

*THE TRANSLATION OF BASIC BEHAVIORAL RESEARCH
TO SCHOOL PSYCHOLOGY:
A CITATION ANALYSIS*

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In recent years, school psychology has become increasingly grounded in data-based decision making and intervention design, based upon behavior analytic principles. This paradigm shift has occurred in part by recent federal legislation, as well as through advances in experimental research replicating laboratory based studies. Translating basic research into practice is commonly known as “bridge” research. The present study analyzed four top school psychology journals with regards to their citation trends both within the school psychology literature and between school psychology and behavior analysis. Findings suggest that collaboration between school psychology and behavior analysis is extremely limited, and lacking in the translation of basic-applied studies.

Key words: Citation analysis, bibliometric analysis, scientific translation, bridge research, school psychology

In recent years, school psychology has entered into a new era of accountability where scientifically-based practices are not only encouraged, but are mandated by law (IDEA, 2004). For school-based practitioners, this means documenting the rationale and empirical support for behavior change procedures in the classroom. Failing to do so is not only a poor practice of school psychology, it may also have legal ramifications. Thus, it is of no surprise that the field of school psychology has turned to applied behavior analysis due to its rich empirical support, behavioral assessment methodology, and function-based approaches to solving behavioral concerns (Kratochwill & Martens, 1994). Vollmer and Northup (1997) suggest that one of the key aspects of applied behavior analysis that makes it complimentary to school psychology is its foundation in the basic principles of behavior.

In *The Technology of Teaching*, Skinner remarked that “a really effective educational system cannot be set up until we understand the processes of learning and teaching” (Skinner, 1968, p. 95). Skinner’s views on education continue to resonate today as

practitioners and applied researchers alike attempt to pinpoint the active treatment ingredient responsible for behavior change through an understanding of the basic behavioral processes at play in a successful behavior change program. As any practicing school psychologist can attest, the classroom ecology is extremely complex, with multiple schedules of reinforcement operating at any given time (Martens & Kelly, 1993). For instance, within any classroom, many students will be exposed to behavior support plans, Individualized Education Programs (IEPs), direct instruction programs, behavior altering medication for behavioral concerns, differing reinforcement histories, etc. With such confounding variables, it becomes very difficult to truly understand what is accounting for the observed behavior change after an intervention is implemented. Thus, it is not always readily apparent which procedures are responsible for behavior change during intervention implementation.

One of the fundamental attributes of behavioral research is its reliance on parsimony in understanding behavior change

(Johnston & Pennypacker, 1993). While it is easy to monitor gains in the classroom without an understanding of the controlling behavioral processes, this oversight is not only dangerous to the long-term sustainability of the intervention, it actually does a disservice to the field. When an intervention works, the most we can walk away with is an understanding of what works with *that* individual in *that* setting for *that* target behavior. In sum, the generalizability of the intervention across students, time, settings, and responses is compromised. However, with an understanding of the basic behavioral principles at play, one can individually tailor the intervention to account for these individual and situational differences.

The avenue to accomplishing a true understanding of the behavioral principles implicated in academic or academic-related behavior is through a form of research termed “bridge” or “translational” research. This approach to research is characterized by simple replications of laboratory studies to applied situations and clinical populations (Lerman, 2003). In essence, translational research affords the researcher a greater deal of experimental control (i.e., akin to a laboratory setting), while still being directed toward an applied problem. Yet, despite the seemingly critical need for a relationship between basic and applied research, the disconnect between the two continues to widen (Mace, 1994; Mace & Wacker, 1994).

While researchers have demonstrated much success translating basic experimental research to applied settings (Iwata, 1991), many practitioners and school psychologists may feel that basic research is too esoteric for their settings. Likewise, basic researchers may be hesitant to conduct school-based experimental studies due to the complex and ill-controlled environments characteristic of the classroom setting. This chasm which exists between basic behavioral research and application has come to be known as the “knowledge-to-practice” gap (Heward, 2005).

As Hake (1982) suggests, behavioral psychology may be viewed as a continuum ranging from basic animal research in the laboratory to the direct application of behavioral principles in natural settings, such as a classroom. However, despite the apparent “gap” between the basic and applied researchers, their relationship may be considered a symbiotic one. For example, basic researchers need the applied work to provide external validity and generalizability to their work, while school-based practitioners need the basic research to provide a theoretical framework to their approaches and to work within the best practices of the field.

Interactions between these polar ends of the research continuum foster the development of new behavioral technologies for use in applied settings, such as classrooms and schools. Unfortunately, it is hard to discern the degree to which school-based practitioners utilize the basic principles of behavior analysis, or turn to the behavioral literature for support. To ascertain the degree to which applied behavior analysis has permeated other fields of applied science (or “bridged” the gap between the experimental analysis of behavior to an applied setting), some researchers have turned to citation analyses as a method of investigation (Critchfield, 2002; Critchfield & Reed, 2004; Elliott, Morgan, Fuqua, Ehrhardt, & Poling, 2005; Reed, DiGennaro Reed, Reed, Cos, & Gardner, unpublished manuscript).

Within this approach, the number of shared cross-citations between journals serves as a proxy to the strength of the relationship between the respective fields. For example, if it is evident that a school psychology journal frequently cites *Journal of Applied Behavior Analysis (JABA)*, one can assume that these school psychological researchers are being influenced by translational studies, or even indirectly influenced by basic research (i.e., due to *JABA*’s relationship with *Journal of the Experimental Analysis of Behavior [JEAB]*). Past research on the translation of

basic behavioral principles to education has indicated that these applied journals only shared a mediated relationship with basic behavioral research through the *JABA* (Critchfield & Reed, 2004). That is, while the education and school psychology journals did in fact cite *JABA*, they did not cite *JEAB* directly. Unfortunately, this research did not exclusively examine school psychology journals, nor did it conduct any focused analyses concerning the kinds of research topics or behavioral principles being translated through *JABA*.

The goal of this study was to analyze the number of shared citations between school psychology journals and their relationships with both *JABA* and *JEAB* in 2006 to provide a current estimate on the levels of scientific translation occurring between basic behavioral research and school psychology. In addition, this investigation analyzed the key-word descriptors for those *JABA* articles cited by the school psychology journals which cite *JEAB*, and those *JEAB* articles themselves. Through an analysis of these descriptors, researchers can gain an understanding of which basic principles are being translated to school psychology, and what school psychology topics are being influenced by both basic and applied behavioral research.

Method

School psychology journals were selected for analysis based upon their primary focus in school psychology service delivery, their emphasis on diverse research methodologies and interests within school psychology, and their relative impact factor within the school psychology literature. The four journals identified were *School Psychology Review* [*SPR*], *School Psychology Quarterly* [*SPQ*], *Psychology in the Schools* [*PITS*] and *Journal of School Psychology* [*JSP*]. Citation analyses were limited to only four journals given the complexity of citation analyses. Between-journal analyses were conducted via the 2006

Journal Citation Reports® (*JCR*), which is part of the larger *ISI Web of Science*™ online database (<http://isiwebofknowledge.com>). *JCR* allows users to analyze citation data from more than 7,500 scholarly and technical journals from over 3,300 publishers. This database and methodology has been employed in previous citation analysis studies concerning the scientific translation of behavioral research (Critchfield, 2002; Critchfield & Reed, 2004; Reed, et al., unpublished manuscript). Citation relations were deemed existent if at least one journal contributed $\geq 2.00\%$ of another journal's total citations.

Within each relation, levels of symmetry were assessed to determine if one journal contributed proportionally more to another, skewing the number of shared citations. Specifically, for each journal's contribution to its relational counterpart, a symmetry ratio was computed to determine which, if either, was contributing more. This symmetry ratio was replicated from Critchfield (2002):

$$\frac{[A \text{ cites } B] / \text{total citations } \# A]}{[B \text{ cites } A] / \text{total citations } \# B]}$$

Proportions were considered strongly asymmetrical if the proportion was ≥ 4.00 , and moderately asymmetrical if the proportional was ≥ 2.00 .

To further investigate the translation of basic behavioral research to school psychology journals, hand searches were conducted within each of the four school psychology journals to find the cited *JABA* or *JEAB* articles. The key-word descriptors for each cited *JABA* or *JEAB* article were compiled and sorted into broad categories. Moreover, for each *JABA* article cited in a school psychology journal, hand searches were conducted within the respective *JABA* article to investigate the percentage of cited *JABA* articles which directly cited *JEAB*. Any cited *JEAB* article was then coded for its respective key-word descriptors and were also broadly categorized. This was done in an effort to investigate *JABA*'s role as a mediator of basic

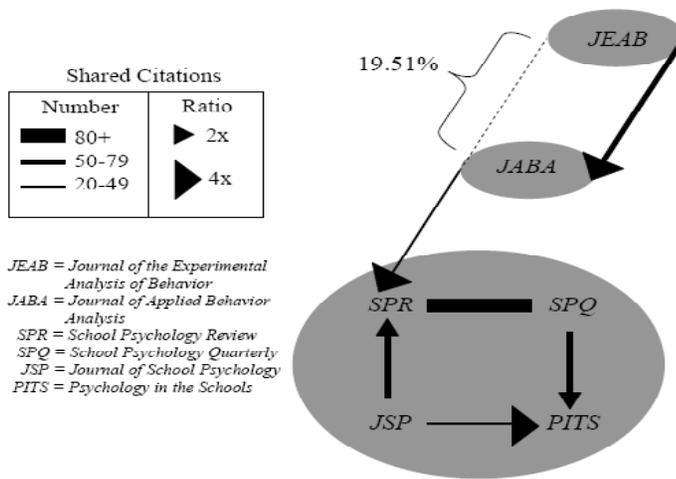


Figure 1. Citation relations linking *JABA* and *JEAB* to school psychology journals. Direct relationships are denoted by solid lines, while mediated relationships are denoted by dashed lines. Line thickness and color of the solid lines reflects the number of shared citations between the pair of journals. Percentages of *JABA* articles cited by a school psychology journal in which a *JEAB* citation appeared in the *JABA* article are denoted next to the dashed lines for *SPR*. Arrows indicate asymmetrical relations, where one journal cited another proportionally more, pointing away from the more-often cited journal towards the citing journal. Absence of an arrow between the pair indicates a nearly symmetrical citation relationship. See text for calculations of symmetry.

science to school psychology and to understand the varying behavioral technologies being contributed to school psychology research.

Results and Discussion

Figure 1 depicts the various relations found both between and within *JABA* and *JEAB* and the four school psychology journals. For each found relation between journal pairs, the strength of the relation was depicted by line thickness and color. Strong asymmetrical relations are denoted in Figure 1 with a large arrow, while moderately asymmetrical relations are denoted with a small arrow. In each instance, the direction of influence is depicted in the direction of the arrow, with the arrow pointing away from the contributing journal and to the citing journal. Any proportion < 2.00 was considered a symmetrical relation, with no arrow present.

Within the school psychology cluster in Figure 1, *SPR* and *SPQ* demonstrated the strongest (98 shared citations) symmetrical relation. *SPR* was found to have a moderate relation to *JSP* (56 shared citations), with *JSP* contributing proportionally more (2.18 times more) within the pair. *SPQ* and *PITS*

demonstrated a moderate asymmetrical correlation, with *SPQ* contributing to *PITS* 2.82 times more. The relation between *JSP* and *PITS* was found to be asymmetrical (*JSP* contributing 8.44 times more to *PITS*), and relatively weak in strength with only 49 shared citations. No relations were observed between *JSP* and *SPQ*, or *SPR* and *PITS*. This was a curious finding due to the strong similarities between the journals' goals and mission statements. Future research should investigate the reasons for these anomalies.

Interestingly, only 59 citations were shared between *JABA* and *JEAB*, while Critchfield and Reed (2004) found the number of shared citations to be over 100 in an analysis citation during the 2002 publication year. This finding may suggest that the growing divide between basic and applied research has begun to influence scholarly practices. Within the current analysis, *JEAB* was found to contribute 10.70 times much to *JABA*, suggesting a very strong influence on *JABA* articles. Likewise, this highlights *JABA*'s minimal influence on the basic research published within *JEAB*. This finding replicates other studies done on this topic (Critchfield, 2002; Critchfield & Reed, 2004).

Examination of the translation of basic behavioral research to school psychology research was limited due to no direct citations of *JEAB* within any of the school psychology journals. Moreover, the only school psychology journal with a relation to the *JABA* (which may be considered a mediator of basic-applied research) was *SPR*. However, this relation was minimal with only 43 shared citations. Overall, this relation was the most asymmetrical within the entire analysis, with *JABA* contributing to *SPR* 14.65 times more, suggesting that the relation is strongly skewed by *SPR*'s reliance on *JABA*. Within this mediating relationship, only 19.51% of the *JABA* articles cited by *SPR* had a *JEAB* citation within their reference lists.

Table 1 provides the top ten broad categories of the key-word descriptors found in the *JABA* articles cited by *SPR*, as well as the key-word descriptor categories found within the *JEAB* articles referenced by those cited *JABA* articles. Thus, Table 1 provides a rough description of the kinds of behavioral

research shaping school psychology research. In addition, the *JEAB* descriptors offer some insight into the broad behavioral principles being translated to school psychology research through *JABA*.

In sum, these analyses should serve as a “wake-up call” to both basic behavioral researchers and school psychology researchers with regards to the lack of scientific translations occurring between these fields. It is evident that school psychology is contributing very little to behavior analysis, and that the behavior analytic literature is not being utilized by school psychology. With this information at hand, both fields should recognize the need for more translational research to provide better interventions grounded in basic research to school psychology. Both school psychology and behavior analysis should begin conducting bridge studies with student populations and addressing academic-related problems.

Many solutions have been proposed in the past regarding ways to bridge the basic-applied gap in research, and bear some

N (%)	<i>JABA</i> Descriptor Categories	N (%)	<i>JEAB</i> Descriptor Categories
13 (9.56)	Assessment Issues	6 (25.00)	Motivating Operations
13 (9.56)	Problem Behavior	3 (12.50)	Reinforcement
12 (8.82)	Functional Assessment/Analysis	3 (12.50)	Choice
6 (4.41)	Educational Classifications	3 (12.50)	Stimulus Control
4 (2.94)	Generalization	2 (8.33)	Response Patterns
4 (2.94)	Oral Reading	2 (8.33)	Behavioral Economics
4 (2.94)	Developmental Disabilities	2 (8.33)	Bridge Research
3 (2.21)	Task Difficulty	1 (4.17)	Countercontrol
3 (2.21)	Curricular Modifications	1 (4.17)	Technology development
3 (2.21)	Teacher Behavior	1 (4.17)	Microeconomics

Table 1. Most commonly listed key-word descriptor categories from *JABA* articles cited by school psychology journals in 2006, and *JEAB* articles cited by those *JABA* articles during 2006.

mentioning here as well. School psychology is undoubtedly an applied field, and these solutions ought to produce the same intended effects as those proposed to the broader applied field. Firstly, more research is needed in the replication of animal models of behavior (e.g., discounting, choice, momentum, etc.) to human populations (Mace, 1994). This would not only serve as a validation of these principles, it may in fact offer further insight into ways to utilize basic behavioral principles to produce meaningful change in classroom behavior change programs. Secondly, highly controlled operant experiments should be conducted with diverse populations (Mace, 1994). Within school psychology, this may lead to better behavioral descriptions of the effects of reinforcement contingencies on academic-related tasks. Thirdly, behavior analysts and practitioners alike should be more broadly trained in the importance of linking science to practice (Critchfield & Reed, 2004). Best practices in school psychology dictate that school psychologists operate under the scientist-practitioner model, and ground their work in empiricism (Allen & Graden, 2002). However, it is not likely that many school psychology training programs offer courses on operant techniques. Likewise, it is not expected that behavior analysts be trained in the problem-solving approach utilized by school psychology. With such disconnect, both fields lack the appropriate experience and knowledge to find areas of research in which to translate basic processes to school psychological practices. Thus, collaboration between behavior analysis and school psychology should be encouraged to foster more creative research in addressing applied problems through a basic behavioral lens. Finally, both fields should recognize the importance of disseminating their research to broader arenas. Translational studies between these fields should be shared with one another through publication outlets, conference presentations, and other scholarly exchanges. The crux of scientific translation is the transfer

of technology from one science to another. Without direct lines of dissemination and technology sharing, we cannot expect our practices to have as broad an impact as we intend.

Analyses such as these should be interpreted within certain parameters. For instance, this study looked only within *JABA* and *JEAB* as avenues of scientific translation. Certainly other behavioral journals could be influencing school psychology practices. Future research should examine these relations to provide a better understanding of the associations between these fields. Nevertheless, given *JABA*'s status as the flagship behavioral journal, it is expected that other behavioral journals will contribute even fewer translation studies to the school psychology literature base. Furthermore, this study only considered translation occurring directly through *JABA*. It is reasonable that many of the *JABA* articles cited by *SPR* cited other *JABA* articles which were based upon basic research. It is expected that many other indirect relationships between school psychology and basic research do in fact exist. However, it is assumed that the more indirect the relationship becomes, the less salient the scientific translation is on the influence of applied work.

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