BEHAVIOR ANALYST CERTIFICATION BOARD

Fourth Edition Task List

Introduction

The BACB Fourth Edition Task List is organized in three major sections:

I **The first section, Basic Behavior-Analytic Skills**, covers tasks that a practicing behavior analyst will perform with some, but probably not all, clients. These tasks represent basic, commonly used skills and procedures.

II **The second section, Client-Centered Responsibilities,** includes tasks related to working with all clients and they should apply in most applied situations.

III **The third section, Foundational Knowledge,** covers concepts that should have been mastered prior to entering practice as a behavior analyst. The topics listed in this section are not tasks that a practitioner would perform; instead, they are basic concepts that must be understood in order to perform the tasks included in the first two sections.

This list is provided mainly as a resource for instructors and a study tool for candidates. Candidates for the BCBA and BCaBA credentials should have a thorough understanding of these topics.

All of the questions on the BCBA and BCaBA examinations are linked to the tasks listed under Basic Behavior-Analytic Skills and Client-Centered Responsibilities. Each examination form will contain one or two questions evaluating candidate knowledge of every task from these two sections. The topics listed in the Foundational Knowledge section will not be directly assessed with a specific number of questions; however, they may be indirectly assessed through questions about related tasks. For example, a test question about the Client-Centered Responsibility task J-11 "Program for stimulus and response generalization" might cover Foundational Knowledge item 36 "Define and provide examples of response generalization" or item 37 "Define and provide examples of stimulus generalization."

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Ethics and Professional Conduct are subsumed within each section of the task list. The BACB Professional Disciplinary and Ethical Standards and Guidelines for Responsible Conduct for Behavior Analysts are essential companion documents to the task list. BACB certificants must practice in compliance with the professional disciplinary and ethical standards and should structure their practices in accordance with the conduct guidelines. Candidates are expected to have a complete understanding of these documents, including, but not limited to, the importance of ethical conduct as it relates to professional practice of the tasks identified in the Fourth Edition Task List. **As a result, questions addressing ethical issues related to specific tasks will appear on the examination.**

Section I:
Basic Behavior-Analytic Skills

A. Measurement

A-01	Measure frequency (i.e., count).
A-02	Measure rate (i.e., count per unit time).
A-03	Measure duration.
A-04	Measure latency.
A-05	Measure interresponse time (IRT).
A-06	Measure percent of occurrence.
A-07	Measure trials to criterion.
A-08	Assess and interpret interobserver agreement.
A-09	Evaluate the accuracy and reliability of measurement procedures.
A-10	Design, plot, and interpret data using equal-interval graphs.
A-11	Design, plot, and interpret data using a cumulative record to display data.
A-12	Design and implement continuous measurement procedures (e.g., event recording).
A-13	Design and implement discontinuous measurement procedures (e.g., partial & whole interval, momentary time sampling).
A-14	Design and implement choice measures.

B. Experimental Design

B-01	Use the dimensions of applied behavior analysis (Baer, Wolf, & Risley, 1968) to evaluate whether interventions are behavior analytic in nature.
B-02	Review and interpret articles from the behavior-analytic literature.
B-03	Systematically arrange independent variables to demonstrate their effects on dependent variables.
B-04	Use withdrawal/reversal designs.
B-05	Use alternating treatments (i.e., multielement) designs.
B-06	Use changing criterion designs.
B-07	Use multiple baseline designs.
B-08	Use multiple probe designs.
B-09	Use combinations of design elements.

B-10	Conduct a component analysis to determine the effective components of an intervention package.
B-11	Conduct a parametric analysis to determine the effective values of an independent variable.

C. Behavior-Change Considerations

C-01	State and plan for the possible unwanted effects of reinforcement.
C-02	State and plan for the possible unwanted effects of punishment.
C-03	State and plan for the possible unwanted effects of extinction.

D. Fundamental Elements of Behavior Change

D-01	Use positive and negative reinforcement.
D-02	Use appropriate parameters and schedules of reinforcement.
D-03	Use prompts and prompt fading.
D-04	Use modeling and imitation training.
D-05	Use shaping.
D-06	Use chaining.
D-07	Conduct task analyses.
D-08	Use discrete-trial and free-operant arrangements.
D-09	Use the verbal operants as a basis for language assessment.
D-10	Use echoic training.
D-11	Use mand training.
D-12	Use tact training.
D-13	Use intraverbal training.
D-14	Use listener training.
D-15	Identify punishers.
D-16	Use positive and negative punishment.
D-17	Use appropriate parameters and schedules of punishment.
D-18	Use extinction.
D-19	Use combinations of reinforcement with punishment and extinction.

D-20	Use response-independent (time-based) schedules of reinforcement (i.e., noncontingent reinforcement).
D-21	Use differential reinforcement (e.g., DRO, DRA, DRI, DRL, DRH).

E. Specific Behavior-Change Procedures

E-01	Use interventions based on manipulation of antecedents, such as motivating operations and discriminative stimuli.
E-02	Use discrimination training procedures.
E-03	Use instructions and rules.
E-04	Use contingency contracting (i.e., behavioral contracts).
E-05	Use independent, interdependent, and dependent group contingencies.
E-06	Use stimulus equivalence procedures.
E-07	Plan for behavioral contrast effects.
E-08	Use the matching law and recognize factors influencing choice.
E-09	Arrange high-probability request sequences.
E-10	Use the Premack principle.
E-11	Use pairing procedures to establish new conditioned reinforcers and punishers.
E-12	Use errorless learning procedures.
E-13	Use matching-to-sample procedures.

F. Behavior-Change Systems

F-01	Use self-management strategies.
F-02	Use token economies and other conditioned reinforcement systems.
F-03	Use Direct Instruction.
F-04	Use precision teaching.
F-05	Use personalized systems of instruction (PSI).
F-06	Use incidental teaching.
F-07	Use functional communication training.
F-08	Use augmentative communication systems.

Section II:
Client-Centered Responsibilities

G. Identification of the Problem

G-01	Review records and available data at the outset of the case.
G-02	Consider biological/medical variables that may be affecting the client.
G-03	Conduct a preliminary assessment of the client in order to identify the referral problem.
G-04	Explain behavioral concepts using nontechnical language.
G-05	Describe and explain behavior, including private events, in behavior-analytic (non-mentalistic) terms.
G-06	Provide behavior-analytic services in collaboration with others who support and/or provide services to one's clients.
G-07	Practice within one's limits of professional competence in applied behavior analysis, and obtain consultation, supervision, and training, or make referrals as necessary.
G-08	Identify and make environmental changes that reduce the need for behavior analysis services.

H. Measurement

H-01	Select a measurement system to obtain representative data given the dimensions of the behavior and the logistics of observing and recording.
H-02	Select a schedule of observation and recording periods.
H-03	Select a data display that effectively communicates relevant quantitative relations.
H-04	Evaluate changes in level, trend, and variability.
H-05	Evaluate temporal relations between observed variables (within & between sessions, time series).

I. Assessment

I-01	Define behavior in observable and measurable terms.
I-02	Define environmental variables in observable and measurable terms.
I-03	Design and implement individualized behavioral assessment procedures.
I-04	Design and implement the full range of functional assessment procedures.
I-05	Organize, analyze, and interpret observed data.

I-06	Make recommendations regarding behaviors that must be established, maintained, increased, or decreased.
I-07	Design and conduct preference assessments to identify putative reinforcers.

J. Intervention

J-01	State intervention goals in observable and measurable terms.
J-02	Identify potential interventions based on assessment results and the best available scientific evidence.
J-03	Select intervention strategies based on task analysis.
J-04	Select intervention strategies based on client preferences.
J-05	Select intervention strategies based on the client's current repertoires.
J-06	Select intervention strategies based on supporting environments.
J-07	Select intervention strategies based on environmental and resource constraints.
J-08	Select intervention strategies based on the social validity of the intervention.
J-09	Identify and address practical and ethical considerations when using experimental designs to demonstrate treatment effectiveness.
J-10	When a behavior is to be decreased, select an acceptable alternative behavior to be established or increased.
J-11	Program for stimulus and response generalization.
J-12	Program for maintenance.
J-13	Select behavioral cusps as goals for intervention when appropriate.
J-14	Arrange instructional procedures to promote generative learning (i.e., derived relations).
J-15	Base decision-making on data displayed in various formats.

K. Implementation, Management, and Supervision

K-01	Provide for ongoing documentation of behavioral services.
K-02	Identify the contingencies governing the behavior of those responsible for carrying out behavior-change procedures and design interventions accordingly.
K-03	Design and use competency-based training for persons who are responsible for carrying out behavioral assessment and behavior-change procedures.

K-04	Design and use effective performance monitoring and reinforcement systems.
K-05	Design and use systems for monitoring procedural integrity.
K-06	Provide supervision for behavior-change agents.
K-07	Evaluate the effectiveness of the behavioral program.
K-08	Establish support for behavior-analytic services from direct and indirect consumers.
K-09	Secure the support of others to maintain the client's behavioral repertoires in their natural environments.
K-10	Arrange for the orderly termination of services when they are no longer required.

Section III:
Foundational Knowledge Accompanying the BACB Fourth Edition Task List

Explain and Behave in Accordance with the Philosophical Assumptions of Behavior Analysis

FK-01	Lawfulness of behavior
FK-02	Selectionism (phylogenic, ontogenic, cultural)
FK-03	Determinism
FK-04	Empiricism
FK-05	Parsimony
FK-06	Pragmatism
FK-07	Environmental (as opposed to mentalistic) explanations of behavior
FK-08	Distinguish between radical and methodological behaviorism.
FK-09	Distinguish between the conceptual analysis of behavior, experimental analysis of behavior, applied behavior analysis, and behavioral service delivery.

Define and Provide Examples of:

FK-10	behavior, response, response class
FK-11	environment, stimulus, stimulus class
FK-12	stimulus equivalence
FK-13	reflexive relations (US-UR)
FK-14	respondent conditioning (CS-CR)
FK-15	operant conditioning
FK-16	respondent-operant interactions
FK-17	unconditioned reinforcement
FK-18	conditioned reinforcement
FK-19	unconditioned punishment
FK-20	conditioned punishment
FK-21	schedules of reinforcement and punishment

FK-22	extinction
FK-23	automatic reinforcement and punishment
FK-24	stimulus control
FK-25	multiple functions of a single stimulus
FK-26	unconditioned motivating operations
FK-27	conditioned motivating operations
FK-28	transitive, reflexive, surrogate motivating operations
FK-29	distinguish between the discriminative stimulus and the motivating operation
FK-30	distinguish between motivating operation and reinforcement effects
FK-31	behavioral contingencies
FK-32	contiguity
FK-33	functional relations
FK-34	conditional discriminations
FK-35	stimulus discrimination
FK-36	response generalization
FK-37	stimulus generalization
FK-38	behavioral contrast
FK-39	behavioral momentum
FK-40	matching law
FK-41	contingency-shaped behavior
FK-42	rule-governed behavior

Distinguish between the Verbal Operants

FK-43	Echoics
FK-44	Mands
FK-45	Tacts
FK-46	Intraverbals

Measurement Concepts

FK-47	Identify the measurable dimensions of behavior (e.g., rate, duration, latency, interresponse time).
FK-48	State the advantages and disadvantages of using continuous measurement procedures and discontinuous measurement procedures (e.g., partial- and whole-interval recording, momentary time sampling).

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DISCUSSION AND REVIEW PAPER

Determining BACB Examination Content and Standards

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Abstract The standards associated with high-stakes professional credentialing are well established in the field of testing and measurement and are well supported by antitrust, administrative, and contract law. These standards have evolved to assure that the scope of work for a field's practitioners is appropriately reflected in the content of credentialing examinations and that the means by which credentials are earned include practitioners and other stakeholders throughout all phases of the credentialing process. This article describes the procedures by which the content of credentialing examinations is determined. The certification programs administered by the Behavior Analyst Certification Board are used as an illustration throughout. The article also considers the implications of these procedures and mechanisms.

Keywords Certification · Certification standards · Certification examination content · Behavior Analyst Certification Board

The procedures used by the Behavior Analyst Certification Board® (BACB®) to develop its certification examinations are used for certification and licensure examinations worldwide. The science of test development is a professional field in its own right, and many educational institutions offer advanced degrees in testing and measurement. The testing field's professional associations (e.g., Institute for Credentialing Excellence; Council on Licensure, Enforcement, and Regulation; and Association of Test Publishers) have developed an extensive body of literature describing best practices in measurement and evaluation (e.g., American Educational Research Association, American Psychological Association, and National Council on Measurement in Education 1999). Furthermore, formal standards have been developed for evaluating credentialing programs through third-party audit processes such as those of the National Council of Certifying Agencies (NCCA) and the American National Standards Institute (ANSI). To date, 112 credentialing organizations have had programs accredited by NCCA (Institute for Credentialing Excellence 2014), including the BACB, and 48 organizations have had programs accredited by ANSI (2014).

The legal foundation for high-stakes credentialing procedures evolved out of the interaction of a variety of legal principles. Significant legal implications for certification bodies are found in antitrust, administrative, and contract law. In antitrust law, certification programs offering credentials that are considered prerequisites to practice must demonstrate that those credentials are reasonable. Failure to demonstrate reasonableness of the credentialing requirements could result in claims of unlawful restraint of trade. In administrative law, certification programs must also meet the requirements of minimal due process. Notice to candidates about the testing specifications and certification requirements, along with opportunities to appeal denials, are founded in best practices arising out of due process laws and procedures. In contract law, the application for certification and any rules and requirements relating to how to apply, standards for qualifying, renewal and recertification, and examination requirements constitute a contractual relationship between the certifying body and the candidate/certificant.

This paper is dedicated to the memory of Dr. Jerry Shook, whose contributions to credentialing applied behavior analysts have had a profound impact on the field and those it serves.

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With regard to actual test questions, the most significant legal concern is "reasonableness" under the antitrust considerations identified above. There is a long line of precedence finding reasonableness to be grounded in the process followed to develop and score a test item. An example of how this test is applied in court cases appeared in the US Supreme Court decision in Ricci v. DeStefano (2009). This case is informally referred to as the "Connecticut firefighter" lawsuit. In this case, the Supreme Court of the USA reinstated examination results even though those results had a substantial negative impact on minority firefighters. The examination results were reinstated because the processes used when developing the examination items and "cut score" (passing score) were demonstrated to be valid and reasonable. The courts reviewing this case took into consideration the extent to which the examination questions followed generally accepted best practices for development, including a foundation in job task analysis, with procedures in place to ensure unbiased item writing, administration, scoring, and post-examination review. The best practices for certification examinations often mirror best practices for employment testing (United States Equal Employment Opportunity Commission 1978).

Consider the following question previously used on an earlier version of the BACB examination for Board Certified Behavior Analyst® (BCBA®) certification.

> Charmaine has sporadic incontinence. Recently, incontinence has increased to two or three occurrences per day. The change appears to coincide with a change in her medication, which was adjusted when she was last seen by her physician about three weeks ago. What should the behavior analyst do FIRST?
>
> A. Have Charmaine keep an incontinence log
> B. Conduct a functional analysis
> C. Advise caregivers to contact her physician
> D. Review all records

Did you answer it correctly? In case you are not sure, the best answer is option "C." This is the best answer because the change in Charmaine's incontinence seems to coincide with a medication change. Having Charmaine keep a log is not helpful because we already know the rate is two to three times per day. Conducting a functional analysis is premature given that there is a potential cause, which can be evaluated by contacting the physician. Reviewing all records goes beyond what is necessary and could be an invasion of Charmaine's privacy.

Thousands of questions similar to this one comprise the item pool for BACB examinations. This item pool is a continually updated collection of questions that have survived item analysis evaluations from previous examination administrations. An item analysis is a routine statistical evaluation of each item used in an examination that confirms that each item adequately discriminates between candidates who perform well on the exam and those who perform poorly (Livingston 2006). Items that are problematic are either revised or discarded. As with all new items, revised items are included on future examinations to determine if they perform well and can therefore be included in the pool. Such items are scored and analyzed but not counted in the candidate's performance. Generally, this process is described as "pre-testing" items.

This item pool constitutes one part of a set of contingencies that influence what authors include in textbooks, what instructors incorporate into course syllabi, and what students study in taking these courses and preparing for the certification examination. These contingencies are therefore an important part of determining the competencies assessed by BACB examinations. The focus of this article concerns from where examination questions come and the elaborate process underlying the determination of standards used by the BACB and similar high-stakes professional credentialing programs. High-stakes credentialing programs are those that have significant consequences for not just the candidate and the credentialing body but for the public, which can be put at risk by unqualified candidates. Protecting the public from this risk is the rationale underlying all facets of the credentialing process.

How Examination Items are Developed

Items may be written by a variety of individuals under varying circumstances. Most professional credentialing programs rely on individuals who hold the credential for which the examination is being developed. By virtue of having obtained and maintained the credential, these people are deemed to be "subject matter experts" or SMEs. SMEs are usually volunteers who have been working in the profession for a while and now wish to give something back to their field. As an example of this general approach, items in the pool from which BACB examinations are constructed are written by BACB certificants who have participated in a 2-h workshop presented by the BACB's psychometrician (an expert in testing and measurement; the second author). This workshop teaches participants how to develop good multiple-choice test questions. The workshop also provides an overview of the steps required to develop fair, valid, and reliable examinations. Upon completion of the workshop, these certificants are assigned specific tasks for which to draft test items. The tasks assigned are determined based on an inventory of the pool of questions, which is conducted prior to each workshop to identify areas in need of additional items. Depending on the nature of the workshop, the SMEs may write their items on site or submit items online using a secure website designed for

this purpose. All submitted items are entered into the BACB item pool as "draft" items. The BACB conducts periodic item-review workshops during which a panel of BACB certificants is convened to review, revise, and approve the draft items for use as "pilot" items on an examination. The pilot items are not included among the scored items on the examination because the pilot items are being tested to gather data on how they might perform if included on future examinations. Only items that "pass the test" will become eligible for use as scored items on future examinations. To "pass," an item must be answered correctly by the majority of candidates and must appropriately discriminate between candidates who do and do not possess sufficient knowledge to obtain the credential. In other words, answering the item correctly should be positively correlated with overall examination scores. After being pilot tested, the statistical data that have been gathered on the items are reviewed by the psychometrician. In the event of questionable statistical performance, the item will be reviewed, revised, or discarded by another panel of SMEs.

Construction of questions is driven by specific knowledge, skill, and ability statements (KSAs). These are detailed statements, much like operational definitions, that expand on the tasks that appear in the published task list describing the content of credentialing examinations. For the BACB, the KSAs are designed to serve as "prompts" for the certificants who will draft items for the examinations. Although not an exhaustive list of every concept or activity pertinent to the practice of applied behavior analysis (ABA), they cover key points that should be included in the examinations.

The BACB's KSAs are developed by a panel of certificants shortly after the task list is approved by the BACB's Board of Directors. The KSAs comprise an internal document that is used as a guide during item writing. For example, the task statement for the above item was "G-02: Consider biological/medical variables that may be affecting the client." (BACB 2012). The specific KSA statement for the above item was "Seek consultation to identify potential medical issues causing behavior problems." Each KSA serves as the basis for several items. Although these items focus on the same KSA, each may take a slightly different approach to probing the candidate's understanding of the material.

An important benefit of this redundancy is to increase the size of the overall item pool. The necessary size of the pool is determined based on the frequency with which the examination is administered, the number of candidates who sits for the examination during each testing window, and the number of examination forms that is used during a given testing window. An examination form is a unique collection of items (150 items for the BCBA and 130 items for the Board Certified Assistant Behavior Analyst®, BCaBA®) selected to cover the content identified by the task list. For security reasons, the BACB administers multiple examination forms during the testing windows each year. The item pool contains over 10 times the number of items required to create one examination form for each credential.

The KSAs are in turn derived from task statements. In the case of the BACB, these are descriptive statements that identify the work activities performed by BCBAs and BCaBAs. Each task statement consists of a verb describing the action that takes place, an object receiving that action, and one or more qualifiers if needed for clarification. Task statements covering related material are organized into logical content areas, which represent the major job functions of an applied behavior analysis practitioner. For instance, there are presently 11 content areas covering the material that both BCBA and BCaBA candidates are responsible for knowing. These content areas contain from 3 to 21 task statements, although some tasks involve multiple statements. Collectively, these content areas and their tasks are called the task list. The *Fourth Edition Task List* includes 115 tasks (BACB 2012).

How the Task List is Developed

Task lists result from an elaborate process called a job analysis (Raymond and Neustel 2006; Shook et al. 2004). A job analysis identifies the key functions and basic job duties of a profession at a particular point in time. By design, they represent not the latest practices or trends, but the mainstream activities generally accepted by practitioners. This conservative approach protects against including content that is not yet established by research or broadly accepted within a field and that may yet fall by the wayside. This caution means job analyses must be periodically updated by repeating the effort, typically every 5 to 10 years depending on the needs of the profession, to accommodate advances that eventually pass muster.

A job analysis consists of specific components. First, the credentialing organization convenes a representative panel of SMEs. Individuals are selected based on their experience and expertise in broad areas of the field represented by practitioners. The resulting panel membership typically considers dimensions such as gender, geography, type of employment, area of expertise, professional contributions, and so forth. The goal is to bring together a diverse group of panel members that provides a good cross-section of the field as a whole. In the case of the BACB's most recent job analysis, for example, this panel included university faculty, as well as practitioners working in different areas within the USA and in other countries, with training from different educational institutions, working in a variety of applied settings, and with various levels of supervisory experience.

The panel is brought together for a multi-day meeting to review and consider possible content or organizational revisions to the existing task list, as well as changes to educational, practice, or other requirements for certification. Given the

intentional diversity of panel membership, it is important that panelists feel free to argue for whatever changes each finds appropriate. This meeting is typically coordinated by a professional in the field of testing and measurement who is skilled in facilitating productive discussion and encouraging the group to systematically probe all aspects of the existing task list and to consider all points of view. The BACB's most recent panel was coordinated by its psychometrician. The process focused on inclusion of new content, elimination of outdated and redundant content, and reorganization of content into different task areas.

The product of the expert panel is a set of revisions to the existing task list agreed to by majority vote of the panel. The next step involves professionals in testing and measurement turning these revisions into an electronic survey instrument asking respondents to rate the frequency and importance of each task. Other questions may probe the level of supervision needed and the potential for harm that would result from lack of competence. The details of survey questions vary based on the needs of the field in which survey is done. This survey may be tested as a draft instrument with a preliminary cohort of experts in the field to insure that its design and other features will yield useful information. Based on this feedback, minor edits may be made to the survey that does not conflict with the panel's revisions. A draft of the BACB's most recent job analysis survey instrument was sent to 282 experts in behavior analysis around the world. The final form of the survey is then sent electronically to a large sample of the field's membership.

As an example of the survey process, the BACB's most recent job analysis survey was administered using a web-based survey tool. Survey participants were asked to provide some background information and to then respond to the survey based on their current credential. Due to the extensive time and effort required to accurately complete the survey and given the importance of the survey results to the BACB, five type 5 continuing education credits were offered to individuals who completed the entire survey. Using the BACB database, the effective sample size of the 2009 survey was 7,067. Of these, 2,236 (31.64 %) responded to the survey. The number of responses was sufficient to be considered a representative sample of the certificant population and to permit appropriate analyses to be performed. In fact, the response rate was consistent with industry standards (Henderson and Smith 2009). We refer the reader to the May 2011 issue of the *BACB Newsletter* for additional information about this survey and its findings (BACB 2011).

Survey data are then thoroughly analyzed. This analysis typically includes evaluating responses across various demographic categories, including age, gender, race, geography, training and experience, employment, and other dimensions. However, the primary focus of the analysis lies in the respondents' evaluations of each of the task statements in terms of its importance and frequency of performance. In preparing respondents to rate the tasks, survey instructions may encourage respondents to consider factors such as (a) the frequency with which the specified activity is performed, (b) the risks associated with performing the activity poorly, and (c) whether the activity should be tested on the certification examinations. In the case of the BACB, this analysis is conducted separately for BCBA and BCaBA certificants.

A report of the job analysis survey is prepared by testing and measurement professionals and submitted to the credentialing agency. The centerpiece of this report provides descriptive statistical measures of respondent ratings of each task statement in terms of their importance for practitioners. The governing body of the credentialing organization (in the case of the BACB, its Board of Directors) or an assigned committee sets a cutoff for these ratings to determine whether any of the proposed task statements should be eliminated from the task list. The agency also considers recommendations of the expert panel regarding possible changes in educational, practice, or other requirements for certification. The final result of this process is a decision by the organization to promulgate a revised set of task statements and associated requirements for how practitioners must prepare to qualify for the field's credentials.

These requirements are scheduled to take effect at a specified future date to allow the field to prepare for the changes. Before they are implemented, however, several steps are necessary. The KSAs must be reviewed and revised to match the new task list, with new KSAs being written to cover any new content that was added. The pool of test items must be reviewed and compared to the new task list and KSAs to determine which items can be retained and where they fit. An inventory must then be conducted to identify tasks and KSAs that require more items. The inventory will be used to guide the efforts of item writers who will draft new items based on the new task list. As already described, new items are pilot tested and reviewed to ensure that they meet acceptable performance criteria. After the item pool has been sufficiently updated, new test forms can be generated that match the updated task list requirements.

How the Examination's Passing Score is Determined

At this point, a cut score used to determine whether a candidate passes or fails the examination must be established. There are different approaches to this task, but most of them involve bringing in a panel of practitioners to systematically review and assess the difficulty of each test item on a "base" examination form. The BACB uses a modified Angoff approach in which panel members estimate the proportion of entry-level practitioners (i.e., those who have sufficient competency to obtain the BCBA or BCaBA credential) who will know the

answer to each item (Angoff 1984). The estimates from all panel members are averaged to arrive at a recommended cut score, which is then presented to the BACB Board of Directors for approval.

How the Task List is Turned into an Examination

Actual examinations are created by selecting items from the pool that match the specifications for the base examination form that resulted from the job analysis study. These specifications are referred to as the examination blueprint because they provide detailed information on the content that will be covered in each examination form even down to the number of questions that will be asked about each task. The item selection process is basically a stratified random sampling of the item pool with the strata representing the tasks. Each "active" item that is eligible for use on an examination form has a detailed statistical history, which includes information on the number of people who answers the item correctly, how answering the item correctly relates to the overall test performance, and information on the number of people who selects each of the wrong answers. In addition to statistical performance, other factors that are considered when selecting items include how frequently the items have been used and whether the items are "enemies" of other selected items (i.e., giving answers to other items or asking the same question as another item).

Once the examination form has been selected, it is reviewed by a panel of SMEs to ensure that it meets the blueprint requirements and that all of the selected items are accurate and reflect current practices. In addition, each form is statistically equated to the base examination form to ensure that any differences in difficulty level across forms are taken into account. As a result of the equating process, the pass rates generally remain quite stable throughout the life span of each base examination form. New base examination forms are created approximately every 5 years or whenever there is a significant change to the examination content, such as the introduction of a new task list.

After the experts have approved an examination form, it is administered to candidates during a testing window. After the testing window ends, an item analysis is conducted. This analysis includes an evaluation of the number of candidates who selects each answer choice and the relationship between selecting that answer choice and overall test scores. Items that perform poorly (e.g., those that many candidates answer incorrectly or those that have a negative relationship to test scores) are flagged for review by another panel of SMEs. On rare occasions, the panel may determine that the flagged items have flaws, such as more than one correct answer or even no correct answer. In these cases, the panel may recommend adjustments to the scoring key so that candidates are not adversely affected by the flawed items. Once this review process is completed, scores for the examination are finalized and reported to candidates. Thus, every examination form is subjected to the scrutiny of multiple experts in the field throughout the development cycle. This ensures that any variations in quality and difficulty of the items are accounted for in the scoring process so that candidates have an equal opportunity to demonstrate their knowledge of applied behavior analysis.

The Foundation of High-Stakes Credentialing Procedures

Many other fields use the processes described here to develop credentialing programs that identify competent practitioners and protect the public health, safety, and welfare. For example, Cardiovascular Credentialing International offers ANSI-accredited certifications in eight different specialty areas for technicians working in the cardiovascular field. The National Registry of Food Safety Professionals certifies over 100,000 food safety managers annually through an ANSI-accredited program. $(ISC)^2$ offers an ANSI-certified credential held by almost 100,000 professionals working in the field of information security. The Dental Assisting National Board certifies over 33,000 dental and orthodontic assistants through its two NCCA-accredited examinations. Accreditation of a credentialing body's practices by ANSI or NCCA is a demanding process which indicates that they rely on appropriate job analysis studies to define the scope of work for their practitioners and include practitioners and other stakeholders throughout all phases of the credential development process in accordance with testing and measurement industry standards (see American National Standards Institute 2003; National Commission for Certifying Agencies 2003).

There are a number of advantages to adhering to national accreditation and best practices in the field of certification. Certificants gain assurances that their examination, application, and related documentation are fairly reviewed in accordance with current psychometric and legal standards for credentialing. The requisite appeal process for denied applications and disciplinary actions also helps to ensure fair enforcement of certification requirements. Consumers, employers, and legislators benefit from a uniform basis to help assess qualifications of service providers. Certificants, universities, and the overall community can depend on a mechanism for notice of proposed changes. Finally, there is comfort in knowing that the certification procedures undergo independent and unbiased review by standard-setting professionals.

Influence over Credentialing Content

The focus of BACB credentialing standards is to produce ABA practitioners that meet the minimum competencies

necessary to serve consumers as effectively as the field's science and technology will allow. It is understandable that there might be disagreement within the field regarding these minimum competencies. Indeed, it is appropriate that such a discussion be ongoing because it reflects a vibrant discipline with genuine interest in its practitioner community. For example, pressure from those with expertise in the basic research literature for greater representation of their interests in practitioner credentialing standards is important in helping to maintain the relationship between the science and its technology. Some understandably push for task standards that better reflect the value of conceptual issues in the work of practitioners. Still, other interests appropriately argue that different treatment populations and settings should be represented by increasing specialization in practitioner credentials.

Such diverse voices are important because, although the standards for credentialing a field's practitioners may emerge from all of the field's interests, there is no a priori best answer for what those standards should be. Each interest group may offer its recommendations with unyielding conviction, but it is important that the inevitable conflicts are not settled by political processes. An approach based on the political power of one interest or another might create a clear set of standards, but it can result in a variety of problems. For instance, there may be few educational programs that can meet standards created in this manner. Though its proponents may be pleased with this outcome, a small and slowly growing practitioner cohort may only assure that the credential has limited impact in the marketplace and little value. Another possible problem is that practitioner training may provide broad and deep expertise in certain areas, acquired at considerable expense to students, even though some of this expertise may have little practical value in the daily work of practitioners. A curriculum too strongly biased toward one interest may also limit training in other areas, resulting in certain deficits in practitioner skills. Of course, each community of interest may argue that this is already the case and that the problem can be rectified by modifying the standards so that academic curricula properly reflect its particular concerns.

At the least, all parties to this important debate might agree that the desired outcome of credentialing standards is the production of an adequate supply of credentialed practitioners that have the minimum competencies needed to represent the best of what the field has to offer. However, what does the phrase "minimum competencies" mean? It is tempting to focus on the pejorative connotation of the term "minimum" and argue that we should be aiming at a higher standard, but this misunderstands the term's application to credentialing standards. Any credentialing examination sets some minimum standard for the competencies of those who pass. That standard may be quite high by some criteria, but it is still a minimum because those who fail to achieve a passing score do not earn the credential. Physicians, lawyers, dentists, accountants, and other credentialed professionals all pass exams that define the minimum competencies targeted by the task statements underlying their exams.

Across practitioners within a field, there is always variation in expertise above this minimum. There will always be some credentialed practitioners who know more or are more effective than others. If some advanced level of expertise above an existing minimum standard were defined by the profession *through the above described job analysis process* as minimally necessary for its desired standard of competence, it would then be included in the task statements designating minimum competencies. Of course, there would still be some practitioners whose skills exceeded even this new standard. The challenge in determining appropriate task statements is to identify the minimum competencies needed by practitioners to reflect what the field has to offer the society.

These and other issues are part of an important and healthy ongoing debate in behavior analysis. It is important that this discussion should not be hampered by a "let us determine the task list" remedy proposed by one interest or another in the field that conflicts with the processes described in this article, which adhere to the standards of the field of testing and measurement and are consistent with their legal foundation. The primary purpose of these established methods is to ensure that the content of credentialing examinations is broadly based in the mainstream views within a field and is not the agenda of a particular organization, group, or interest. In other words, these methods have evolved to protect consumers by insuring that credentialed practitioners in a field have demonstrated the minimum competencies resulting from a process that prevents any one group or interest from having excessive influence on the designation of those competencies. For the field of behavior analysis, these methods serve the function of producing task standards guiding academic training requirements and exam content that comes from a mix of academics, researchers, and practitioners. Practitioners must be well represented because they are in the best position to respond to the job analysis survey question of how important each task is in their work. To argue that practitioners who have already earned their credential would be inclined to respond to the importance of proposed tasks in a way that lowers credentialing standards for future candidates not only insults these professionals but also reveals a perspective that is out of touch with the contingencies of practice.

Our description of established credentialing procedures should make it especially clear that no organization should play a standard-setting role by establishing its own procedures without subject matter and psychometric guidance. In this regard, it is important to understand that the BACB's Board of Directors and Chief Executive Officer do not control the content of its task statements or credentialing exams. They do not create the task statements, selectively modify them, or pick and choose among them, aside from setting a floor for evaluating job

analysis task rating data in a manner consistent with established credentialing procedures. By following such established procedures, the BACB's certification programs have achieved a status of legal and professional defensibility and parity with how other profession's credentials are developed.

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Applying Behavior Analysis in Organizations: Organizational Behavior Management

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Organizational behavior management (OBM) is the application of behavioral principles to individuals and groups in business, industry, government, and human service settings. OBM has its roots in the field of applied behavior analysis, which involves the application of operant and respondent procedures to produce socially significant change in human behavior. Modern OBM includes a number of subdisciplines such as performance management, systems analysis, and behavior-based safety. Its focus is on organizational problems such as lack of knowledge and skills, occupational injuries, productivity improvement, and quality deficits. This review provides a description of the theoretical and conceptual background of OBM, a brief history of the discipline, and a description of common topics and areas of applications. An example of a typical OBM application in a human service setting is also included.

Keywords: applied behavior analysis, organizational behavior management, performance management

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Organizational behavior management (OBM) is the application of behavioral principles to individuals and groups in business, industry, government, and human service settings. OBM has its roots in the field of applied behavior analysis (ABA), which involves the application of operant and, to a lesser extent, respondent procedures to produce socially significant change in human behavior. The purpose of this article is to introduce the discipline of OBM. First, we describe the theoretical and conceptual background of OBM. Next, we provide a brief history of OBM and its principal journal, the *Journal of Organizational Behavior Management* (*JOBM*). We then delineate common topics and areas of application in OBM, and we provide a case study describing an OBM consult. Finally, an Appendix provides a list of suggested readings in OBM.

Theoretical and Conceptual Background

OBM is a subdiscipline of ABA, which is in turn the applied wing of the discipline of behavior analysis, or the science of behavior. Two other branches of behavior analysis are the experimental analysis of behavior, which focuses on the study of basic principles of behavior with both human and nonhuman animals, and behaviorism, which is the branch of behavior analysis that focuses on the conceptual and philosophical underpinnings of the science of behavior. ABA emphasizes the use of operant and, to a lesser extent, respondent procedures to produce socially significant change in behavior (i.e., changes that are meaningful to someone). In contrast to much of mainstream psychology, ABA does not use the hypothetico-deductive model of research. That is, theory testing is not the focus of ABA. Instead, the field has adopted an inductive model of research in which procedures are evaluated for their utility irrespective of theoretical significance. Of course, the discipline

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is not atheoretical; radical behaviorism is the philosophy or theory underlining ABA.

Moore (2008) described radical behaviorism as being very poorly understood by both philosophers and psychologists. The adjective *radical* is often taken to mean *anticognition.* In fact, the *radical* in *radical behaviorism* means just the opposite. It refers to the notion that private events, or behavior occurring beneath the skin such as thinking and dreaming, must be included in a scientific analysis of human behavior. However, because these events cannot be directly manipulated, they cannot be considered as causes of behavior. Radical behaviorism is often contrasted with methodological behaviorism, an older version of behaviorism popularized by John Watson and others in the middle of the 20th century, which proposed that events occurring beneath the skin are not observable and therefore cannot be candidates for a scientific analysis. For a detailed account of radical behaviorism and how it differs from methodological behaviorism, see Moore (2008) or Chiesa (1994).

Guided by its roots in radical behaviorism, behavior analysis as a science has very explicit goals. Prediction and control of behavior, with an emphasis on control, are the objectives of behavior analysis (Hayes & Brownstein, 1986). These goals largely dictate the type of topics investigated in ABA and, more specifically, OBM. The focus of these two fields is almost exclusively on practical strategies that can be used to change behavior. Thus, functional topics such as the investigation of methods to directly improve performance, as opposed to structural topics such as the personality traits that are most predictive of high performers, are most prevalent in ABA and OBM.

OBM is sometimes referred to as a branch of industrial–organizational psychology, and the two fields do have in common a fundamental focus on the behavior of people at work. However, beyond this similarity, many differences between the two fields exist. Industrial–organizational psychology is generally theory driven, uses the hypothetico-deductive model of research, and has historically emphasized topics such as personnel selection and placement, although topics such as culture and management have also been of interest to industrial–organizational psychologists. In contrast, OBM is guided by a single theory of human behavior, uses an inductive model of research, and has historically emphasized identification and modification of the environmental variables that affect directly observable or verifiable (not self-reported) employee performance (Bucklin, Alvero, Dickinson, Austin, & Jackson, 2000).

History of OBM

The history of OBM is similar to the history of ABA, at least early on. The work of E. L. Thorndike and John Watson influenced B. F. Skinner and the development of behavior analysis as a science. Skinner's applications of behavioral principles to instructional design and other early applications of what was then termed *behavior modification* to clinical populations influenced OBM greatly. These clearly showed that human behavior could be changed for the better with the use of operant principles (Bucklin et al., 2000).

Although OBM did not officially begin until the 1960s, there are a number of historical influences outside of behavioral psychology that contributed to its development. First, Fredrick Taylor, the "father of scientific management," is often cited as an influence on the field's development. He was the first individual to advocate for the use of the scientific method to improve employee and organizational performance. An early event that influenced OBM was the Hawthorne Studies, a series of studies conducted at the Western Electric Plant near Chicago in the 1930s. One of the main outcomes of these studies was the erroneous assumption that a variety of environmental manipulations, such as increased attention to the well-being of employees and even a change in lighting quality, can have an impact on employee performance. Instead, reanalysis of the data from a behavior analytic perspective suggested that the changes in behavior were the result of the manipulation of knowledge of results and positive reinforcement in the form of monetary incentives (Parsons, 1992). For these and other related reasons, Parsons (1992) argued that the Hawthorne Studies represent an early OBM experiment.

The main outlet of the field, the *JOBM*, began publication in 1977. However, by this time more than 45 articles on OBM had been published in other journals and at least one OBM consulting firm had been established. Aubrey Daniels was the first editor of *JOBM*, and his

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influence on the field remains strong to this day through his many publications describing OBM and through the consulting firm he founded, Aubrey Daniels International (Bucklin et al., 2000). *JOBM* is now a quarterly journal published by Haworth Press and is in its 28th volume. It has recently been ranked as having the third highest impact factor among applied psychology journals according to the Journal Citation Reports published by Thompson/ISI Publishers (Hantula, 2005).

JOBM publishes original research, review articles, research reports, reports from the field, discussions, and book reviews on assessing and intervening to improve the performance of individuals and groups in organizations. More specifically, *JOBM* focuses on specific workplace concerns such as employee productivity, safety, knowledge and skill development, absenteeism, tardiness, turnover, the use of monetary and nonmonetary incentives, and the evaluation of employee satisfaction and feedback systems. The *JOBM* editorial board is made up of more than 50 practitioners and researchers in the field of OBM. An international conference devoted exclusively to OBM is held every other year, and OBM-related presentations are also common at the annual meeting of the Association for Behavior Analysis, International.

A number of graduate programs in OBM have been established. In some cases, OBM programs exist as separate tracks in ABA graduate programs, whereas in others they are distinct from ABA programs. OBM programs are generally housed in university psychology departments (e.g., Western Michigan University, Florida Institute of Technology, University of Nevada, and Appalachian State University; more information can be obtained at http://www.obmnetwork.com), but in some cases they are in schools of business (e.g., University of Detroit). Graduates of these programs work in the private sector as external consultants for a number of OBM-related consulting firms (e.g., Aubrey Daniels International, Continuous Learning Group, and Quality Safety Edge), as internal consultants for large organizations (e.g., Chevron Corporation and Nissan), or as program managers for state-funded human service organizations. A number of graduates also take faculty positions in academia. Currently, no licensure or certification program for OBM practitioners exists, although some practitioners do seek and obtain board certification in behavior analysis, particularly if they work in or seek employment in a human service setting.

Common OBM Topics and Areas of Application

Early OBM work was characterized by a focus on small-scale organizational problems such as improving the attendance of one or a few employees (Kempen & Hall, 1977) and decreasing negative comments made by a shift supervisor (Chandler, 1977). The work often served (and in many cases, still does) the dual purposes of practice and research. That is, it often took place in the context of a consultation to an organization. The research designs used in these studies and reports were often less than what would be considered adequate by today's standards. Nevertheless, the discipline attracted the interest of many students, professors, and business owners and managers and continues to do so today.

One particularly interesting early application of OBM occurred at Emery Air Freight. Edward J. Feeney, who was at the time a sales manager for Emery Air Freight, attended an OBM-related workshop at the University of Michigan in the late 1960s. On the basis of what he learned at this workshop, Feeney later went on to design a sales training package for Emery that resulted in large sales increases. He then took additional OBM-related workshops and, bolstered by his initial success, created performance improvement programs throughout the company that eventually resulted in a $2 million increase in annual profits (O'Brien, Dickinson, & Rosow, 1982, p. 459). Feeney's success was widely publicized in both the academic and business literature (an article describing Feeney's work appeared in the magazine *Business Week* in 1971), and he eventually left Emery Air Freight to start his own OBM consulting firm, which disseminated OBM to hundreds of businesses, both small and large (Dickinson, 2000).

Another interesting early application of OBM occurred in the textile industry in Georgia and other southern states. Aubrey Daniels, the first editor of *JOBM* and then-president of Behavioral Systems, Inc., an early OBM consulting firm, started working with companies in the textile industry after learning that many of them had turnover rates of more than 200%. Daniels

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and his firm were asked to reduce turnover in many of these companies. Daniels's model was straightforward: Supervisors in the companies were taught to deliver feedback by regularly graphing individual and group employee performance and to increase positive reinforcement for improving performance. Daniels and his firm managed to decrease turnover by more than 50% in just 3 months using these methods. Daniels's success in this industry set the stage for the creation of his own consulting firm, Aubrey Daniels International, which is still in operation today and continues to work with clients such as 3M, Xerox, AT&T, and Honeywell (Dickinson, 2000).

Today, OBM applications are more diverse but are still based on the same fundamental principles of behavior analysis. The field focuses on the isolation, analysis, and modification of the environmental events that most directly affect performance. A target performance is first described and defined. Next, a system to measure the target performance is developed and tested. Analysis of the variables that may be responsible for the (lack of the) target performance often begins with an examination of antecedent events and stimuli such as the presence or absence of specific people (e.g., managers), written prompts, working conditions such as number of staff, the establishment of goals, and the arrangement of work materials that may correlate with the target performance. Consequences that may affect performance, such as the immediacy and frequency of feedback, monetary and nonmonetary incentives, and the consequences associated with goal attainment, are also examined. On the basis of assessment results, an intervention is then developed, tested, and applied on a large scale, and measurement of the target performance continues. If the intervention is effective, it remains in place. If it proves ineffective, additional components are added or an altogether new intervention is applied. A financial cost–benefit analysis is then often conducted. Finally, the social validity of the intervention is formally examined, often by asking employees and, in some cases, customers, about the extent to which they approve of the intervention.

The research designs that are used to evaluate OBM interventions include within-subject designs such as ABAB reversal designs, multiple baseline designs, and alternating treatment or multi-element designs. However, it is often difficult to implement designs such as ABAB designs that involve the removal, even if only temporarily, of an effective intervention. For this reason, multiple baseline designs and even simple AB designs with systematic replications must be used in some cases. Therefore, the data that appear in academic journals and that require meeting rigorous standards may not be typical of the effects of most OBM interventions (Austin & Mawhinney, 2005).

Recently, formal assessment procedures such as the Performance Diagnostic Checklist (PDC; Austin, 2000) have been developed by OBM researchers and practitioners. The PDC is a questionnaire completed by an employee or manager that examines the variables that might be responsible for the (lack of the) target performance. The PDC is divided into four categories of questions: antecedents and information, equipment and processes, knowledge and skills, and consequences. On the basis of employee or manager responses to the questions in each of the categories, an intervention targeting the areas most in need of improvement is then developed and tested. Although OBM researchers and practitioners much prefer the direct observation of performance to the use of self- or other report of performance, direct observation of many of the variables affecting employee performance in organizations (e.g., directions or rules given to employees by managers) can be difficult. Thus, informant-based tools such as the PDC are sometimes used to supplement direct observation procedures.

OBM interventions can be classified into two categories: antecedent-based interventions and consequence-based interventions. Antecedent-based interventions include task clarification, equipment modification, goal setting, prompting, and training. Consequence-based interventions include feedback (many varieties of feedback exist), praise, and monetary and nonmonetary incentives. Task clarification consists of simply operationally defining the tasks for which employees are responsible. In many cases, employees have not been adequately informed about their responsibilities; task clarification is most appropriate under these circumstances. Equipment modification is also as straightforward as it sounds. In some cases, the equipment employees are asked to use prevents optimal performance. Identification and modification of the limiting variables

in the functioning of the equipment can be very useful. Goal setting consists of defining a specified, preset level of performance to be obtained and then, contingent on goal attainment, providing access to some previously agreed-on reward. Prompting involves the use of verbal, gestural, or written prompts to perform or continue performing an activity. Training consists of identification and modification of inadequate employee knowledge, skills, or capacity.

Feedback involves the delivery of information about past performance to the employee. However, as it is used in research and practice, feedback is not as simple as it sounds. Feedback varies according to format (i.e., verbal, written, or graphic), frequency (i.e., daily, weekly, or monthly), and delivery agent (i.e., manager–supervisor, consultant–researcher, or fellow employee). Two comprehensive review articles on feedback (Alvero, Bucklin, & Austin, 2001; Balcazar, Hopkins, & Suarez, 1985), both published in *JOBM*, have found that certain combinations of feedback are more effective than others. For example, graphic feedback delivered daily or weekly by supervisors or managers has been shown to be more effective than other types of feedback. The use of monetary and nonmonetary incentives involves the delivery of money, benefits, or tangible items contingent on improved performance. Although these interventions have been presented separately, in both practice and research they are often combined. That is, package interventions are common in OBM.

Feedback is by far the most common intervention used in OBM. In fact, some form of feedback was used in 75% of *JOBM* studies published between 1987 and 1997 (Bucklin et al., 2000). More recent OBM research is no different; a quick glance at current issues of *JOBM* suggests that feedback or a combination of feedback and other interventions accounts for a majority of interventions investigated in *JOBM*. Although no formal data exist to confirm this, it is likely that some form of feedback is included in most recommendations to improve performance made by OBM practitioners.

Recently, OBM has grown such that specialty areas have been established within the field. Three specialty areas that are now often recognized are performance management, systems analysis, and behavior-based safety. Consulting firms specializing in each of these areas have begun to appear (e.g., Quality Safety Edge, Aubrey Daniels International, and Performance Design Laboratory), and research in these areas is being published and presented at professional conferences with increasing frequency.

Performance Management

Performance management is the application of behavioral principles to manage the performance of employees. This term was once used synonymously with the term *OBM* by many, but with the recent growth of the field it is now more often used to refer to an area of OBM application. It is contrasted with specialty areas that are geared toward other levels of the organization, such as the process level (see *Systems Analysis* section). Performance management focuses on changing worker behavior to achieve more valuable organizational results.

Systems Analysis

Systems analysis refers to the analysis and modification of organizational processes to produce the greatest benefit to the organization. Systems analysis focuses on how individuals or groups of employees go about working on a series of interdependent tasks that culminate in the creation of products or services important to the organization as a whole. Intervention at the systems level involves improving the efficiency with which processes are completed by rearranging the order or assignment of tasks and creating effective workflow systems.

Behavior-Based Safety

Behavior-based safety is perhaps the fastest growing specialty area within OBM. It focuses specifically on the analysis and modification of work environments to reduce injuries and promote the safe behavior of employees. In contrast to other disciplines that approach safety from the standpoint of mechanical or structural engineering, behavior-based safety focuses on changing the behavior of employees so that injuries are reduced and safe performance becomes more common. Behavior-based safety has become so popular in recent years that consulting firms specializing in this area and graduate programs with behavior-based safety tracks have appeared. An annual conference

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devoted exclusively to this topic, Behavioral Safety NOW, has also been established.

Case Study

Although the details of OBM cases vary greatly, all cases generally follow the same seven steps that characterize the course of OBM consults regardless of problem, setting, and intervention (Austin & Mawhinney, 2005).

1. *Determine key results.* The typical OBM case solution is one in which the practitioner or researcher first works with managers and executives to identify the key results they hope to achieve.

2. *Find the pinpoints.* After the key results are made obvious, the OBM practitioner then works with executives and managers to determine the important behavior and intermediate results needed to accomplish the key results. These behaviors and results are often called "pinpoints," or "targets."

3. *Develop a measurement system.* The OBM practitioner then helps the target audience to develop an accurate and reliable means of measuring the pinpointed behavior and results. In many instances, this measurement system will also involve tracking costs associated with the pinpoints. The purpose in this case is to get an idea of the current levels of the important behaviors and results and to provide a baseline comparison that can later be used to evaluate the effects of solutions.

4. *Diagnose the problem.* In this phase, the practitioner teaches managers to ask questions and conduct observations of work completion and the work environment to determine the cause(s) of the performance deficiencies. Typically, this functional assessment involves asking questions and collecting data about four broad areas of potential causes: antecedents, knowledge and skills, equipment and processes (including a systems analysis), and consequences.

5. *Develop and implement a solution.* On the basis of the results of the assessment, the practitioner should work with managers and employees to help them develop and implement a set of solutions that addresses the identified deficiencies. In practice, employees and managers are trained to implement on their own and to maintain the practices specified by the solution once the practitioner withdraws from the organization.

6. *Evaluate the effects.* Results are typically measured before, during, and after solution implementation. At least three types of results are of interest to the OBM practitioner and researcher: behavior change results, treatment acceptability, and cost–benefit results. Behavior change results are of interest for obvious reasons, including that the practitioner wants to be sure that the solution changed the intended behaviors and produced the intended outcomes. Treatment acceptability is very important in OBM because the solution will not be maintained if employees and management find it to be unpalatable. Finally, cost–benefit results are important to calculate return-on-investment figures. These figures tell the practitioner and managers how many dollars were earned or saved by the organization for every dollar spent on the OBM efforts.

To further illustrate OBM services, we provide a real-world example of an OBM case. This example is set in a human services agency. In fact, many OBM applications take place in human service settings (see Vol. 18, Issue 2/3, of *JOBM*). A residential center serving adolescents with severe behavior problems, referred to as *Therapeutic Center*, contacts a consulting firm that offers OBM services. Therapeutic Center employs approximately 100 direct-care professionals (staff members) who work with their residents, carrying out the details of intervention plans developed by center psychologists. Although the staff members are well trained, many of the plans require frequent prompting and praising of appropriate resident behavior and tedious data collection on resident behavior. Because of these detailed requirements, the integrity with which the plans are implemented by staff often suffers. Realizing that plan implementation is critical to resident progress, center psychologists request assistance from the OBM consulting firm to improve

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staff performance. Once Therapeutic Center and the OBM consulting firm agree to the case, the consulting firm sends an employee to the work site to work with the psychologists and the administration. Consultants are usually on site for a few days in the beginning stages of a consult; however, the consultant and his or her organizational contact person are usually in contact regularly via phone and e-mail.

The consultant's first task is to learn more about Therapeutic Center. To do this, she asks questions about the size, health, and key results desired by the organization and the specific department or unit (i.e., adolescent residential unit) she is working with. After gathering this information, the consultant turns her attention to the identification of the pinpoints. The organizational contact person (unit psychologist in this case) and the consultant discuss and agree that the focus of the consult should be the percentage of opportunities in which plans are implemented appropriately. Next, the unit psychologist and administrative representative walk through (both figuratively and literally) the treatment plan implementation process with the consultant; this helps the consultant gain hands-on knowledge and experience with the processes involved to make more appropriate suggestions for improvement.

The next step is to develop a tool to measure the number of opportunities in which staff implement a treatment plan appropriately. Surprisingly, it is often the case that no such tool or methodology exists. A simple data sheet (or computer tracking program) is created from a spreadsheet, and the consultant spends some time teaching the unit psychologist and a number of direct-care professionals how to complete the data sheet. After the consultant has explained how to use the data sheets, she encourages Therapeutic Center to collect some data to test out the data sheets and to determine the mean number of opportunities in which staff members implement treatment plans accordingly. As it turns out, the children's unit at Therapeutic Center is having similar problems, so the consultant proposes that data be collected for that unit as well. In many cases, an evaluation design such as a multiple-baseline design across units (adolescent and child) can be used to evaluate the effects of an intervention.

After testing the data sheets for a couple of weeks, the consultant determines that staff members are correctly implementing treatment plans on only about 60% of opportunities. In other words, staff are missing about 40% of opportunities to correctly implement plans. The consultant graphs these data, and she and the unit psychologist then jointly establish an initial goal to increase the opportunities in which plans are correctly implemented from a mean of 60% to 75%.

To learn more about the reasons for the treatment plan implementation problems, the consultant then interviews the unit psychologist and several direct-care professionals using the PDC; the psychologist and staff members are asked additional questions about the treatment plans and how they should be implemented. After the PDC has been completed, the consultant notes consistent problems pertaining to the antecedents and information, equipment and processes, and consequences sections. Antecedent issues noted by Therapeutic Center are that task aids are absent from the immediate environment. Process issues that are noted include obstacles that prevent staff members from properly implementing the treatment plans they are assigned. In addition, it is determined that although staff members receive training on treatment plans when they are first hired, the plans are kept in a location to which staff members do not have access. Thus, staff cannot refer back to the plans when they have questions about implementation. Consequence issues that were mentioned include a lack of consistent feedback about staff performance. Thus, the consultant suggests to the psychologist that the intervention focus on the issues identified by the PDC. In consulting practice, the assessment phase is often not made explicit; consultants are fluent at this process and may not teach clients how to do it in detail.

An intervention plan is discussed by the consultant, psychologist, and center administration and is jointly agreed on. The intervention consists of training each staff member to a mastery criterion for each treatment plan, the installation of visual prompts (i.e., signs informing staff members how to collect data and follow specific activity schedules) to prompt general treatment plan implementation at the center, and feedback. Specifically, it is suggested that each staff member be trained such that she or he can score at least 90% correct implementation on both a written and in vivo test of each resident's plan. The

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psychologist must sign and date a data sheet indicating that each staff member has achieved this criterion before the staff member is eligible to work with residents. Also, framed signs indicating resident activity schedules and data collection procedures will be placed in each resident's room. Finally, the psychologist will randomly measure staff treatment plan implementation using the data sheets previously developed. Weekly, group graphic feedback will be posted in each unit break room showing the percentage of opportunities in which staff correctly implemented treatment plans. The intervention is to be implemented on the adolescent unit first, followed by the children's unit.

After 2 months of intervention, Therapeutic Center reports that the percentage of opportunities in which staff members correctly implement treatment plans increased from 60% to 80%, meeting the goal, which was set at 75% (see Figure 1 for hypothetical data). The psychologist and administration are satisfied with the results and are interested in continuing to increase correct plan implementation to a subsequent goal of 90% correct. Before the consultant turns over the intervention to the psychologist, she examines the social validity of the intervention by asking direct-care staff members and center residents what they think about the new process and the feedback they now receive. Once assured that all staff members and residents are satisfied, she conducts a cost–benefit analysis of the intervention. She determines that the intervention appears to be saving Therapeutic Center money by reducing

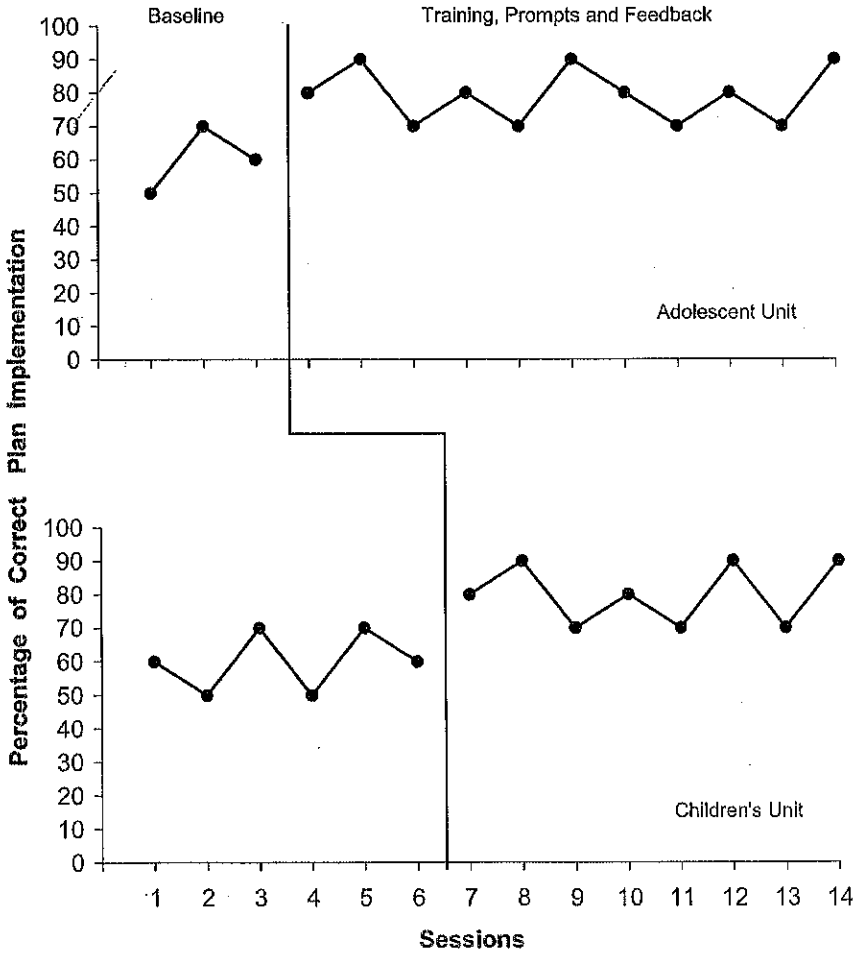

Figure 1. Hypothetical data depicting the evaluation of baseline and intervention phases with Therapeutic Center using a multiple baseline design.

staff turnover and increasing the number of residents who can be treated, and she presents these data to the psychologist and administration. From this point on, the consultant maintains close contact with the psychologist and visits the company about every 3 months. Data collection and the intervention remain in place, and Therapeutic Center continues to improve the integrity of its treatment plans, increasing the mean percentage of correct plan implementation to 90% within 6 months.

Summary

To summarize, OBM is the application of behavioral principles to individuals and groups in business, industry, government, and human service settings. The history of OBM is similar to the history of ABA in general, and the field also shares some historical events with industrial–organizational psychology. OBM now includes subdisciplines such as performance management, systems analysis, and behavior-based safety. Given the diverse settings in which it is practiced, the objective way in which its interventions are evaluated, and society's increasing focus on improving human performance at work, the future of OBM appears bright.

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Appendix

Suggested Readings

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CHAPTER 28

Behavioral Gerontology

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Global and national demographics have shifted steadily toward an older population, with adults 65 years or older projected to account for 20% of the total U.S. population by the year 2030 (American Psychological Association Working Group on the Older Adult Brochure [APA-WGOA], 1998). The group that is age 85 and older, referred to by researchers as the oldest-old, is growing faster than any other demographic group, with a disproportionate increase for women and minority groups (APA-WGOA, 1998; Belsky, 1999). These adults will need a range of medical and psychological services because they are likely to experience increased poor health conditions, sensory deficits, and cognitive impairments that are costly, debilitating, and potentially socially isolating (Belsky, 1999). However, the infrastructure for providing these services is projected to be woefully inadequate as "baby boomers" age and demand alternatives to traditional palliative care nursing environments (Molinari et al., 2003). As a result of the growing discrepancy between needs, infrastructure, and research base, enormous research and practice opportunities exist for psychologists interested in working with older adults.

Behavioral gerontology refers to the application of behavior analysis and therapy to older adults, ranging from basic behavioral research to clinical applications to organizational issues in service delivery agencies (Adkins & Mathews, 1999; Burgio & Burgio, 1986). Behavior analysts have long advocated the use of behavioral interventions and environmental modifications to enhance the lives of older adults (Lindsley, 1964). Prominent behavior analysts have suggested that natural contingencies for older adults support ineffective behavior (Skinner, 1983), and that basic operant principles readily account for aging-related phenomena and for experimental evidence that many skill declines in older adults are reversible (Baltes & Barton, 1977).

Several reviews, book chapters, and handbooks published in the 1970s and 1980s documented the early interest in behavioral gerontology (Baltes & Barton, 1977; Lewinsohn, Teri, & Hautzinger, 1984; Patterson & Jackson, 1981; Wisocki, 1984). In spite of this early growth, many prominent psychologists lament the failure of psychology and the subfield of behavior analysis to learn sufficiently about the aging process, disseminate acquired knowledge, and directly improve the lives of older adults (Carstensen, 1988; Storandt, 1983). Burgio and Burgio (1986) commented that behavioral geron-

tology had enormous potential for positive social impact, but interest in the field waned and publications were infrequent. Carstensen (1988) echoed these sentiments and advocated for clinical behavioral research with older adults but identified practical concerns (e.g., difficulty finding appropriate and receptive non-aging outlets) as barriers that might lead many to abandon work in the area.

Since the mid-1980s a small, stable number of publications on aging has appeared in behavioral journals, while behavioral gerontologists have increasingly published works in multidisciplinary aging journals (Altus, Engelman, & Mathews, 2002a, 2002b; Burgio et al., 2002; Hussian & Brown, 1987). These and other publications have attempted to illustrate for nonbehavioral audiences the advantages of a behavioral approach to aging. These benefits include avoidance of ageism and focus on environmental factors that promote or suppress behavior, belief in the potential reversibility of decline, and cost-effectiveness and consistency in treatment approach (Dupree & Schonfeld, 1998). This chapter provides a review of the literature on behavioral gerontology from all of these publication sources for behavior analysts who may not be familiar with the area. The chapter is organized in three main content areas (basic research, clinical application, organizational application), with an emphasis on studies published in the past 20 years.

Basic Behavior Analytic Research on Aging

Basic research on aging has been dominated by the study of memory and cognition from an information-processing perspective (Birren & Schaie, 2001; Cherry & Smith, 1998), with very little published literature from a behavior analytic perspective. Derenne and Baron (2002) identify basic research as the area of largest disparity between traditional and behavior analytic studies of aging. The behavior analytic experimental literature on aging is small and focuses primarily on age-related changes in classically conditioned responses, response to schedules of reinforcement, signal detection, and formation of stimulus equivalence classes. A few of the most consistent findings are briefly summarized below. Additional research is needed in each of these areas to clarify conflicting findings and to explore the parameters of age-related differences in performance.

A series of studies has documented clear age- and dementia-related changes in classically conditioned responses. Durkin, Prescott, Furchgott, Cantor, and Powell (1993) documented that two older groups (i.e., ages 50–63, 66–78) showed impaired acquisition of classically conditioned eyeblink and heart-rate responses compared to two younger groups, but greater conditioning than a no-trials control group. Changes in classically conditioned response acquisition appear in later middle age and progress into old age (Finkbiner & Woodruff-Pak, 1991; Woodruff-Pak & Jaeger, 1998; Woodruff-Pak & Thompson, 1988) with even greater changes observed for individuals with dementia. Conditioned eyeblink responses reliably differentiate typically aging individuals from those with cerebrovascular dementia and those with dementia–probable Alzheimer's type (Woodruff-Pak, 2001; Woodruff-Pak, Papke, Romano, & Li, 1996).

Several studies have examined age-related sensitivity to reinforcement with somewhat mixed findings. Fisher and Noll (1996), who compared discriminations of young and old subjects between concurrent variable interval schedules using a two-choice operant task, found slower initial acquisition for older individuals but improved responding with increased exposure to reinforcement contingencies. Tripp and Alsop (1999) compared children, young adults, and older adults on a signal detection task requiring discrimination between two pattern types under various ratio schedules. Older adults demonstrated the slowest reaction times and the lowest bias toward the higher ratio stimuli, suggesting decreased sensitivity to frequency of reinforcement. Plaud, Plaud, and von Duvillard (1999), who investigated sensitivity to changing operant schedules when reinforcement density was manipulated using a computer-based task, found adequate sensitivity to reinforcement contingencies but behavioral perseveration when contingencies were changed.

Two studies that have examined the performance of older and younger adults in stimulus equivalence preparations found generally weaker formation of equivalence classes for

older adults. Wilson and Milan (1995) compared groups of older and younger adults, and found slower response times and poorer performance on posttests of equivalence relations for older adults. Perez-Gonzalez and Moreno-Sierra (1999) used single-subject analysis to examine equivalence class formation and found slightly better, but still impaired, formation of equivalence classes in older adults.

Clinical Applications in Behavioral Gerontology

Clinical behavioral gerontologists have focused primarily on mental health problems (e.g., depression), health maintenance, and various problems associated with dementia. In each area, a medical rather than psychosocial model has been dominant, perhaps because 85% of older individuals have health concerns warranting regular medical visits (Butler, Finkel, Lewis, Sherman, & Sutherland, 1992), whereas few older adults have regular contact with psychological professionals (Belsky, 1999). Though the medical model is dominant, evidence in each of these areas supports the principle of dynamic interdependence (i.e., person and environment interact reciprocally), and that change in the environment can produce change in behavior even when medical options cannot alter physical or cognitive status. The effectiveness of behavioral interventions in each area is reviewed below.

Mental Health Problems: Depression and Anxiety

Depression and anxiety are common mental health problems for older adults (Sorocco, Kinoshita, & Gallagher-Thompson, 2005) that often go undetected due to differing presentation in older adults (i.e., less report of sadness), high comorbidity, and assumptions that organic rather than psychosocial conditions account for diagnostic indicators such as sleep problems, fatigue, inactivity or agitation (APA-WGOA, 1998; Zarit & Zarit, 1998). Depression is characterized by sadness, feelings of worthlessness and guilt, lethargy, sleep and appetite disturbances, and loss of interest in activities. Major depression occurs in 1–6% (Mojtabai & Olfson, 2004) of community-dwelling older adults, 10–15% of medically ill or frail individuals (Dick & Gallagher-Thompson, 1996), and 30% of individuals with dementia (Zarit & Zarit, 1998). An additional 9–30% of community-dwelling older adults report subthreshold symptoms that significantly impact quality of life (Blazer, 1993; Thompson, Futterman, & Gallagher, 1988). Generalized anxiety disorder (GAD), the most common anxiety disorder, occurs in approximately 3–17% of older adults and is characterized by worry (Ladouceur, Leger, Duga, & Freeston, 2004; Stein, 2004), with subthreshold anxiety symptoms occurring for an additional 15–43% of healthy older adults (Mehta et al., 2003).

Cognitive-behavioral therapy (CBT) is an empirically supported intervention for both depression and anxiety for older adults (Arean, 2004; Stanley, Diefenbach, & Hopko, 2004), with evidence for the effectiveness of individually administered CBT (Arean, 2004; Gallagher-Thompson & Thompson, 1996; Teri, Logsdon, Uomoto, & McCorry, 1997) and group-based CBT (DeVries & Coon, 2002). CBT generally involves education about depression/anxiety, self-monitoring of negative or anxious thoughts and emotion states, replacement of dysfunctional beliefs and self-statement with functional ones, scheduling of pleasant events, and skills training (e.g., problem solving, coping, relaxation) (Dick & Gallagher-Thompson, 1996; Dick, Gallagher-Thompson, & Thompson, 1996; Garz et al., 1998). Several appealing features of CBT are its brevity and structure of interventions (Dick et al., 1996; Secker, Kazantzis, & Pachana, 2004), the availability of therapist manuals to guide treatment (Stanley et al., 2004), and the general acceptability of the intervention to older adult consumers (Zeiss & Breckenridge, 1997). Recently, modifications to CBT make it especially suitable for older adults, including altered use of homework (Kazantzis, Pachana, & Secker, 2003) and enhancement with learning and memory aids (Mohlman et al., 2003).

Several recent studies illustrate the benefits of CBT over therapeutic-contact control groups, nonspecific therapies, and desipramine. Stanley and Novi (2000) reviewed the effects of CBT for GAD in older adults. They identified six controlled group comparisons and found relaxation training, cognitive restructuring, and multicomponent

CBT interventions to be superior to a wait-list control. In a subsequent empirical study, Stanley and colleagues (2003) compared CBT to weekly phone contact and found significant improvement in reported worry and anxiety, depressive symptoms, and quality of life with CBT, with most gains maintained at 1-year follow-up. Barrowclough and colleagues (2001) compared weekly in-home CBT to in-home supportive counseling and found improvement with both, but greater improvement and better maintenance for the CBT group. Finally, Thompson, Coon, Gallagher-Thompson, Somer, and Koin (2001) found that CBT alone and CBT plus desipramine were equally effective for depressed older adults and superior to desipramine alone. The combined therapy was most effective for patients who were more severely depressed.

Health Maintenance: Diet, Hydration, and Continence

Compliance with health or medication recommendations is referred to as *treatment regimen adherence*, and the degree of compliance is typically a primary determinant of overall health status (Meichenbaum & Turk, 1987). Nonadherence estimates for medication regimens by older adults range from 43 to 62% (Meichenbaum & Turk, 1987) even with education and the threat of dire consequences, such as blindness or death. Recommendations involving lifestyle change and long-term risk produce the poorest adherence in spite of their potential for long-term improvement in quality of life. For example, poor diet and dehydration contribute to risk for cancer, diabetes and heart disease, delerium, urinary tract infections, and medication toxicity (Ho, Lee, & Meyskense, 1991; Kannel, 1986; Sanservo, 1997; Warren et al., 1994). Yet older adults who are particularly susceptible to these problems consistently show little to no change in compliance with psychoeducation (Sands & Holman, 1985). However, other interventions involving prompts and behavioral contingencies for diet and hydration have proven effective.

Stock and Milan (1993) compared the effects of two behavioral intervention packages on dietary practices of older adults in a retirement community. Baseline involved prompts (i.e., identification of healthy selections), while the first intervention involved enhanced prompts (e.g., media, buttons, verbal reminders) with feedback (i.e., graphed percentage of healthy items) and praise upon report of a personal selection. The second intervention incorporated a token-based lottery system with immediate and delayed reinforcers contingent on healthy selections. The first intervention increased healthy selections from a baseline mean of 24–65%, with marginal increase (68% healthy selections) with the addition of the lottery, and diminished effects upon return to the baseline condition.

Prompt systems have proven more effective in increasing healthy fluid consumption for older adults in nursing homes than for those in retirement communities. Spangler, Risley, and Bilyew (1984) had nursing aides present a cup and offer nursing home residents a choice of beverages every 1.5 hours, resulted in clinically and statistically significant improvements in urine specific gravity measures of hydration. Simmons, Alessi, and Schnelle (2001) manipulated the frequency of systematic prompts and beverage choices, and found that 80% of nursing home residents increased their average daily fluid intake with systematic prompts alone. The addition of choice of beverage produced an additional 21% increase in fluid intake and a decrease in the number of beverage refusals.

Urinary incontinence becomes more common with age due to muscle weakness, decreased mobility, memory loss, and communication difficulties (Burgio & Locher, 1996). Older adults may restrict fluid intake in an effort to avoid accidents (Simmons et al., 2001) leading to dehydration and the related problems described earlier, as well as potential social stigma and increased care requirements in nursing homes. Several interventions have proven effective in targeting incontinence, including psychoeducation/behavioral training, prompted voiding schedules, and the use of discriminative stimuli.

Behavioral continence training consists of education about mechanisms of bladder control and specific recommendations, insession practice contracting and identifying relevant muscles, and assigned practice in contraction exercises (Burton, Pearce, Burgio, Engle, & Whitehead, 1988). This intervention produced an 82% reduction in

incontinence compared to a 79% reduction for community-dwelling participants in a behavioral training plus bladder–sphincter biofeedback condition. Burgio and colleagues (2002) replicated the comparison between behavioral training and biofeedback-assisted behavioral training, and also found equal reductions (69 and 63%, respectively) compared to a 58% reduction for participants in a self-administered procedure based on written instructions. These studies indicate that relatively brief behavioral training is sufficient to produce substantial reductions in incontinence, without the need for biofeedback.

Two alternative interventions have proven promising for individuals residing in nursing home facilities. Prompted voiding schedules involve education, scheduled restroom visits with assistance, positive reinforcement for dry intervals and continent voids, and encouragement to resist urinary urges between scheduled visits (Fantl, Wyman, Harkins, & Hadley, 1990; Jeffcoate, 1961). According to Fantl and colleagues (1990), the scheduled visits should begin at either 30- or 60-minute intervals and increase by 30 minutes with each adjustment, until the patient reaches a 3- to 4-hour interval with consistent dryness. In their review, Fantl and colleagues reported 47–100% increases in continence with this procedure; Burgio, Engel, McCormick, Hawkins, and Scheve (1988) reported a 32% increase in continence using the same protocol.

Overdependence: Ambulation and Activities of Daily Living (ADLs)

Independent ambulation and self-care (i.e., grooming, bathing) result in fewer care demands, increased privacy, and enhanced quality of life; but naturally occurring contingencies in many residential care settings support dependence rather than independence (Baltes, 1988). Overdependence may result when well-meaning caregivers provide unnecessary levels of assistance (Engelman, Mathews, & Altus, 2002) in an effort to be helpful and protective, or as a result of failure to recognize individual strengths when serving multiple older adults. Caregivers may want to hasten the process if an older adult proves slow in ambulating, dressing, or bathing, or the caregiver may fear a fall or other injury if the older adult operates independently (Engelman et al., 2002). Temporary injury or illness may lead to persistent overassistance or limits to ambulation, which can increase risk of falls. Increased falls leads to further restriction in ambulation and self-care routines and activities that require standing or walking (Burgio, Westley, & Voss, 1989; Suzuki, Ohyama, Yamada, & Kanamori, 2002).

Several studies have demonstrated the benefits of targeting increased independence directly with non-labor-intensive interventions that actually decrease staff effort while maintaining older adult safety. Burgio, Burgio, Engel, and Tice (1986) increased older adults' ambulation by training nursing home staff to prompt ambulation and praise successively more independent ambulation (e.g., less staff assistance, no walker). All eight participants increased independent ambulation with immediate change for six older adults who rarely walked independently prior to intervention, though they had the physical capacity to do so. In a second study, Burgio and colleagues also used prompting and praise for increased ambulation, with an added component of restriction of access to wheelchairs. Three wheelchair-bound older adults attending a day center program were restricted from wheelchair use by staff removing the chair upon arrival and returning it when they left for the afternoon. The combination of wheelchair restriction, prompting, and praise effectively increased ambulation for all three participants, from a mean of 13.3 feet walked per day in baseline to 290.3 feet during intervention.

Two studies illustrate the effects of training nursing home staff in the use of a simple system of least prompts (SLP) procedure (i.e., verbal, gestural, physical) in increasing independence in activities of daily living (ADLs). Engelman and colleagues (2002) trained three staff members in the SLP procedure, using instruction, modeling, rehearsal and feedback. All participants were dependent on staff assistance completely in baseline but became more independent in intervention. One resident became completely independent with the procedure. In a second study, Engelman, Altus, Mosier, and Mathews (2003) investigated brief caregiver training in SLP to target independent dressing. Staff members increased their use of prompts from a

median of 0 in baseline to a median of 2 during the intervention, and increased their use of praise from 0.05% to 22%. Older adults became more independent in dressing, with no increase in the time required to complete the dressing routine.

Behavioral Disturbances Related to Dementia

Clinically significant behavioral disturbances occur in 50% of outpatient dementia clinic clients and 75% of nursing home patients. Problem behaviors are also the most common precipitating factor for institutionalization (O'Donnell et al., 1992; Plaud, Moberg, & Ferraro, 1998). Behavioral excesses (e.g., aggression, wandering) are targeted more commonly for intervention than deficits because they are problematic for caregivers (Plaud et al., 1998). Pharmacological interventions are used to address behavioral disturbances (Carstensen & Fisher, 1991; Fisher & Swingen, 1997), however, behavioral problems often persist despite antipsychotic use with medication-induced risk of falls, extrapyramidal symptoms, sedation, and cognitive decline (Talerico, Evans, & Strumpf, 2002). Overreliance on neuroleptic medications prompted creation of the Federal Nursing Home Reform Act, part of the Omnibus Budget Reconciliation Act of 1987 (OBRA '87; VandenBos & DeLeon, 1998), which stated that older adults should be free of unnecessary and inappropriate physical and chemical restraints, and prohibited medication use for behavior modification without prior attempts at less restrictive interventions, such as behavioral interventions. Behavioral interventions have several advantages over pharmacological interventions, in that they emphasize increasing functional repertoires and access to reinforcers, minimize the need for chemical or physical restraints, and do not decrease mobility of already-compromised repertoires of individuals with diminished cognitive abilities (Fisher, Harsin, & Hayden, 2000; Fisher & Swingen, 1997).

Behavioral interventions for problem behavior typically involve environmental modification or active skills building (Fisher et al., 2000; Teri, 1996). Recent studies have focused on functional assessment of the environmental contingencies that function as a reinforcer for problem behavior, and incorporation of that information into individualized function-based treatments. Function-based interventions typically involve direct manipulation of the environment to establish relevant discriminative stimuli, to decrease the relevant establishing operations for problem behavior, or to provide the relevant reinforcers (e.g., social interactions, escape from aversive situations, sensory stimulation) independent of the occurrence of problem behavior (Carr, Coriaty, & Dozier, 2000).

Aggression

Up to 86% of individuals with dementia display physical aggression that can contribute to placement in long-term care facilities, use of chemical and physical restraints, and caregiver burnout (Bourgeois, Schulz, & Burgio, 1996; Burgio & Bourgeois, 1992; Cohen-Mansfield, Marx, & Rosenthal, 1989; Cohen-Mansfield, Werner, Culpepper, Wolfson, & Bickel, 1996; Raskind, 1999). The most commonly identified function for aggression in older adults with dementia is escape from a situation perceived as threatening or unpleasant, with common antecedents including task demands, verbal prompts, and physical contact by care providers during ADLs (Burgio & Bourgeois, 1992; Cohen-Mansfield et al., 1996; Fisher & Swingen, 1997; Patel & Hope, 1993). A recent study by Baker, Hanley, and Mathews (2006) illustrates the use of a function-based intervention for aggression associated with bathroom routines. Following a staff-conducted functional analysis suggesting escape-maintained aggression during bathroom routines, noncontingent escape (NCE) resulted in near-zero levels of aggression.

Earlier studies using behavioral but non-function-based interventions to manage aggression illustrate that punishment procedures may be used more commonly when no functional analysis is incorporated. Rosberger and MacLean (1983) used differential reinforcement and time-out to address the aggression of an older adult woman with dementia. Staff members differentially praised her appropriate interaction attempts, while aggression resulted in removal from activities and physical restraint. Aggression occurred 3–16 times per day in baseline, decreasing to near zero levels during intervention. Vaccaro (1988) used a multicomponent be-

havioral intervention for aggression during 1-hour group activity sessions with six older adults. Tangibles and social praise were provided in a 10-minute differential reinforcement of other behavior (DRO) contingency. Aggression resulted in loss of the potential reinforcer, as well as a verbal reprimand and a 10-minute time-out, during which the participant left the group and watched from a remote area. Aggression decreased from a baseline mean of 25.5 per hour to 7.8 per hour in intervention, with simultaneous decrease in a generalization setting.

Wandering

Wandering, typically defined as excessive pacing without purpose, or ambulation into unsafe areas, is estimated to affect from 3 to 59% of all older adults (Burns, Jacoby, & Levy, 1990; Reisberg et al., 1987). Wandering occurs at all levels of cognitive impairment but is more common with greater impairment (Chenoweth & Spencer, 1986; Teri, Hughes, & Larson, 1990). It increases the likelihood of getting lost or injured, having conflict with others (i.e., entering others' rooms), and losing a placement, and it presents serious health concerns due to excessive calorie expenditure, dehydration, and exposure to the elements (Cohen-Mansfield et al., 1996; Hussian, 1988). Simple environmental manipulations, such as reducing clutter and locking doors that lead to unsafe areas (e.g., cleaning supplies), can ensure a safe environment for wandering and minimize the likelihood of establishing an attention function because caregivers do not have to shift their attention suddenly to the older adult following episodes of wandering (Peskind & Raskind, 1996). For example, Hussian and Davis (1985) used a stimulus control procedure to teach three patients with dementia to wander only in safe areas by pairing different colored stimuli with specific consequences in relevant areas (i.e., orange/safe = food reinforcer; blue/unsafe = loud, aversive noise). Posting the colored stimuli successfully decreased wandering into inappropriate areas.

When secure wander areas are not feasible, alternative environmental interventions such as visual barriers and WanderGuard® may prove beneficial. Visual barriers operate on the premise that many individuals with dementia perceive two-dimensional patterns as three-dimensional barriers, without the need to create a real barrier (Hussian & Brown, 1987). Hussian and Brown effectively reduced exit-seeking with a simple grid of masking tape in front of doors. Namazi, Rosner, and Calkins (1989) used seven different visual barriers (e.g., cloth across a door handle, other doorknob patterns, various floor grid patterns) and found that cloth barriers were the most effective in preventing patients with Alzheimer's disease from exiting through an emergency door. Feliciano, Vore, LeBlanc, and Baker (2004) effectively used a visual barrier and extinction to decrease client entry into a staff office area with safety hazards. WanderGuard is a small transponder worn by older adults that emits an alarm when the individual attempts to exit a door. The alarm may function as an aversive stimulus, punishing the behavior of approaching the door and establishing the door as a discriminative stimulus for punishment. However, the alarm may result in a shift to monitoring and interaction following the alarm rather than continuous monitoring, which could result in attention-maintained wandering if the right establishing operations are in effect.

Common behavioral functions of wandering include access to or escape from sensory stimulation (e.g., sights, smells, sounds) and access to attention or preferred items (Cohen-Mansfield et al., 1996; Heard & Watson, 1999). One study has examined the function of wandering directly, with subsequent development of function-based interventions. Heard and Watson (1999) conducted functional analyses that identified maintaining variables of attention for two participants, access to tangibles for one participant, and sensory stimulation for one participant. The relevant functional reinforcer was then incorporated in a DRO intervention for each participant, with substantial reductions in time spent wandering.

Disruptive Vocalizations

Disruptive vocalizations are loud repetitive requests and self-talk, screaming, negative remarks, and use of obscenities (Cariaga, Burgio, Flynn, & Martin, 1991; Cohen-Mansfield, 1986). Unlike aggression and wandering, disruptive vocalizations pose no

immediate threat to safety but produce constant irritation for caregivers that may lead to an older adult's social isolation, nursing home placement, or chemical restraint (Burgio & Bourgeois, 1992). Conversely, moderate decreases in such behavior often produce meaningful social impact by allowing prolonged community placement or eliminating the need for restraint because safety is not an issue,. For example, Green, Linsk, and Pinkston (1986) taught spousal caregivers to reinforce appropriate statements socially and ignore inappropriate verbalizations for two community-dwelling older adult men who faced impending nursing home placement. The behavior change was sufficient to result in continued community placement, and the effects were maintained at a 6-month follow-up.

Common functions of disruptive vocalizations are access to social attention and increased stimulation. Buchanan and Fisher (2002) illustrated the use of functional analysis of disruptive vocalizations and found that repetitive vocalizations in two older adult nursing home patients were attention-maintained, with a possible secondary function of increased stimulation. They effectively reduced the frequency of disruptive vocalizations using noncontingent presentation of the identified reinforcers (i.e., attention, music). Based on the possibility that disruptive vocalizations might provide increased stimulation for some individuals, Lund, Hill, Caserta, and Wright (1995) used interactive videotapes to provide an alternative source of stimulation. A "video respite" system was used on a large scale in 10 nursing home units, with staff ratings indicating a decrease in both wandering and verbal agitation when using the videotapes. Similarly, Burgio, Scilley, Hardin, Hsu, and Yancey (1996) used two "white noise" audiotapes of soothing sounds to decrease verbal agitation in nursing home residents. The nursing home staff provided tape players and headphones with the tape identified as the most effective for that individual during periods of heightened verbal agitation, producing an average 23% reduction in verbal agitation.

Memory Problems

Memory deficits are the hallmark feature of dementia and can lead to communication difficulties, social isolation, wandering, failure to take medication, and agitation (Golden & Chronopolous, 1998). Behavioral interventions for memory deficits typically involve use of *memory aids*, which are discriminative stimuli (i.e., pictoral, textual prompts) for increased independence and communication.

Several studies illustrate the use of simple memory aids with older adults with dementia. Nolan, Mathews, and Harrison (2001) placed portraits with large-print nameplates in hallways to aid adults with dementia in finding their own rooms in a residential setting. Correct, independent room finding increased from a mean of 34% in baseline to 85% during this simple intervention. Bourgeois (1993) used memory aids to enhance conversational content and social skills in adults with dementia. Eight individuals placed into dyads were given memory aid wallets for one dyad member. The wallets included 18–35 pictures about their daily schedule, family, and other life facts. The memory aids increased on-topic and novel utterances for both members of three of four dyads. Though these memory aids are not technology based, electronic memory aids are becoming increasingly popular. Recently, Cohen-Mansfield and colleagues (2005) surveyed 100 healthy older adults about the use of electronic memory aids. Their results indicated that 58% of older adults would use an electronic memory aid for tasks such as personal self-care tasks, reminders for medication, and appointments and important dates, and that they would like the device to be small and portable.

Disengagement

Inactivity or disengagement is common for residents in institutional settings and can lead to skills loss and increased risk for falls and mental health problems (Suzuki et al., 2002). However, relatively simple behavioral interventions have proven effective in increasing levels of engagement of older adults in nursing homes (Altus et al., 2002a; Engelman, Altus, & Mathews, 1999; Jenkins, Felce, Lunt, & Powell, 1977). For example, Jenkins and colleagues (1977) increased engagement with a simple intervention of increased presentation of leisure materials and prompts for engagement. Staff members

presented a choice of four leisure activities several times during 2-hour periods twice a day, with praise and interaction contingent on engagement. The number of participants in the lounge area tripled during intervention, and the number of residents engaging in activities increased as well.

In two studies, Mathews and colleagues targeted engagement in nursing homes across several contexts. Engelman and colleagues (1999) used a "resident check-in" procedure that required staff to make personal contact with each resident every 15 minutes, provide praise for specific behaviors, and offer a choice of at least two activities if a participant was not engaged. The check-in procedure increased appropriate engagement of five participants from 41% of intervals in baseline to 81% of intervals in intervention, with a corresponding increase in the variety of activities. Altus, Engelman, and Mathews (2002b) targeted increased engagement in the form of participation and conversation during mealtime. "Family-style mealtime" involved changing mealtime routines to enhance participants' involvement and communication compared to the typical baseline procedure of prepared plates in nursing homes. The "family-style" meal presentation, combined with staff prompts and praise for appropriate behaviors, substantially increased participation from 10 to 65% of intervals, and conversation from 5 to 18% of intervals.

Recently, Camp, Orsulic-Jeras, Lee, and Judge (2005) evaluated the effects of a Montessori-based intergenerational program on the engagement of adults with dementia using a crossover group design. The program consisted of 20-minute sessions in which dyads of adults ages 50–95 with a diagnosis of dementia and children ages 2½–5 years worked on Montessori activities. Results indicated that the adult participants showed increases in constructive engagement and pleasure, as well as decreases in passive engagement (e.g., watching) and nonengagement.

Organizational Applications

Behavioral interventions are clearly useful for a variety of clinical issues faced by older adults, but residential settings often have organizational characteristics that greatly decrease the likelihood of effective use of behavioral interventions. First, long-term care facilities have low staff–client ratios that can make functional analyses and individual behavioral interventions cumbersome. An employee is responsible for the basic safety, health, and personal care of six to eight individuals during a shift. Any new job duties must fit in with primary care activities (e.g., feeding, toileting, transporting) without substantially increasing work requirements or time constraints. Second, people who directly interact with older adults often are unfamiliar with behavioral procedures. Approximately 80–90% of a nursing home resident's contact occurs with certified *nursing* assistant (CNA) staff (Burgio et al., 2002) who are familiar with the medical model but have little exposure to behavior analysis. Consequently, CNAs need training in basic principles, as well as consistent implementation of behavioral interventions and data collection procedures. Third, frequent staff turnover means that training must be nearly constant to ensure consistency across staff and a culture shift toward proactive behavioral strategies.

Consistency of implementation is critical because the positive effects of behavioral intervention in individuals with dementia are often only evident when the intervention is in place and accurately implemented, with resulting immediate relapse when the intervention is removed. Several studies illustrate that independence and skill use that emerged when one person implemented an intervention were not evident with other staff members until they used the interventions as well. Mathews and Altus (1997) and Engelman and colleagues (2002) taught CNAs to use SLP procedures to increase independence in elderly adults. Increased independence in dressing occurred during intervention with a specific CNA, but the effects did not occur with other CNAs until they were explicitly taught the intervention and used it consistently. Burgio and colleagues (2002) increased continence using prompted voiding schedules on a specialty care unit but found that continence gains did not maintain when individuals returned to a general care unit. All staff members had to be trained to implement schedules consistently. Thus, effective training with a well-structured, sys-

temswide program with regular practice, feedback, and supervision is imperative.

Typical staff training in nursing home settings consists of didactic instruction during a one-day workshop or in-service (Burgio, 1991; Burgio & Burgio, 1990), with 85% of training lasting 1 hour during or between shifts (Wieland, Wendland, & DeRyke, 1992). Even though lecture or didactic instruction is common, more effective training systems have been established and commonly are used in business settings and in other organizational systems. Strategies such as explicit practice with feedback, offsite education, career development, and incentive systems are becoming increasingly popular methods of successful staff training in businesses (Wieland et al., 1992). Many of these same strategies used successfully in long-term care for individuals with developmental disabilities have not been fully incorporated into mainstream nursing home care, presenting an enormous dissemination need and opportunity (Burgio, 1991).

Recently, behavioral gerontologists have incorporated effective training and systems management strategies in nursing home settings. For example, Burgio and colleagues (2002) compared formal staff management (i.e., self-monitoring, feedback, incentives) and conventional staff management (i.e., status quo supervision without feedback or incentives) for maintenance of previously trained behavioral skills in CNAs. Formal staff management resulted in better skills maintenance than did conventional management. Other studies have examined training and feedback strategies when investigating increases in engagement, independence, and continence (Engelman et al., 1999, 2002, 2003) with positive effects.

Summary and Conclusion

Behavioral gerontology has enormous potential for positive social impact; however, several prominent behavior analysts have suggested that behavioral gerontology has neither flourished as a subfield (Burgio & Burgio, 1986; Carstensen, 1988) nor fully explored all potential applications of behavior analysis to aging (Derenne & Baron, 2002). As an example, there have been relatively few functional analysis studies of older adults with dementia compared to the thriving literature on functional analysis in individuals with developmental disabilities (Hanley, Iwata, & McCord, 2003), even though older adults with dementia are just as likely to have troublesome behaviors. Behavior analysts interested in aging have almost unlimited potential for research and clinical opportunity due to the growing demand for a range of services for older adults.

Additional, basic human operant studies are needed for virtually every aspect of responding that might be impacted by age-related changes in human functioning. In the applied area, more studies are needed that incorporate functional assessment and address health and mental health issues in community-dwelling elders. Additionally, future applied studies in residential settings must focus on incorporation of electronic technology and organizational strategies to improve overall efficiency and effectiveness of service delivery. Behavior analysts must continue to publish studies in journals on aging and those specific to other disciplines (e.g., nursing, occupational thearpy) to introduce these groups to the benefits of the behavioral approach. However, behavior analysts also must continue to publish enough studies on behavioral gerontology in flagship behavior analytic outlets to ensure that new behavior analysts remain interested in the field.

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