Issues in Classification in Meta-Analysis in Substance Abuse Prevention Research

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Meta-analysis as a method holds great promise for allowing fields of research to accomplish synthesis and integration of findings. This goal must be compared to experimental research, which is inherently reductionistic in its approach. Because of this divergence in methods and implicit goals, meta-analysts are often faced with a need to reconceptualize original research in order to fit it into a method that allows comparison. The authors have identified two such issues (classification of variables and classification of correlational results) that will pose continued dilemmas for meta-analysts.

This chapter has two goals. The first is to discuss strategies to create schema for classifying independent variables. The second is to discuss issues of classifying types of correlational relationships between independent and dependent variables. Both have practical relevance for incorporating theory into meta-analytic practice.

CLASSIFYING INDEPENDENT VARIABLES

Creating a classification schema for independent variables is a major dilemma for meta-analysts. Yet, inevitably, completing such work is among the first steps that one must take in beginning a meta-analysis. The resulting schema will ultimately determine much of the meaning that emerges from subsequent analyses.

An extensive literature about analytic methods has emerged. Topics include attention to effect size estimates (Glass et al. 1981; Hall et al. 1994) and controls for methodological problems (Cook et al. 1992; Wortman 1994). What is being analyzed, which lies at the root of wanting to complete analyses in the first place, has unfortunately received less attention (Cooper 1990; Orwin 1994; Stock 1994). It is the authors' observation that creating links with theory in completing meta-analyses gives meaning and value to the methods.

Categorization of independent variables is challenging because no single theory captures all available variables. Theories that guide reductionist research focus only on relevant variables, ignoring variables that are

perceived to be irrelevant. Theoretical traditions also reflect diverse scientific disciplines. Meta-analysis needs to account for this diversity and the diversity limits a meta-analyst's ability to use theory a priori. Of necessity, linking theory and categorization in meta-analysis must be done post hoc.

Creation of an Inclusive Categorization Schema

The authors faced the problem of categorization in an analysis of 242 drug abuse correlational studies. The analysis reflects a truly evolutionary process. In the initial phases of meta-analytic work, started in 1986, the authors began abstracting research articles that included correlates of substance use. At that time, there was an a priori interest in topics relevant to current substance use prevention curriculum development. Seven categories of independent variables were created: (1) peer use, (2) parent use, (3) sibling use, (4) rebelliousness, (5) attitudes about substances, (6) normative beliefs, and (7) miscellaneous other variables. The miscellaneous other variables category was divided into subcategories. If a reported independent variable failed to fit within an existing subcategory, a new variable category was created. By the time approximately 100 studies had been entered, nearly 50 miscellaneous subcategories had been created.

The dataset was initially created to answer a limited number of questions about variables relevant to social influence-based substance abuse prevention program development (Hansen 1988). The miscellaneous other variables category was initially ignored for analysis purposes. However, as the number of studies grew, it became clear that a refinement of miscellaneous subcategories was needed. All variables, including those originally grouped in the initial six categories, were recategorized. The first goal of this recategorization was to organize the independent variables with greater precision. The second goal of the reclassification was to create a broad categorical matrix into which measures from newly identified articles could be readily classified. It was apparent that major groupings of variables might be possible. These groups would not be expected to follow the organization of a specific theory. In some respects, these groups were expected to create meta-theoretical constructs that would apply to an entire field.

Ultimately, a two-tier classification system was developed. In the initial tier, 12 categories were established. These included: (1) previous substance use, (2) intentions to use substances, (3) cognitive factors, (4) competency factors, (5) personality factors, (6) use by others, (7) social pressures, (8) institutional affiliations, (9) peer structure, (10) home and

family structure, (11) demographic factors, and (12) miscellaneous factors. For each of these 12 major categories, a second tier of subcategories was created (these are described in detail below). The development of subcategories proceeded by examining the descriptions of measures within each group in the first tier and making logical subdivisions where appropriate. Research has made little or no attempt to insure that all potential variables are used equally. The uneven pace of normal research guarantees that some variables will be used frequently and will be highly similar in structure and content. Such variables can be rapidly reduced to the most elemental concepts. Other variables are rarely used, differ markedly in format and meaning, and do not group easily. Both prevalence of an item and similarity of concept were used to create subcategories. When sufficiently large numbers of similar items were identified, they were joined into initial subcategories. If, in comparison to the size of other subcategories, extremely large numbers of cases were present, further logical divisions were attempted until additional subclassification would result in too few cases for analysis. This left numerous items that remained together as loose constructs because similarity and frequency were not sufficient for more precise categorization.

Substance use measures were identified as dependent variables. A number of studies reported the correlation among various substances. To enable analyses, one of the two measures was identified as a dependent variable and one as an independent variable. The variable identified as the dependent variable was either the variable that was measured first (in the case of longitudinal studies) or the most prevalent substance. As an example of the second case, drinking alcohol is generally more prevalent than steroid use. Alcohol would have been identified as the dependent variable in a case where correlations between the two substances were observed. Previous substance use included six subcategories of substances as independent variables: tobacco, alcohol, marijuana, other single drugs, other combined drugs, and being drunk.

Intentions measures included the expected probability of future consumption as well as measures of commitment toward limiting future use and abuse of substances. Intention measures, almost without exception, focused on intentions to use a specific substance. Five sub-categories were defined by the substance about which the intention was assessed: tobacco, alcohol, marijuana, other single drugs, or combined drugs.

Measures of cognitive factors addressed beliefs (including knowledge), attitudes, and values. Seven subcategories were developed. Belief and

knowledge items were sufficiently prevalent to create three distinct subgroups: beliefs about health consequences, beliefs about social consequences, and beliefs about psychological consequences. Items relevant to values were also sufficiently well represented to create three distinct subgroups: general values, religious values, and values related to achievement. Attitudes about drugs formed the seventh subcategory.

Measures of competency were subcategorized into five groups. Intelligence test scores, primarily from standardized tests, formed a category that was distinguishable from other competency measures. School performance, including grades as well as standardized achievement tests, formed the second group. Self-efficacy, the perceived ability to deal with a variety of social situations including (but not limited to) peer pressure, was a rather heterogeneous subcategory. Decisionmaking skills and stress management skills had sufficient definition in the measures that two clearly defined categories could be created.

Personality factors were grouped into seven subcategories. Personality variables were broadly defined as those that reflected a personal trait or characteristic other than competence. The attribution on the part of researchers was to ascribe relatively stable psychological characteristics to individuals. Several subcategories were separated from the general concept of personality because of the prevalence of highly similar measures. For example, self-esteem, affect (characteristic mood), and locus of control were constructs that were identified frequently enough to create a sizable number of indicators that were specific to each. In the case of self-esteem and locus of control, numerous studies reported similar measures for defining each construct.

Independence and deviance are often thought to be highly related. Sufficient numbers of measures were included that it was possible to separate each construct. Measures of independence included the expressed need for or value of independence, sensation seeking, and risk taking. Deviance measures included definable observances of violence, antisocial behavior, and delinquency.
The remaining personality measures fit into two categories. The first group contained those items that reflected other psychological characteristics of individuals not grouped into the subcategories listed above. These intrapsychic characteristics were distinguished from personality characteristics that described an individual's social personality. Examples of the latter include gregariousness and likability.

The sixth overall category of variables included a variety of institutional affiliations. Three distinguishable subcategories, church attendance,

religious affiliation, and moral codes, were created. Church attendance refers to religious practice. Religious affiliation was often noted as the type of religion to which the respondent belonged. Moral codes referred to a belief in or attitude toward a general or specific religious or other moral code. Two additional subcategories, school bonding and academic expectations, were also defined. School bonding reflected a feeling of acceptance by the school as an institution. Academic expectations reflected the hopes and desires of others regarding an individual's academic performance. Finally, two related but distinguishable subcategories, structured and nonstructured activities, were created. Structured activities included self-reports about the extent of participation in extracurricular sports, music, hobbies, and other supervised activities. Nonstructured activities included self-reports about hanging out, spending time in the neighborhood, and other activities that implied or specified a lack of adult supervision.

Use by others was the seventh broad categorical group of variables. Five subcategories were identified. Three of the five were relatively easy to define: drug use by peers (same age, older, and younger friends and acquaintances), drug use by parents, and drug use by siblings. A fourth subcategory included drug use by extended relatives (aunts, uncles, grandparents, and cousins). The fifth subcategory included perceptions about drug availability. These measures typically included ratings of the frequency with which drug use was observed in the community as well as the ease or difficulty of obtaining substances. It is noteworthy that these measures all included perceptions of prevalence that were broad and general as well as those that were specific; it is likely that broad and general perceptions are more likely to be biased by perceptual processes, reducing the degree to which actual use among others is accurately measured. The distinction between perception and documented occurrence was not pursued in classification.

The social pressures category included seven definable subcategories. The first subcategory included reports of receiving offers to use substances from peers as well as parents and nonspecified or miscellaneous others. The original intent was to use the source of the offer to define a specific subcategory. However, there were too few examples to make separate subcategories, and a general offers category emerged instead. The second subcategory included reports about an individual's motivation to comply with social pressures to use substances. Peers' attitudes about drug use, parents' attitudes about drug use, and others' attitudes about drug use each constituted three separate sub-categories. Others' attitudes (including parents and peers as well as miscellaneous or nonspecified others) about topics other than substance

use (e.g., violence) were also identified. The final subcategory included variables that attempted to measure exposure to or influence from mass media sources related to substance use.

The ninth category of independent variables included peer structure. The first subcategory was labeled "peer group characteristics." This set of measures included various descriptive indices that characterized peer groups as rebellious, risk taking, religious, academically oriented, and so forth. The second subcategory assessed the balance between peer and parent influence, often through self-reports of the respondent. These measures addressed which source (peer or parent) of social influence predominated as well as indices assessing the extent of conflict between parents and the peer group. The third subcategory included the level of intimacy that existed between the respondent and other teens, primarily of the opposite sex. The primary measure included in this factor was self-reports of sexual intercourse. The final peer factor subcategory included assessments of social bonding and attachment to the peer group. In some instances, this included a simultaneous assessment of the positive or negative nature of the peer group. However, these measures primarily addressed the degree to which the adolescent perceived himself or herself to be accepted by or belong to a group of friends.

The 10th major category of variables assessed a variety of home and family structures. This was developed to be as similar as possible to the peer structure category described above. Unfortunately, there were few parallel comparisons across studies. Six subcategories were therefore created. These included parents' psychological traits, which roughly correspond to peer group characteristics but included measures of clinical personality characteristics as well. Parental relations roughly paralleled measures of peer bonding that assessed feelings of attachment and caring from and for parents. Additional family measures were also identified. The third home factors subcategory included measures that assessed the viability of parents' marriage. The fourth subcategory included measures of parents' educational achievement. The fifth subcategory included descriptive measures of the composition of the family, including descriptions of who lived at home. The final home factors subscale assessed participants' socioeconomic status, including income as well as surrogate measures (e.g., Hollingshead measures).

Demographic information formed an 11th major category. Gender, age, ethnicity of the sample, and geographic identifiers (such as urban-suburban-rural distinctions as well as geopolitical location) were included as subcategories.

Finally, a miscellaneous category was created to include variables that did not fit within any of the other major categories. Included in this were two substantive subcategories (political involvement/social activism and exposure to school information or formal programs). In addition, a truly miscellaneous subcategory that included all other measures was created.

Mapping Classification to Existing Classification Schema

The database created for meta-analytic purposes was broad and comprehensive. It was assumed at the outset that the database could be used to answer a variety of questions. Not only can the database be used to generate summary findings, it is also possible that the database could be used to compare previous work with work in progress. However, the authors learned that a second order of manipulation was needed to complete such tasks. As is usual in the case of research, individual projects address only a limited number of project-specific variables, the construction of which is typically dictated by project-specific theoretical issues. As a result, referencing the meta-theoretical database presented unique problems when the authors began using it to examine convergence with findings from an empirical study.

A review of school-based curriculums (Hansen 1992) identified 12 curriculum approaches common to intervention. Each approach implicitly addressed a mediating variable that has been postulated to account for substance use. As a result of the review, a project was funded to examine the potential of each of the 12 postulated mediating variables. In this study, scales were developed to measure each of the following postulated mediating processes: (1) beliefs about susceptibility to the consequences of using substances, (2) decisionmaking skills, (3) stress management skills, (4) social skills, (5) goal-setting skills, (6) beliefs about alternatives to using substances, (7) self-esteem, (8) skills for resisting peer pressure (self-efficacy), (9) skills for getting and providing assistance for solving problems, (10) normative beliefs about the prevalence and acceptability of substance use, (11) perceptions that substance use would interfere with personal values and lifestyle, and (12) a strong personal commitment to not use substances. Data have been collected on three occasions, each 12 months apart, using these measures and measures of substance use.

The review and the followup study that examined postulated mediating variables were developed independently of the creation of either the classification schema or the meta-analytic database. Connecting the two was not planned. Nonetheless, the presence of both datasets provided an opportunity to examine the potential of the meta-analytic database to be

used as a source of cross-validation of initial findings from the empirical project.

The initial step for completing a comparison between a study and the database findings was to find variables in each that provided some degree of correspondence. Table 1 presents the measures for which correspondence appeared appropriate.

Corresponding concepts were identified in the meta-analytic database for all but three of the variables in the ongoing study. In the ongoing study, social skills specifically discussed skills for communicating and resolving interpersonal differences. The nearest corresponding variable in the meta-analytic database was social personality traits. However, this subcategory included more personality measures than skill measures, and many were not relevant. Goal-setting skills also failed to find a match. Achievement values consisted predominantly of motivation and aspiration measures, few of which attempted to assess skills per se. It was felt that achievement values, general values, and religious values corresponded more closely with the ongoing study's variable that addressed incongruence between values and lifestyle and substance use. A match between goal-setting skills and a meta-analysis category was not available. Finally, measures of skills for getting and providing assistance were not observed in the creation of the meta-analysis database. Thus, while incomplete, it was felt that the correspondence between two datasets would prove useful for comparison purposes.

TABLE 1. *Corresponding measures from the ongoing study and the meta-analytic database.*

Ongoing study	Meta-analytic database
Beliefs about suspectibility to the consequences of using substances	Beliefs about social consequences Beliefs about health consequences Beliefs about psychological effects
Decisionmaking skills	Decisionmaking skills
Stress management skills	Stress management skills

Social skills Goal-setting skills	
Beliefs about alternatives to using substances Self-esteem	Participating in structured activities Participating in nonstructured activities Self-esteem
Skills for resisting peer pressure (self-efficacy) Skills for getting and providing assistance for solving problems	Skills for resisting peer pressure (self-efficacy)
Normative beliefs about the prevalence and acceptability of substance use Perceptions that substance use would interfere with personal values and lifestyle	Peer drug use Peer drug attitudes Achievement values General values Religious values
Commitment to not use substances	Intentions/commit ment

CLASSIFYING CORRELATIONAL RELATIONSHIPS

The second issue of classification emerged as comparisons were attempted. The meta-analytic database included four types of measures: (1) correlation coefficients (e.g., Pearson r, phi); (2) odds and risk ratios; (3) multivariate coefficients (e.g., standardized regression weights); and (4) group mean comparison statistics (analysis of variance (ANOVA), multivariate ANOVA (MANOVA)). Of these, correlation coefficients were most prevalent, provided greatest standardization, and were most similar to analyses already available from the empirical study (Hansen, under review).

Correlation coefficients pose an additional problem that is related to classification in meta-analysis. Specifically, the issue of calculating and

reporting positive and negative signs for correlational values is problematic. The sign of the correlation coefficient is dependent upon four independent factors: (1) the scaling of the independent variable, (2) the scaling of the dependent variable, (3) the empirical relationship, and (4) the actions of the investigator in reporting the findings. Table 2 presents the expected sign values that correspond to different combinations of factors (1) and (2), scaling of the independent and dependent variables.

TABLE 2. *Criteria used for classifying correlation coefficients.*

		Independent variable scaling	
		High = • More of a theoretically undesirable trait or situation • Less of a theoretically desirable trait or situation	High = • More of a theoretically desirable trait or situation • Less of a theoretically undesirable trait or situation
Dependent variable scaling	High = High drug use	Expected correlation Positive Type 1	Expected correlation Negative Type 2
	High = Low drug use	Expected correlation Negative Type 3	Expected correlation Positive Type 4

When the independent variable is scaled so that high values are theoretically less desirable and dependent variable high values are theoretically undesirable (high drug use), the correlation is expected to be negative (type 1). For example, it might be hypothesized that high academic achievement (a socially and theoretically desirable trait) would be inversely related to high drug use. If both are measured so that high values represent fulfilling each condition, a negative correlation coefficient is expected. However, it must be remembered that scaling is relatively arbitrary in social science. Either or both scales can be inverted by either reversing the response categories or by multiplying the final values by negative one (-1). There are no rules that all researchers and research teams follow. If the academic achievement variable, still scored so that high was better, and the drug use (dependent) variable were reversed (e.g., in the case of measuring the degree of abstinence rather

than use), the sign would be expected to reverse (type 3). More often, it appears that investigators vary the ordering of the independent variable.

The third factor that may influence the sign of the correlation is the empirical situation. For example, figure 1 presents a theoretical distribution of correlation coefficients based on fictitious data. (For the sake of argument, assume that this is a type 1 coefficient as defined in table 1.) As with all measurement phenomena, there is a distribution of scores and, in this case, some scores are negative. Even though a positive correlational value is expected (the mean of correlations is positive), some values will be negative. In meta-analytic terms, this may be due to differences in populations, differences in methods (specific measures selected), or chance findings.
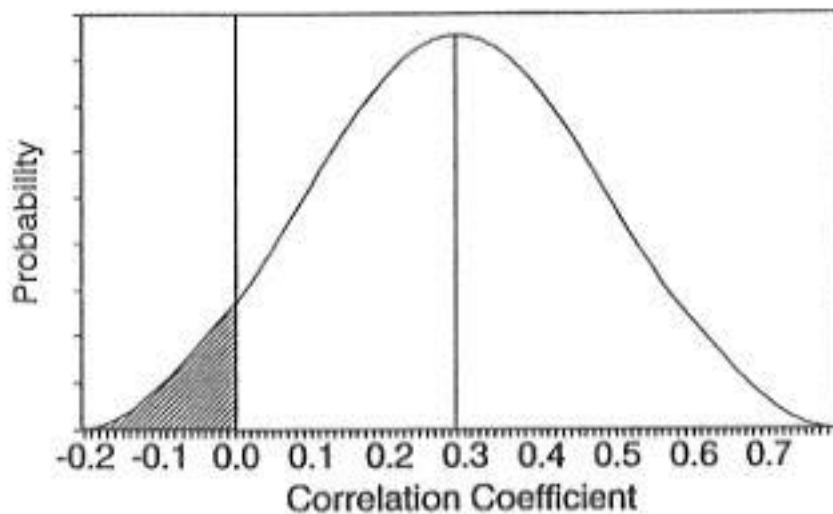

FIGURE 1. *Theoretical sampling distribution of correlation coefficients.*

The final factor that may influence the sign of the correlation coefficient is manipulation on the part of the investigator. When findings are presented, there are occasionally reasons to alter the sign. In most (but not all) cases, this occurs as a transformation to the positive sign. The purpose appears to be ease of presentation on the part of the researcher. The details that underlie the justification for selection of directionality for any given scale may be complicated. It is possible, for instance, that no theoretical model exists for ordering the direction of a scale. The use of multiple scales with mixed directionality may be simplified by creating a uniform direction for presentation purposes. Whatever the intent or reason, it is clear that such practices occur relatively often. Unfortunately for the meta-analyst, such transformations are often undocumented.

What has resulted in the field of substance abuse research is the presentation of correlational data that are relatively noncomparable. Not only is variable scaling often not described sufficiently to inform the reader, unexpected findings are often not highlighted and investigator-induced transformations not documented. This left the authors with a serious dilemma and two options. First, there was the possibility of examining the literature by individual result to determine which of the four types of correlations, adjusted for apparent transformation by the researcher, existed. The authors are actually pursuing this strategy, but it is time consuming and may not result in perfect classification. Second, the authors could arbitrarily transform all the data. Given the time constraints under which this chapter was developed, the authors adopted the latter strategy. All correlation coefficients were transformed to positive values.

Implications of Transforming All Correlations To Be Positive

Before presenting the findings, the implications of this transformation should be clearly documented and understood. Given a theoretical spread of correlation coefficients that corresponds roughly to those presented in figure 1, the transformation of values had a relatively predictable effect. Figure 2 presents the same data with the negative values folded over the positive values. It is apparent that the distribution of values became skewed and the mean of the distribution was inflated. However, in the case presented, the increase in the mean is only slight. Had the distribution of the available values been smaller (i.e., all above zero), no inflation would have been seen at all.
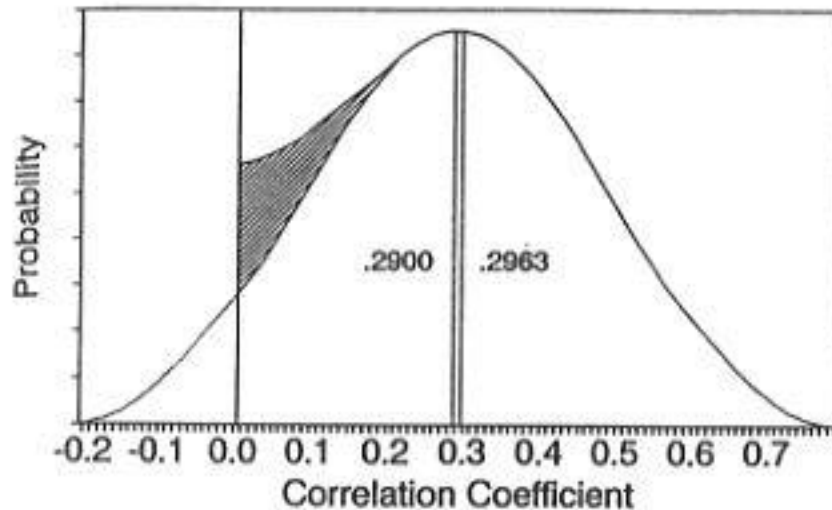
FIGURE 2. *Two theoretical sampling distributions of correlation coefficients with a relatively high true mean correlation (r = 0.29), one allowing and one not allowing negative correlation coefficients.*

Figure 3 presents the same fictitious distribution but with the mean of correlations lowered from 0.2900 to 0.0963. It is readily apparent that in this case, using absolute values of correlations greatly increases skewness and vastly inflates the mean.

These examples illustrate the difficulty of the approach. This procedure violates fundamental statistical assumptions, but with relatively well-known effects. The essential problem that emerges is that values close to zero are expected to be grossly inflated. At the same time, high mean correlations are expected to be relatively accurately portrayed. The point at which confidence is restored is related to skewness and variance. Practical experience from the meta-analysis suggests that correlations of 0.30 and higher experience little inflation and are expected to be accurate.

The utility of this approach is that it allows the identification of correlations that are likely to be valuable for the development of prevention programming. Small correlations are presumed to indicate weak causal linkages. Large correlations are presumed to indicate strong causal
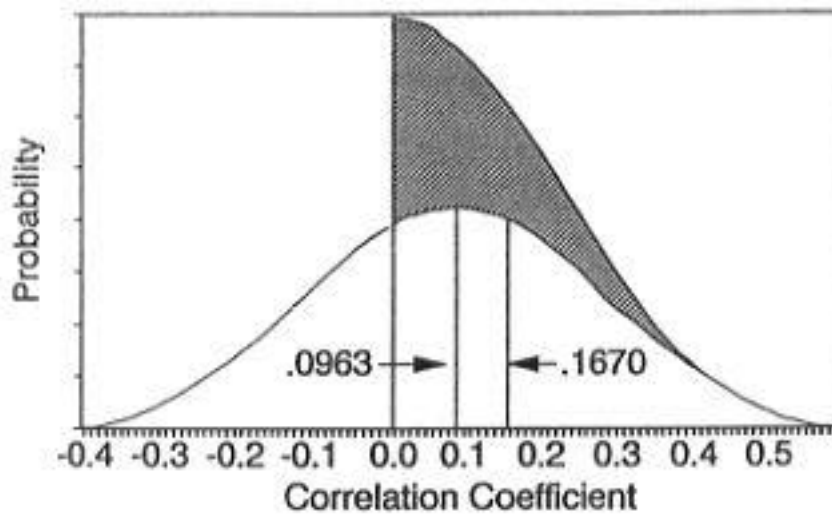
FIGURE 3. *Two theoretical sampling distributions of correlation coefficients with a relatively low true mean correlation (r = 0.0963), one allowing and one not allowing negative correlation coefficients.*

linkages. The later are of most interest and, at least in this case, are most likely to be accurate indicators of the true underlying mean.

CORRESPONDENCE BETWEEN ONGOING AND DATABASE FINDINGS

The ability to compare classification strategies and data makes meta-analytic findings useful. To demonstrate the utility of these strategies, two sets of findings were compared. From the meta-analytic database, variables that corresponded to those in an ongoing empirical study were selected and compared. Because absolute values of correlation coefficients were included in the meta-analytic database, all values are presented as positive numbers. In the case of the ongoing study, this involved an absolute value transformation of otherwise negative (type 2) values.

Table 3 presents cross-sectional data from both the ongoing study of 12 mediating variables and data amassed from the meta-analytic database. Results indicate that there is relatively high concordance among findings. In both cases, commitment and intentions were relatively strong predictors. Similarly, peer drug use and peer drug attitudes, elements of which were captured in the study's measure of normative beliefs, demonstrated a relatively high correlation with substance use. The ongoing study yielded a relatively high correlation between beliefs about

consequences and substance use. Among analyses included in the meta-analysis, only beliefs about social consequences and psychological effects yielded a comparable relationship. Beliefs about health consequences had a lower relationship in the meta-analytic database.

TABLE 3. *Correspondence between meta-analytic and ongoing findings; cross-sectional correlations with substance use; average of alcohol, tobacco, and other substances.*

Meta-analytic findings				Ongoing findings	
	N	Mean	SD		Mean
Commitment	25	0.36	0.11	Commitment	0.42
Health beliefs	87	0.15	0.10	Beliefs about	
Social beliefs	59	0.32	0.19	cons	0.33
Psychological beliefs	104	0.30	0.18	equences	
General values	75	0.21	0.16	Incongruence	
Religious values	30	0.20	0.12	between values and	
Achievement values	42	0.21	0.09	substance use	0.38
Decisionmaking	15	0.14	0.17	Decisionmaking	0.16
Stress management	45	0.25	0.19	Stress management	
					0.14
Self-efficacy	26	0.32	0.20	Self-efficacy	0.27
Self-esteem	72	0.16	0.11	Self-esteem	0.19
Structured activities	69	0.17	0.10	Alternatives	0.28
Nonstructured activities	58	0.27	0.12		
Peer drug use	386	0.36	0.18	Normative beliefs	0.44
Peer drug attitudes	82	0.36	0.25		

KEY: SD = standard deviation.

Other variables that appeared to have similar magnitudes of correlations were decisionmaking skills, self-efficacy for resisting peer pressure, and self-esteem. The alternatives measure appeared to be closest in magnitude to reports of participating in nonstructured activities and was markedly higher than the meta-analytic finding for participating in structured activities.

Several variables had low correspondence. The measure of perceived incongruence between values, lifestyle, and substance use was relatively strong, whereas each of the three categories of values-oriented measures from the meta-analytic database were less predictive. In part this may reflect a different way of measuring this construct with an emphasis on the incongruence rather than the presence or absence of any given value.

The authors also observed a smaller correlation coefficient for stress management than was observed generally. This suggests that the role of stress management skills might be generally more important as a predictor than reflected in the authors' ongoing research.

Longitudinal analyses were also compared (see table 4). For values from the meta-analytic database, all data that involved comparing earlier measures of the predictor with later measures of substance use qualified the data as longitudinal. This resulted in significant variability in the time lag between measures, which is ignored in these analyses. For the ongoing study, measurement of mediators and substance use is delayed 12 months.

TABLE 4. *Correspondence between meta-analytic and ongoing findings; longitudinal correlations with substance use; average of alcohol, tobacco, and other substances.*

Meta-analytic findings				Ongoing findings	
	N	Mean	SD		Mean
Commitment	35	0.17	0.20	Commitment	0.38
Health beliefs	43	0.15	0.11	Beliefs about consequences	
Social beliefs	23	0.16	0.12		0.30
Psychological beliefs	24	0.15	0.10		
General values	13	0.12	0.07	Incongruence between values and substance use	
Religious values	10	0.20	0.08		
Achievement values	19	0.24	0.09		0.37
Decisionmaking	0	---	---	Decisionmaking	0.11
Stress management	42	0.17	0.11	Stress management	
					0.09
Self-efficacy	15	0.30	0.21	Self-efficacy	0.23
Self-esteem	40	0.15	0.11	Self-esteem	0.16
Structured activities	44	0.22	0.19	Alternatives	0.11
Nonstructured activities	5	0.18	0.13		
Peer drug use	109	0.28	0.17	Normative beliefs	0.40
Peer drug attitudes	55	0.26	0.16		

A generally consistent pattern of relationships was observed in these analyses. Peer drug use, peer attitudes, and normative beliefs measures were similar in magnitude. This convergence suggests that these variables are strong longitudinal predictors of substance use. The magnitude of self-efficacy to resist peer pressure as a predictor in both datasets also remained relatively strong. In contrast to the ongoing study's findings about commitment, beliefs, and values, the meta-analytic longitudinal correlation coefficients were markedly smaller. The authors' measure of

alternatives was a relatively weak longitudinal predictor of substance use. Both measures from the meta-analytic database were somewhat stronger, albeit in a moderate range for longitudinal findings. Self-esteem remained a weak predictor of substance use in both datasets. There were no longitudinal studies in the meta-analytic database that examined skill at decisionmaking as a predictor of substance use.

CONCLUSION

The purpose of this chapter was to examine classification issues in meta-analysis. Classification is an inherent underlying activity that receives little attention. Nonetheless, without a well-conceived classification schema at the base of meta-analysis, the theoretical implications of specific analyses lose their meaning. Two specific issues in classification were addressed: classifying variables for analysis and understanding correlation coefficients needed in analysis.

The measurement typology classification schema that resulted in the creation of the database is meta-theoretic in nature. That is, no single theory includes all variable classes. The classification schema appears to be useful in that a diversity of studies and variables can be incorporated within it. The authors nonetheless recognize that the classification model is at least partly dependent upon the topic being studied (substance use), the existing theories that have driven prior research and influenced the development of measures, and the amount of detail that exists in the available studies. The overall pattern of classification involved identifying successive hierarchies of variables, with each level of nesting emerging as sufficient numbers of cases were observed. A two-tier hierarchy was presented. It might have been as easily considered a three-tier hierarchy with some elements complete and some incomplete. With sufficient data from the field, it may be possible to create a full three-tier or four-tier classification schema, the progression being dependent upon refinement of measures and theoretical constructs and the availability of sufficiently large numbers of cases.

A distinct but equally perplexing problem exists for classifying correlational relationships. The field has not progressed sufficiently for a clear typology of relationships to have become standard for presenting data. Four independent elements (the scaling of the independent and dependent variables, the empirically observed relationship, and the needs of the investigator for presentation of findings) were identified as barriers to the consistent application of comparable methods for presenting correlational findings. Of the two available solutions, transformation of

all values to positive numbers is the easiest to complete. This method provides inflated estimates of the average correlation coefficient, particularly when correlational values are near zero. Given the difficulties in completing topologies, this method produces results that have utility. Refinements in reporting will significantly improve the ability of meta-analysts to resolve this dilemma.

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