, K., & Kärkkäinen, P. (1983). Diary gives more accurate information about alcohol consumption than questionnaire. *Drug and Alcohol Dependence*, *11*, 209-216.
- Roese, N. J., & Jamieson, D. W. (1993). Twenty years of bogus pipeline research: A critical review and meta-analysis. *Psychological Bulletin*, *114*, 363-375.
- Smart, R. G. (1975). *Recent studies of the validity and reliability of self-reported drug use 1970-1974* (Substudy No. 670). Toronto: Addiction Research Foundation.
- Smart, R. G., & Jarvis, G. K. (1981). Do self-report studies of drug use really give dependable results? *Canadian Journal of Criminology*, *23*, 83-92.
- Summers, T. (1970). Validity of alcoholics' self-reported drinking history. *Quarterly Journal of Studies on Alcohol*, *31*, 972-974.

- Tedeschi, J. T. (Ed.). (1981). *Impression management theory and social psychological research*. New York: Academic.
- Tedeschi, J. T., Lindskold, S., & Rosenfeld, P. (1985). *Introduction to social psychology*. St. Paul, MN: West Publishing.
- U.S. Department of Health and Human Services. (1989). *Reducing the health consequences of smoking: 25 years of progress: A report of the surgeon general* (DHHS Publication No. PHS 89-8411). Washington, DC: U.S. Government Printing Office.
- Viswesvaran, C., & Schmidt, F. L. (1992). A meta-analytic comparison of the effectiveness of smoking cessation methods. *Journal of Applied Psychology, 77*, 554-561.
- Werch, C. E. (1990). Two procedures to reduce response bias in reports of alcohol consumption. *Journal of Studies on Alcohol, 51*, 327-330.
- Werch, C. E., Gorman, D. R., Marty, P. J., Forbess, J., & Brown, B. (1987). Effects of the bogus-pipeline on enhancing validity of self-reported adolescent drug use measures. *Journal of School Health, 57*, 232-236.
- Werch, C. E., Lundstrum, R. H., & Moore, A. (1989). Bogus-pipeline effects on self-reported college student drug use, problems, and attitudes. *International Journal of the Addictions, 24*, 1003-1010.
- Winters, K. C., Stinchfield, R. D., & Henly, G. A. (1993). Further validation of new scales measuring adolescent alcohol and other drug abuse. *Journal of Studies on Alcohol, 54*, 534-541.
- Wolf, F. M. (1986). *Meta-analysis: Quantitative methods for research synthesis*. Beverly Hills, CA: Sage.

