

# THE BEHAVIOR ANALYST TODAY

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*A Context for Science with a Commitment to Behavior Change*

## VOLUME 7, ISSUE 1

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# THE BEHAVIOR ANALYST TODAY

## PUBLISHER'S STATEMENT

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The Behavior Analyst Today (BAT) is published quarterly by Joseph Cautilli. BAT is an online, electronic publication of general circulation to the scientific community. BAT's mission is to provide a concentrated behavior analytic voice among voices which are more cognitive and structural. BAT emphasizes functionalism and behavioral approaches to verbal behavior. Additionally, BAT hopes to highlight the importance of conducting research from a strong theoretical base. BAT areas of interest include, but are not limited to Clinical Behavior Analysis, Behavior Models of Child Development, and Community based behavioral analytic interventions, and Behavioral Philosophy. BAT is an independent publication and is in no way affiliated with any other publications.

The materials, articles, and information provided in this journal have been prepared by the staff of the Behavior Analyst Today for informational purposes only. The information contained in this journal is not intended to create any kind of patient-therapist relationship or representation whatsoever.

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### Our Mission

The Behavior Analyst Today is committed to increasing the communication between the sub disciplines within behavior analysis, such as behavioral assessment, work with various populations, basic and applied research. Through achieving this goal, we hope to see less fractionation and greater cohesion within the field. The Behavior Analyst Today strives to be a high quality journal, which also brings up to the minute information on current developments within the field to those who can benefit from those developments. Founded as a newsletter for master level practitioners in Pennsylvania and those represented in the clinical behavior analysis SIG at ABA and those who comprised the BA SIG at the Association for the Advancement of Behavior Therapy, BAT has evolved to being a primary form of communication between researchers and practitioners, as well as a primary form of communication for those outside behavior analysis. Thus the Behavior Analyst Today will continue to publish original research, reviews of sub disciplines, theoretical and conceptual work, applied research, program descriptions, research in organizations and the community, clinical work, and curriculum developments. In short, we strive to publish all which is behavior analytic. Our vision is to become the voice of the behavioral community.

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## Submission Information

Most contributions are by invitation and all are then peer-reviewed and edited. The editors, however, welcome unsolicited manuscripts, in which case, we suggest potential authors send an abstract or short summary of contents and we will respond as to our interest in a full manuscript submission. In all cases, manuscripts should be submitted electronically saved in “rich text format” (.rtf) to BOTH Michael Weinberg at [mweinberg@percs.info](mailto:mweinberg@percs.info) and Joe Cautilli at [jcautill@astro.temple.edu](mailto:jcautill@astro.temple.edu). Please adhere to APA format and use “Times New Roman” font in 11 pt. throughout. In references, however, please italicize the places where APA format would have you underline. Abstracts and keywords must be included, as well as full contact information for all authors.

Authors who wish to be considered for publication in BAT must submit a signed assignment of rights form with their article. The form can be downloaded from the BAT website on the submissions page.

Peer Review: All submitted manuscripts are reviewed initially by a BAT editor. Manuscripts with insufficient priority for publication are rejected promptly. Other manuscripts are sent to expert consultants for peer review. Information from submitted manuscripts may be systematically collected and analyzed as part of research to improve the quality of the editorial or peer review process. Identifying information will remain confidential.

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### A Word about Abstracts

In order to ensure that BAT will be accepted in the major psych databases, there are certain guidelines that must be followed for abstracts relating to our article and the Journal. The following guidelines are straight from the PsycINFO website: <http://www.apa.org/psycinfo/about/covinfo.html>

#### General Guidelines for Writing Effective Abstracts

For use in PsycINFO and other databases, an abstract should not exceed 960 characters and spaces (approximately 120 words).

Characters may be conserved by:

- using digits for numbers (except at the beginning of sentences)
- using well-known abbreviations
- using the active voice

Begin with the most important information, but don't waste space by repeating the title. Include in the abstract only the four or five most important concepts, findings, or implications.

Embed as many key words and phrases in the abstract as possible; this will enhance the user's ability to find the citation for your article in a computer search. Include in the abstract only information that appears in the body of the paper.

Style:

Remember that not all people who read your abstract will have a high level of psychological knowledge.

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Define all acronyms and abbreviations, except those for measurements.

- Spell out names of tests
- Use generic names for drugs (when possible)
- Define unique terms

Use the present tense to describe results with continuing applicability or conclusions drawn and the past tense to describe variables manipulated or tests applied. As much as possible, use the third person, rather than the first person.

Abstracts for Empirical Studies:

Abstracts of an empirical study are generally about 100—120 words. Include the following information:

- problem under investigation (in one sentence)
- pertinent characteristics of subjects (number, type, age, sex, and genus and species)
- experimental method, including apparatus, data-gathering procedures, complete test
- names, and complete generic names and the dosage and routes of administration of any drugs (particularly if the drugs are novel or important to the study)
- findings, including statistical significance levels
- conclusions and implications or applications

Abstracts for Review/Theoretical Articles

Abstracts for review or theoretical articles are generally about 75—100 words. Include the following information:

- the topic in one sentence
- purpose, thesis, or organizing construct and the scope (comprehensive or selective) of the article
- sources used (e.g., personal observation, published literature)
- conclusions

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Accepted manuscripts are copy edited according to APA format and returned to the author for approval. Authors are responsible for all statements made in their work, including changes made by the copy editor and authorized by the corresponding author. Please adhere to APA format and use "Times New Roman" font in 11 pt., single spaced throughout. In references, however, please italicize the places where APA format would have you underline.

Additional requirements:

To be published in any of the BAO journals, we have additional requirements that authors must adhere to. Our requirements supercede any requirements that conflict with APA requirements.

\* All articles must be created as one continuous document - no documents that are created in sections or sub documents.

\* Authors must not insert their own headers, footers, or pagination.

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\* Graphics, figures, tables, etc., must be in jpg or bmp format. Graphics, figures, tables, etc., may be embedded in the text body of the article by the author. No Excel graphs will be accepted. If graphical materials are submitted as separate Word documents, they should be in portrait format and should be full page, or one half page or less only. Graphical materials larger than one page cause serious layout problems. If graphical materials are not inserted into the text portion of the article by the author, indicators must be placed in the text body so we know where the graphical materials belong.

\* All articles should be single spaced, with one inch margins all around.

\* All abstracts must contain keywords.

\* Full author contact information must be included in the article.

Thank you!

*The Behavior Analyst Online Journals Department*

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## Call for Papers



*Joseph D. Cautilli, Ph.D.*  
*Associate Editor, Behavior Analyst Today*

As this issue shows, the Behavior Analyst Today continues to break new ground. We have become in many ways the face of behavior analytic theory, practice, and research globally. Our global reach can be seen in the number of countries that regularly download articles from the Behavior Analyst Online web site. Now in our eighth year, we are still a free publication committed to the representation of behavior analysis across the globe. In addition, each year the article content has grown stronger and stronger. We have really published articles across behavior analysis, including articles from the philosophy of Behaviorism to Experimental Analysis of Behavior, Applied Behavior Analysis and its many sub fields including: Organizational Behavior Management, and Clinical Behavior Analysis.

While we have truly published articles from all areas of behavior analysis, we would like to receive many more articles from some areas, which remain under-represented. Three areas come quickly to mind, the first being the Experimental Analysis of Behavior. While we have published some high quality articles in this area (a few examples –Halper & Neuman, 2004; Keenen, & Kerr, 2002; Mazur, 2004), we seek more submissions. Two growing sub areas of EAB are behavioral pharmacology and behavioral neuroscience. The Behavior Analyst Today is actively seeking submissions in these areas and bridging studies from the basic research in these areas to the applied area.

A second area that we seek to publish more articles in is of personal interest to this author. It is the area of behavioral medicine. The Behavior Analyst Today has published articles previously in behavioral medicine issues (a few examples are Auguston, 2000; Dahl & Lundgren, 2005; Giardino, & Schmalig, 2002; Kerwin, 2003; Vandenberghe, Ferro, & Furtado da Cruz, 2003) but the total number of articles does not represent the vast scope of influence that behavior analysis has had in this area. Behavior analysis in general has greatly contributed to the field of behavioral medicine, as the new special interest group, which is chaired by this author at the Association for Behavior Analysis: International (ABA:I) suggests. This new special interest group, will have its first business meeting at ABA this year on May 29th from 7:00 p.m. to 7:50 p.m. in the University room. The purpose of this meeting will be to kick off the SIG but also ways to discuss a research agenda and publication strategy for those seeking to publish articles in the Behavior Analyst Today (BAT) on Behavioral Medicine subjects. This author hopes that the SIG and a growing number of clinically oriented articles will begin to foster a greater understanding of the impact of behavior analysis on behavioral medicine. Areas of publication interest for BAT and of SIG interest include the study of self-injury, feeding disorders, sleep problems, obesity, pain, cerebral palsy interventions, and smoking reduction programs. A brief review of the literature shows that APA's Task Force (1999) on the promotion of empirically supported treatments listed multi-component operant therapy as a well-established treatment for pain (Turner & Clancy, 1988; Turner, et al. 1990), as well as behavioral intervention for obesity (Epstein et al., 1994; Wheler & Hess, 1976). In addition multiple operant based behavioral techniques such as biofeedback are listed. For example biofeedback is listed as probably efficacious for a number of problems. These include EMG biofeedback for chronic pain (Flor &

Birbaum, 1993; Newton-John et al, 1995), thermal biofeedback for Raynaud's syndrome (Freedman et al. 1983), thermal biofeedback plus autogenic relaxation training for migraine (Blanchard et. al, 1978; Sargent, et al. 1986) and tension headaches (Blanchard, et. al, 1980). With behavioral research continuing in many areas including vocal distress (Warnes, & Allen, 2005) and epilepsy (Wyler, Robbins, Dodrill, 1979). According Larsson & Andrasik (2002) and McGrady, Adrasik, Davis, Steifel, Wickramasekera, Baskin, Penzien, & Tietjen (1999) a considerable body of literature (more then 100 empirical studies) exist to support biofeedback and other forms of relaxation training for migraine and tension headaches. BAT looks to continue to publish articles on the above areas and further the development of research and clinical practice within these specialties. On the research end the operant model of chronic pain (Fordyce, 1976), has developed many innovative ways of testing its tenets (see Romano, Jensen, Turner, Good, & Hops, 2000 for the use of video with regression analysis to determine contingency). In addition, a convergent line of research in neuroscience has found that with people who experience chronic pain, it is often the normal nerve cells and not damaged nerve cells firing.

Interestingly enough, most U.S. insurance companies cover the costs of operant behavioral intervention such as biofeedback for pain. In addition, many behavior analysts currently work in the hospital setting with medical populations, so we see this area as one that needs greater representation in BAT and at ABA:I. Thus, all are welcome to attend this first meeting and submit articles to BAT on these areas.

As to the SIG, it has announced a robust agenda for 2006-2007. This meeting will serve to finalize the agenda and to ensure that all committee positions are filled. The announced agenda is as follows:

1. Create a pamphlet series on behavior analytic practice in behavioral medicine issues (Something like - evidence supporting behavioral approaches to TBI, pain, epilepsy, sleep/insomnia, headaches, incontinence, cerebral palsy, feeding disorders, self-injury, medical procedure related anxiety and depression, etc. and what to expect from a behavior analytically oriented practitioner). Where appropriate the series plans to highlight what is being called third generation behavior therapy-functional analytic psychotherapy, relational frame, and acceptance and commitment therapy. In addition, it will highlight more traditional operant approaches such as multi component operant therapy, biofeedback for pain, functional analysis in the treatment of problem behavior, and behavioral activation for reduction of medical related anxiety and depression.
2. The SIG plans to sell the series to ABA and have the SIG collect royalties if or when ABA sells any of the pamphlets.
3. The SIG plans to use the money combined with money from dues to fund speakers, workshops, and to advertise the SIG at AACBT, Behavioral Medicine Society, etc.
4. The SIG plans to start an educational campaign for the Behavior Analyst Certification Board. It is hoped to convince the board that behavior analysts work in more areas then autism and developmental disability and that behavior analysts in these areas have substantially contributed to both the science and practices in these areas. The goal would be to have a subspecialty category for certification for masters level practitioner in behavior analysis in behavioral medicine. This would identify practitioner for hospitals and clinics. Generating publications in the Behavior Analyst Today, the Journal of Early and Intensive Behavioral Intervention, and the International Journal of Behavioral Consultation and Therapy will go along way to help prove our case.
5. The SIG also seeks to have elections this year at ABA. The goal would be to get all the positions filled.

6. Finally, the SIG seeks to have a steady in source of revenue. Thus it well try to develop a plan to help generate convention income by developing a contract deal with ABA:I rent for ABA:I convention space from biofeedback companies (in exchange for advertisement) to have a booth at ABA each year.

So, those are the thoughts of the journal staff for volume seven and eight, years eight and nine for this journal, respectively. We hope to keep BAT serving all behavior analysts, be they basic researchers or practitioners. It is lining up to be a defining year for behavior analysis worldwide.

#### References

- Auguston, E. (2000). Issues of Acceptance in Chronic Pain Populations. *The Behavior Analyst Today*, 1(1), 14-17.
- Blanchard, E.B., Andrasik, F., Ahles, T.A., Teders, S.J. & O'Keefe, D. (1980). Migraine and tension headaches: A meta-analytic review. *Behavior Therapy*, 11, 613-631.
- Blanchard, E.B., Theobald, D.E., Williamson, D.A., Silver, B.V. & Brown, D.A. (1978). Temperature biofeedback in treatment of migraine headache. *Archives of General Psychiatry*, 35, 581-588.
- Dahl, J. & Lundgren T. (2005) Behavior analysis of epilepsy: Conditioning mechanisms, behavior technology and the contribution of ACT. *The Behavior Analyst Today*, 6.(3), 191 –198.
- Flor, H. & Birbaumer, N.(1993). Comparison of the efficacy of electro-myographic biofeedback, cognitive-behavior therapy, and conservative medical treatment in the treatment of chronic musculo-skeletal pain. *Journal of Consulting and Clinical Psychology*, 61, 653-658.
- Fordyce, W.E. (1976). *Behavioral methods for chronic pain and illness*. St Louis: C.V. Mosby.
- Freedman, R.R., Ianni, P., & Weing, P. (1983). Behavioral treatment of Raynaud's disease. *Journal of Consulting and Clinical Psychology*, 51, 539-549.
- Giardino, & Schmaling (2002). Behavioral Factors in Asthma. *The Behavior Analyst Today*, 3 (2), 204-210.
- Halper, E. & Neuman, P (2004). The Effects of Cocaine on Pigeons' Choices Between Fixed-Ratio and Geometrically Escalating Schedules: A Preliminary Study - *The Behavior Analyst Today*, 5.(3), Page 218 - 235.
- Keenen, M. & Kerr, T. (2002). Human time-based schedule performance: Exploring interactions between instructions and response-reinforcer contiguity. *The Behavior Analyst Today*, 3 (3), 342-362
- Kerwin, M.L (2003). Pediatric feeding problems. *The Behavior Analyst Today*, 4 (2), 162-170.
- Larsson, B. & Andrasik, F. (2002). Relaxation treatment of recurrent headaches in children and adolescents. In V. Guidetti, G. Russell, M. Sillanpaa, & P. Winner (Eds.), *Headache and migraine in childhood and adolescence* (pp. 307-316). London: Martin Dunitz.

Mazur, J.E. (2004). Risky Choice: Selecting Between Certain and Uncertain Outcomes, *The Behavior Analyst Today*, 5 (2), Pg. 190- 195.

McGrady, A.V., Andrasik, F., Davies, T., Striefel, S., Wickramasekera, I., Baskin, S.M., Penzien, D.B., & Tietjen, G. (1999). Psychophysiologic therapy for chronic headache in primary care. *Primary Care Companion Journal of Clinical Psychiatry*, 1, 96-102.

Newton-John, T.R.O., Spence, S.H., & Schotte, D. (1995). Cognitive behavior therapy versus EMG biofeedback in the treatment of chronic low back pain. *Behavior Research and Therapy*, 33, 691-697.

Romano, J.M., Jensen, M.P., Turner, J.A, Good, A.B.& Hops, H.(2000). Chronic pain patient-partner interactions: Further support for a behavioral model of chronic pain. *Behavior Therapy*, 31, 415-440.

Sargent, J., Sollbach, P., Coyne, L., Spohn, H., & Sergenson, J. (1986) Results of a controlled experimental outcome study of non-drug treatment of the control of migraine headaches. *Journal of Behavioral Medicine*, 9, 291-323.

Task Force on Promotion and Dissemination of Psychological Procedures (1995). Training in and dissemination of empirically-validated psychological treatment. *The Clinical Psychologist*, 48, 3-23.

Turner, J.A. & Clancy, S. (1988). Comparison of operant behavioral and cognitive-behavioral group treatment for chronic low back pain. *Journal of Consulting and Clinical Psychology*, 56, 261-266.

Turner, J.A., Clancy, S., McQuade, K.J. & Cardenas, D.D. (1990). Effectiveness of behavioral therapy for chronic lower back pain: A component analysis. *Journal of Consulting and Clinical Psychology*, 58, 573-579.

Vandenberghe, L., Ferro, C & Furtado da Cruz, A.C. (2003). FAP-Enhanced group therapy for chronic pain. *The Behavior Analyst Today*, 4 (4), Pg. 369-389.

Warnes, E. & Allen, K.D.(2005). Biofeedback treatment of paradoxical vocal fold motion and respiratory distress in an adolescent girl. *Journal of Applied Behavior Analysis*, 38, 529-532.

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# APPLICATION OF FUNCTIONAL ANALYTIC PSYCHOTHERAPY: CLINICAL ANALYSIS OF A PATIENT WITH DEPRESSIVE DISORDER

Rafael Ferro García, Luis Valero Aguayo, M. Carmen Vives Montero

## APLICACION DE LA PSICOTERAPIA ANALITICA FUNCIONAL. UN ANALISIS CLINICO DE UN TRASTORNO DEPRESIVO

### Abstract

La Psicoterapia Analítica Funcional está basada en los principios del conductismo radical y pone el énfasis en las contingencias que ocurren dentro de la sesión terapéutica, en el contexto terapéutico, en la equivalencia funcional, en el reforzamiento natural y en el moldeamiento. Por otro lado, la depresión es un tema complejo y de difícil solución terapéutica que requiere de una explicación y una intervención pluricausal. Se presenta el análisis clínico de un caso que presentaba un trastorno depresivo y su tratamiento a través de la aplicación de esta psicoterapia. Se describen las distintas fases de la intervención con ejemplos de la relación terapéutica, y el mantenimiento de los resultados durante un periodo de un año y tres meses.

Palabras Clave: DEPRESION, ANALISIS FUNCIONAL, PSICOTERAPIA ANALITICA FUNCIONAL.

Functional Analytic Psychotherapy is based on principles of radical behaviorism, and emphasizes the contingencies that occur during a therapeutic session, the therapeutic context, functional equivalence, natural reinforcement, and shaping. Depression is a complex problem with multiple causes; the treatment of depression must therefore be approached from different angles. A clinical analysis of a patient with a depressive disorder and its treatment with this type of psychotherapy is presented. The different phases of intervention are described, with examples of the therapeutic relationship. The results were maintained for a period of one year and three months.

Key words: DEPRESSION, FUNCTIONAL ANALYSIS, FUNCTIONAL ANALYTIC PSYCHOTHERAPY.

*Functional Analytic Psychotherapy (FAP)* (Kohlenberg and Tsai, 1991), along with *Acceptance and Commitment Therapy (ACT)* (Hayes, Strosahl, and Wilson, 1999), are two approaches to therapy based on the principles of radical behaviorism and on findings regarding functional generalization, functional analysis of language, and equivalence relations. For further information in Spanish about the implementation of FAP and ACT, two pioneering texts published by Pérez Álvarez are highly recommended: “*Tratamientos Psicológicos*” (1996a) and “*La Psicoterapia desde un punto de vista conductista*” (1996b). Functional analytic psychotherapy places emphasis on the contingencies that arise during the session, within the therapeutic context, in functional equivalence, natural reinforcement and shaping (Kohlenberg and Tsai, 1991, 1995). This approach places major importance on what the client says and does in the presence of the therapist, rather than on homework, events that take place in the family setting, or the thoughts the client may have during other parts of his or her daily life. These manifestations are termed clinically relevant behaviors (CRB), and are classified into three types that the therapist should learn to identify as therapeutic goals (Hayes, Kohlenberg and Melancon, 1989; Kohlenberg, Hayes and Tsai, 1993; Kohlenberg and Tsai, 1991, 1994a, 1994b, 1995). The first category of CRB (**CRB1**) are actual instances of the client’s problems during the session, and which the therapist should try to diminish in frequency. Normally, these behaviors are under the control of aversive stimuli and often consist of avoidance behaviors. These problems may involve thoughts, perceptions, feelings, visions or memories that occur in the course of the session. The second category (**CRB2**) are improvements shown by the client during the session. In the early phases of treatment these behaviors are absent or are manifested only weakly, but as therapy progresses they should become more frequent.

Behaviors considered (**CRB3**) are interpretations by the client of his or her own behavior and its causes. They involve observations and descriptions of the client's own behavior and the reinforcing, discriminative and eliciting stimuli associated with these behaviors. Kohlenberg and Tsai (1991) refer to CRB3 as "clients' talking about their own behavior and what seems to cause it," thereby expressing appropriate cause-effect relationships and describing functional relationships that have established the problem.

In addition, FAP considers the therapist's in-session behavior by proposing **therapeutic rules** in the form of guidelines or methods to help evoke or reinforce the client's behaviors, and help the client to identify them to the therapist and interpret them. Five rules have been developed for therapists (Kohlenberg, Hayes and Tsai, 1993; Kohlenberg and Tsai, 1991, 1994a, 1995). **Rule 1** advises the therapist to develop a repertoire for observing possible CRB during the session. **Rule 2** proposes building a therapeutic environment that is evocative of CRB. **Rule 3** encourages therapists to arrange for positive reinforcement for CRB2. **Rule 4** recommends developing a repertoire for observing the potential reinforcing properties of the therapist's behavior that are contingent upon the client's CRB. **Rule 5** urges the therapist to develop a repertoire for describing the functional relationships between controlling variables and the client's CRB. This rule has to do with both the patient's interpretations and modeling by the therapist.

Functional analytic psychotherapy has been used for depressive disorders (Dougher and Hackbert, 1994; Kohlenberg and Tsai, 1994a), personality disorders (Koerner, Kohlenberg and Parker; 1996), patients subjected to sexual abuse (Kohlenberg and Tsai, 1998), patients who avoided intimate relationships (Cordova and Koerner, 1993), persons suffering from anxiety (Kohlenberg and Tsai, 1995), and, together with acceptance and commitment therapy, in a case of exhibitionism (Paul, Marx, and Orsillo, 1999).

Psychotherapy for depression is complex. As noted by Biglan (1991), depression does not have a single identifiable cause, hence the explanation for depression must be based on multiple causes. We agree with Pérez Alvarez (1996b) that functional behavioral analysis offers a multicausal, contextual and dynamic explanation of psychological functioning, specifically for depression. One of the earliest analyses of depression from a behaviorist viewpoint was published by Ferster in 1973 (Dougher and Hackbert, 1994; Pérez Alvarez, 1996b), although it was not until the 1990s that current analyses of depression from a behaviorist theoretical perspective began to appear (Biglan, 1991; Bolling, Kohlenberg and Parker, 1999; Dougher and Hackbert, 1994; Kohlenberg and Tsai, 1994a; Pérez Alvarez, 1996b). These studies provided complex functional analyses of depressive behavior with a view to its consequential and respondent functions, establishing operations and verbal processes.

Here we offer a detailed clinical analysis of a patient with depressive disorder who was treated with FAP. For each phase of therapy we provide examples of the CRB identified and therapeutic rules that were used. To our knowledge, this is the first attempt to explicitly associate the rules of FAP with specific CRB in a report of an actual clinical case.

## METHOD

### Subject

Ana was 36 years old when she first came to the center. She was the youngest of three children, and held a civil service job. She had requested a transfer to a post in a different location 4 months before her first visit to the center, and had moved in with her family. She had been in an intimate relationship for 8 years, although she had not cohabited with her partner. One month before she sought psychological help, her partner had told her he no longer loved her and that their relationship would have to end. Since then she had felt very bad. She lost her appetite and lost 9 kg, as a result of which she was markedly

underweight. She never went out and spent all her time in her room lying in bed or watching TV. She was apathetic and did not feel like doing anything. It was hard for her to get a good night's sleep. She felt guilty for moving to another town and leaving her former boyfriend behind. She admitted that during the previous 2 years their relationship had not worked well and that they often argued.

When she came to the center she could not accept what had happened to her. She felt that her life had lost its meaning because none of her goals, such as having a family and children, could be realized. She was unable to accept her age and felt too old to begin a new life and achieve her goals. She had nobody to spend her leisure time with because she has lost all her friends. She had no hobbies because all her leisure time activities had been shared with her former partner. She took anxiolytics when she felt anxious. During the initial sessions she had crying episodes and made statements such as, *"I can't take any more. I have nothing to look forward to. What am I going to do with is my life? I wanted to start a family and have children. I don't care about things the way I did before—it's all the same to me now. How could he do this to me? I don't deserve what he did to me. I trusted him. What's going to happen to me now? I don't feel like doing anything. He hurt me so badly. I don't feel like living any more. My life has no meaning."* The client fulfilled the DSM-IV criteria for a diagnosis of major depressive disorder (APA, 1994). In other words, she presented a single episode of depression with the following symptoms: depressed mood most of the day, marked decrease in interest in activities, significant weight loss, insomnia, fatigue, and feelings of uselessness and guilt.

### Procedure

It was felt that the client would benefit from acceptance-based therapy, since part of her problem was that she had trouble accepting herself or the life situation she was in. It was decided to try FAP (Kohlenberg and Tsai, 1991).

The case will be described below in accordance with the concepts proposed by Cordova and Koerner (1993). That is, instead of providing data, we provide a description of the client-therapist relationship during treatment. The transcripts of dialogs reproduced here are based on summaries written by the therapist after each session, as the client declined to allow the sessions to be audiotaped.

Therapy lasted approximately 2 years and consisted of a total of 48 sessions and follow-up telephone interview 1 year and 3 months after the final session in the therapist's office. The first three sessions were used to obtain information for functional analysis of the problem, and to set goal behaviors. Both of these processes are summarized below.

### Functional analysis

The client's rate of social behaviors was very low: she did not leave her room or speak to members of her family, had no social relationships, and avoided seeing her old friends. This was probably a consequence of extinction and punishment contingencies in relation with her former boyfriend and other persons. Her situation was such that she did not receive positive consequences; in other words her rate of reinforcement was low. In addition, when she felt sad and complained of feeling bad, her family tried to help her by encouraging her to go out, to eat more, to cheer up, and to stop crying. These attempts, however, led her to stay in her room and spend more time crying, and to get upset with her family. Her family thus reinforced her sadness and distressed behavior. Thinking she was lonely and that her goals for the future had vanished made her feel sad and spend time crying (i.e., they evoked respondent functions). She avoided situations which might lead to contact with other persons, because they acted as discriminative stimuli for punishment or extinction contingencies Her boyfriend leaving her functioned as an establishing operation (Michael, 1993; Sundberg, 1993), that is, as an event that affected the client by altering the effectiveness of other events as reinforcers. Things that previously had been reinforcing, such

as going out, eating, talking with others or going to the movies, ceased to serve this function. In addition the frequency of behaviors that were reinforced by these events was also reduced. As a result her verbal behavior was maladaptive, and the facts she emitted regarding the cause of her problem were inappropriate. For example, she blamed the fact that the relationship had ended on her former boyfriend's family. In addition, she expressed disguised demands and impure facts (Skinner, 1957): she complained about her situation, about how bad she felt, about how much she was suffering, and about how badly others treated her. These complaints were termed *distressed behavior* by Biglan (1991), who maintained that they were often maintained by negative reinforcement since with these behaviors, patients tend to avoid the aversive consequences of contact with others. Cultural beliefs such as the concept of happiness and well-being also influenced the patient's problem, as she felt that her situation was incompatible with being happy. A final observation was that the patient responded to words as though they were actions (through stimulus equivalence). For example, during one session she responded as though her ex-boyfriend had actually telephoned: "*If he calls me to ask me to still be friends with him, I won't go to the phone. No, no! I'm not taking the phone! [Insults] I don't want to be his friend!*"

### Clinically relevant behaviors

The **CRB1** identified were:

1. Not accepting her situation. Not accepting that her boyfriend had left her, and all related behaviors such as refusing to talk about him and insulting him during sessions. Not accepting that her plans to form a family and have children no longer made sense.
2. Social isolation and avoidance of relations with others. Being alone, not having anyone to spend her free time with, losing all her social relationships. Being unwilling to talk about looking for alternatives. Being afraid that if she began a new relationship, it would end like the one with her ex-boyfriend. Being socially aggressive (fighting, arguing, insulting, breaking things, etc.).
3. Apathy. Not caring about anything. Not feeling like eating, listening to music, going out, shopping for clothes or reading magazines, but spending her time lying in bed or watching TV. Losing weight. Not having any hobbies. Not talking about other things besides her problems.
4. Poor appearance and self-concept. Complaining about her appearance, not wearing snug-fitting skirts, pants or a bathing suit. Complaining about her age, not wanting to state her age, seeing herself as older than she was.
5. Avoiding bad feelings. Getting upset when she felt anxious or sad, not going to the doctor's or dentist's to avoid physical pain. Avoiding talking about things that made her unhappy. Avoiding feeling anxious. Smoking to calm down. Taking anxiolytics to keep from feeling anxious.
6. Not explaining clearly what had happened, and about her own and others' behavior. Blaming others for her own problems. Not admitting her role in the events, not knowing why things had happened that way.
7. Complaining about what had happened, about her life, about the things others did, and about how others treated her. Criticizing others, not understanding other persons' preferences.

The **CRB2** chosen for intervention were:

1. Accepting what had happened. Talking calmly about the past, her relationship, and her ex-boyfriend. Describing her own responsibility for what had happened. Not crying, getting upset, or insulting her ex-boyfriend when she talked about the breakup.
2. Holding on to positive social relationships. Going out and meeting people. Accepting that others are different. Not fighting or being aggressive. Understanding others. Maintaining a cordial, pleasant relationship with the therapist.
3. Having plans to get on with her life. Getting involved in new activities, meeting more people, calling old friends, etc. Studying to apply for a job promotion. Expanding her range of activities. Talking about different subjects during sessions.
4. Accepting herself as she really was, accepting her age and appearance, not worrying about finding a partner before she got too old. Not worrying about starting a family and having children soon.
5. Establishing functional relationships (CRB3) appropriately. Explaining what had happened in her life, her past, how she could get over the situation, etc.

## INTERVENTION

### (A) Initial phase

#### Sessions 1 to 10

This phase comprised the first six months of treatment from sessions 1 to 19. During Sessions 1, 2, and 3, in the first 3 weeks of therapy, the client's problems were evaluated and a functional analysis was carried out. During this period her rate of CRB1 was high. She cried frequently and fidgeted in her seat, dropped things and smoked frequently (approximately 5 to 10 cigarettes per session). She complained constantly, with frequent exclamations such as: "*I can't take any more!*", "*I don't deserve this!*" or "*What am I going to do with my life?*" She stated that she had had problems with the persons around her. For example, during her ex-boyfriend's last phone call, when he told her their relationship would have to end and that he wanted them to remain friends, she got so angry she broke the phone when she slammed down the receiver without saying good-bye. As she described this event she raised her voice, insulted her ex-boyfriend, and responded as if he were actually on the phone at that time. She responded literally to language as though it represented actions (for a more detailed explanation, see Ferro and Valero, 1998; and Hayes and Wilson, 1993, among others). During the final summer of their relationship she argued with her family and her boyfriend, and insulted him in public on several occasions.

During Sessions 4 to 10, from the fourth week to the end of the third month of therapy, complaining continued to be the most frequent CRB1. For example, she often said she didn't feel like doing anything, didn't know why life was so hard, didn't understand why life had treated her so badly, and was very hurt that her boyfriend had not phoned. The therapist did not respond to these complaints since his intention was to extinguish them (**Rule 3**). Some of the client's explanations for what had happened to her became more appropriate (CRB3). For example, she sustained that on weekends she felt very bad and that during the week she felt better while she was at work, but felt bad again during the evenings. She said she felt guilty when she reacted badly to something or was rude to someone. She noted that she avoided arguing with her family (CRB2). In response to these comments the therapist used the description of how badly she felt and how hard she was trying to get over it, as ways to reinforce these behaviors ("*You must really love your family. You're having a really bad time now with all this, and are*

really trying hard to get over it”). The rules she expressed about the breakup (CRB3) were still inappropriate, she failed to admit her own responsibility for the breakup, and blamed her ex-boyfriend’s family. When these explanations appeared, the therapist used shaping (**Rule 5**) with questions such as: “Why do you think that? Do you really think X left you because of his family? If that’s the case, why didn’t he leave you earlier? What happened during those last few years?” Although the client was reluctant to answer these questions, she began to express more appropriate rules: “He didn’t love me. I didn’t realize before because I was blind” (CRB2 and CRB3). Contingent upon these positive rules, the therapist used the description of her emotional distress as a reinforcer (**Rule 3**). This was effective, as it increased the frequency with which she talked about negative aspects of the relationship (**Rule 4**).

In Session 7 CRB2 began to become more frequent. The client said she was thinking of enrolling for driving classes and made some positive comments about her job, although CRB1 were still frequent. For example, she complained about her life and that everyone had abandoned her. She commented that when her colleagues at work talked about their families and children, she evaded the situation. She mentioned several cases of suicide that others had told her about. When she mentioned the suicides, the therapist asked “Are you going to commit suicide?” and later noted “If you want to kill yourself, there’s nothing I can do to stop you. But it would make me feel very bad,” using an expression of his own feelings as a way to evoke CRB (Kohlenberg and Tsai, 1991). After this the client never mentioned suicide again (**Rule 4**). Another example of **Rules 3 and 4** was when the patient showed the therapist a photograph taken of her a taken few years previously, to show him how much better she looked before. In the picture she weighed more and looked better, and she asked the therapist, “See how bad I look now?” (This was a CRB1 that functioned as a disguised mand intended to prove how bad she looked and felt at the time of the session.) In this situation the therapist replied “Oh yeah” and left the picture lying on the desk (with the intention of extinguishing these mands). During subsequent sessions the client did not repeat this type of behavior.

During these sessions, CRB1 were frequent. The patient complained, expressed confusion about her feelings, was unable to express how she felt or to explain why she felt bad. Crying episodes continued. She used culturally-determined rules to face her problem. For example, she commented, “It’s better to laugh to keep from crying,” and “Time heals all wounds.” She rejected her appearance. Her explanations about what was happening to her and what she should do were inappropriate: “This is what I get for being a good person. If I’d been tougher... .” However, more positive CRB3 also appeared: “I should stop brooding and get over my depression.” Some of the dialogs during this initial phase were revealing, as in these examples of **Rule 5**:

Therapist (T): How would you define happiness?

Client (C): Not having any problems in life. (Cultural influences on happiness)

T: Do you think happiness is not having any problems?

C: [The client remains silent.]

T: Do you think I don’t have any problems? With my job, or with my family, for example?

C: I guess so. But you know how to deal with your problems.

T: How would you define an intimate relationship?

C: Until this happened, I thought that an intimate relationship had to last your whole life, like my parents’ relationship. (This ply rule and its pliance made it hard for the client to accept the breakup and insensitive to its consequences.) (For more information on pliance see Hayes, Zettle and Rosenfarb, 1989 and Zettle and Young, 1987).

T: What about now?

C: I don’t think that anymore.

She also mentioned she had been invited to a wedding, but was reluctant to go.

T: Why aren't you going to the wedding?

C: Because of the people. I don't trust the people (CRB1).

T: Do you trust me? (This question compared what happened in-session with what happened outside the session. According to Kohlenberg and Tsai, 1991, p. 60, this is a way to evoke CRB.)

C: Yeah, I do.

T: What makes me different from other people?

C: You seem like a good person.

T: Can't there be other good persons in your life too?

C: I wish.

T: At the wedding you might make new acquaintances or run into someone you know.

C: So what?

T: It might be fun.

C: I doubt it. (The client was unwilling to consider the possibility, and the therapist did not take the subject any further because he felt he might be reinforcing negative rules. This is an example of **Rule 4**).

During the following session the client remarked that she had gone to the wedding, so the shaping during the previous session had been effective (**Rule 4**). After that, a change was apparent. She noted that she had run into a friend and they had arranged to meet and go out. Her appearance had improved. The therapist commented that she looked better and that he liked how she looked (using his own feelings as a natural reinforcer; Kohlenberg and Tsai, 1991). She said she had gone to the hairdresser's and thought she had gained some weight, or at least she was trying to eat better. The therapist said he was sure she was feeling better. In reply, she said, "*I've calmed down some.*" Later, she remarked "*What I need to do is meet people*" (CRB3). Recognizing that progress has been made is a sign that identifies CRB (Kohlenberg and Tsai, 1995).

Sessions 11 to 19 During this period (from the beginning of the fourth month until the end of the sixth month of therapy) the patient continued to talk about making plans, although she didn't act on any of them outside the sessions. Some of her plans at this time were to study for promotion to a better post, to get a driving license, and to go out shopping. She talked about these projects more frequently (**Rule 4**). As the Christmas season approached she admitted to feeling anxious because she had no friends to celebrate the holidays with, and she avoided making plans for New Year's Eve. She also avoided (and escaped by changing the subject) talking about her age, children and families (CRB1). During one session, when the therapist asked her about her ex-boyfriend, she became angry and responded aggressively by shouting at the therapist (**Rule 2**, constructing an environment that evokes CRB).

T: Have you heard from your ex-boyfriend?

C: [Shouting] Why do you have to bring that up? I'm sick and tired of everybody asking me the same thing.

T: Why are you shouting at me? I apologize if I've hit a nerve, but I didn't mean to upset you.

C: I'm sorry too.

T: Is that the way you communicate with people? (Compares what happens in-session with what happens outside the sessions, as a strategy to evoke CRB).

C: Sometimes. With my family.

In a subsequent session the therapist asked again whether she had heard from her ex-boyfriend, and she responded in more measured tones that she hadn't heard from him since the previous summer (CRB2). The therapist's intervention had avoided an aggressive response to the question (**Rule 4**).

In a subsequent session the patient talked about her relationship, accepting what had happened and admitting to part of the responsibility. She noted that she was changing, and that she felt like enjoying herself again. She also remarked that she was trying to control her bad moods. She began to express more positive rules: *"You have to take life as it comes and not fight it."* When these behaviors appeared (CRB2) the therapist reinforced them (**Rule 3**) in consonance with his experience with this client (**Rule 4**). She reported that she had gone out on New Year's Eve with a female colleague from work and had enjoyed the night out. The therapist related how he had spent New Year's Eve, as a form of natural reinforcement. The client also remarked that she had gone shopping. At this point during therapy, she began to carry out the plans she had made. The therapist noted this and compared her situation earlier with the way she was feeling at that point. Using the New Year as a convenient time point, the client set some goals and commitments for herself: *"I have to work to move on with things, and what happened belongs to the past."* She accepted what had happened in her relationship, observing, *"There's nothing I can do now about what happened to me,"* *"I have to move on,"* and *"I have to live my life"* (CRB2). In response to a remark by the therapist, she smiled (CRB2). The therapist observed this reaction and described it, *"Hey, I just caught you smiling"* (**Rule 1**). As therapy progressed the frequency of negative CRB decreased while that of positive CRB increased.

The client still refused to accept her age. She was reluctant to talk about her age and was afraid to meet people. She stated, *"I don't want to go out with people my age because they seem old to me. I'm actually 35 (she was actually a few years older than that) but look 25. And I really feel 25"* (CRB1).

In Session 17 she divulged, with no prompting by the therapist, that she had been mistreated by her ex-boyfriend. Kohlenberg and Tsai (1991, p. 60-61) note that one way to identify CRB is to be alert to subtle behaviors. This patient escaped each time the therapist tried to talk about the problems in her relationship with her ex-boyfriend. For example, *"What were the last years of your relationship like? How did you get along with your boyfriend? Didn't you ever have any arguments?"* The patient's response was to say she did not want to recall any of those things, or to change the subject. In this session the therapist remarked that a new patient had started therapy, and that her partner was hurting her really badly (**Rule 2**, constructing an environment that evokes CRB). The client spontaneously admitted that she had been abused during the relationship.

C: [Stammering] We got along really badly. I used to hit him too.

T: I don't understand. Are you talking about your relationship? You used to hit each other?

C: Yeah. (laughs nervously). Once he hit me in the head in public. And another time I had to go to the emergency room after he kicked me.

T: How did you manage to put up with all that?

C: I used to hit him too, but he'd hit me back harder. He used to smash things too. So did I. He broke the remote control for the TV. Once, at a party, he threw his drink in my face and walked out.

T: I don't understand. Did you love him so much that you put up with all that? You must have had a terrible time (**Rule 3**, reinforcement).

C: I really was miserable. I didn't feel like I was his girlfriend.

T: What rotten luck. Isn't there any other way to meet other kinds of people?

C: In my next relationship I'll be more careful so that it doesn't happen again. In my current situation I don't have anyone to go out with, and besides I don't feel like it. (The therapist stopped asking questions along this line.)

In Session 18 the client spoke again of the abuse she had received, an indication that the consequences the therapist had applied were reinforcing (**Rule 4**).

T: You were lucky it ended. That's not my idea of an intimate relationship.

C: That's life. Now those memories just make me want to laugh. I was blind and couldn't see it. I only saw things through his eyes. I only want to remember when we first met, when he was a fantastic person. The client then spontaneously remarked, The most important thing for me is what a person is like on the inside, not physical attractiveness (a cultural cliché). The client further remarked, I'm tired of this situation (referring to being lonely and depressed). I know I have to get out and see other people, but I don't know how. That's life. (This comment had been made by the therapist several sessions before.)

In this session the client stopped smoking during the conversations. The therapist noticed (**Rule 1**) and described the situation, "*Have you stopped smoking? Why?*" (**Rule 5**). The client answered, "*I'm trying to cut down.*" This behavior was reinforced in the same manner as had been found to be effective in one of the earliest sessions: by describing how hard the client was trying. From this session on her in-session smoking decreased and eventually ceased altogether.

## (B) Intermediate phase

### Sessions 20 to 40

This period, comprising Sessions 20 to 40, lasted more than one year, from the beginning of month 7 to the end of month 18. In Sessions 20 to 31 (months 7 to 12), new CRB1 appeared, including problems with her relationships with others, complaints about her colleagues and job, and avoidance of talking about a conflict with one of her colleagues at work. On this latter problem, the therapist asked her repeatedly what had happened. Eventually the client responded, "*I want nothing to do with her,*" a reaction functionally equivalent to how she reacted when her boyfriend left her. She also admitted that her bad temper persisted. She complained frequently, not about life or about the breakup, but about other persons. For example, "*I'm tired of supporting people, what I want now is for them to support me. People only look out for their own interests.*" New CRB2 also appeared. Through a neighbor, she met a young woman who suggested she join a local cultural association. During these sessions the client was reluctant to go out, and complained about other people. The dialog transcribed below illustrates how the therapist used shaping to encourage the patient to make a greater effort to establish social relationships.

C: My situation is very difficult because I don't have any friends. (Expressing difficulties, according to Kohlenberg and Tsai, 1995, is a sign of CRB).

T: You can't complain these days, since you've just met new people.

C: I'm more independent, and I don't go running after people. If you open up to people, they can hurt you. (Reluctance, a CRB1).

T: You opened up to me. Have I hurt you? (comparison of the therapeutic relationship with the relationship with others)

C: That's different.

T: Why?

C: Because this is your job.

T: Do you think that if it weren't my job, then I'd hurt you?

C: No. I've hurt myself more than he did. (referring to her ex-boyfriend).

At the next session she remarked that she had gone to the cultural association meeting with her new acquaintance, a sign that the shaping had been effective (**Rule 4**). In subsequent sessions she noted that she had met another woman, who was, in her opinion, "crazy." She stated, "*I was really disappointed when I got back. But then I thought it was funny. It was toward the end of the evening, and the only thing this girl wanted to do was drink. She was really rude to me.*" She seemed to deal well with this disappointing outcome.

Another CRB1 appeared in relation to her job. She noted that she felt she might be fired but was reluctant to explain why. She admitted skipping a meeting to avoid feeling anxious. With shaping by the therapist, she explained that she might be fired because she was too thin (an irrational idea because she had a permanent civil service job). She then changed the subject and said, "*People have asked me 'How's your boyfriend? When are you getting married?' and it's given me a lump in my throat.*" The therapist compared her situation at work with her relationship with her boyfriend, asking her, "*Does your job make you feel bad the way your relationship with your boyfriend does?*" to establish equivalence between the two situations. The therapist felt she was avoiding talking about her job, so this was tried on the basis of **Rule 2**, which proposes creating an environment that evokes CRB.

During the subsequent months her circle of social acquaintances broadened. In one session she described how she'd failed to turn up as arranged to meet one of her friends, and noted that her friend might be upset with her. She began to cry and said, "*I feel out of place in the world*" (according to Kohlenberg and Tsai, 1995, talking about difficult feelings is a sign of CRB), instead of saying she felt guilty for what she had done. This reaction was probably a mand. The therapist moved the box of tissues closer to her and waited for her to stop crying (Extinction, **Rule 3**), and then asked, "*Why didn't you go to meet her as planned? Weren't you ashamed of yourself to just stand her up that way? Did you apologize to her?*" (**Rule 5**).

A relative telephoned the therapist and explained that the client's behavior toward her family was despotic, with frequent loud fights. At the next session (**Session 26**) the client smoked, after having abstained from smoking for eight sessions (three and a half months). She justified this by saying her colleagues at work smoked a lot (an inappropriate explanation, CRB1 and CRB3). The therapist said nothing about the phone call from her relative. He asked her how things were going at home, but she did not answer (CRB1). She mentioned feeling sad because she felt lonely at home. This was a mand, insinuating that her family ignored her). The therapist asked again about her relationship with her family, and eventually she admitted that she behaved badly toward them, explaining, "*They're after me all the time, and I feel like a little girl.*" The therapist asked a shaping question, "*Why do you think they do that? Did you tell them calmly, the way you just told me? Here you don't shout at me, and you aren't rude to me. Why is it different with them?*" The therapist compared her in-session behavior with her behavior outside the sessions to establish functional equivalence between the two settings, in an attempt to evoke CRB.

In all sessions, each time the therapist tried to analyze why the client had conflicts with her colleagues at work, she changed the subject or was reluctant to talk about it (CRB1). She was still unable to accept herself (CRB1), nor did she accept it when people told her she was looking thin. This reason kept her from attending a wedding. The therapist remarked, "*You are underweight, but does that keep you from coming here?*" (**Rule 5**, establishing comparisons again between the in-session situation and that outside the sessions). She was also too embarrassed to wear a bathing suit, and therefore avoided going to the beach with her female friend, nor was she willing to talk about this. She noted that she had gone to the wedding (the therapist reinforced this by remarking on how hard it must have been for her to make the effort), and remarked that the wedding had moved her to tears, "*It could be me up there*" (referring to marriage). The therapist asked her to describe what she had got out of going to the wedding (**Rule 5**).

At one session she started to cry as soon as she entered the room (CRB1). The therapist said nothing (Extinction, **Rule 3**) and she then said, "*Don't worry, I'll be okay*" (a mand). After a long spell of crying, she said a female friend had stopped phoning, was going out with other friends without asking her to join them, and made excuses to keep from seeing her. As she made these remarks, she began to insult and criticize her friend (CRB1). The therapist used shaping, "*Do you think she used you? Is that so terrible? Hey, she's not your boyfriend. Don't you think people have the right to do what we want?*" (**Rule 5**). Then the patient expressed rules such as: "*I never do anything. When you're feeling bad you*

*don't feel like doing anything.*” This type of complaining had been abolished in an earlier stage of therapy, but reappeared at this point.

In Session 31, after one year of treatment, there was a change in her course and she began to express more appropriate rules.

C: I've realized I have to stop being so selfish (referring to her reaction when her female friend stopped phoning her).

T: I think there's a relation between what happened and your breakup problem. When your friend left you and when your boyfriend left you, it really made you feel terrible. Do you see it that way? (The therapist explains the functional equivalence between the two situations, since they had the same effect. This was an example of **Rule 5**).

C: I don't know.

T: Each time something like this happens, are you going to get depressed? What if another one of your friends leaves you?

C: I'll have to carry on.

T: What is friendship?

C: Giving everything and not expecting anything in return.

A further example of appropriate rule-making is reflected in the exchange below:

T: What have you learned about life?

C: Locking myself away in him is the worst thing I've done in my life.”

T: What about now? What's different? (The therapist urges her to compare her situation before with her current situation.)

C: I want to get out and live. I feel good. You don't need to be married or to have children to be happy. (At this time she begins to change her concept of happiness.)

She gained weight and said she was trying to eat better and felt calmer (recognizing the progress made is a CRB, according to Kohlenberg and Tsai, 1995). She contemplated new goals for herself, such as buying an apartment, taking courses in things she was interested in, and traveling.

Sessions 32 to 40 took place during months 13 to 18 of therapy. Once again during this period, complaints (CRB1) about her friends, her job, her colleagues and illnesses gradually increased. The therapist was unable to abolish complaints by ignoring them (**Rule 4**). The client was angry when she arrived for one session because her (female) friend had told her she always talked about the same things and that made conversations with her boring. The therapist analyzed the feelings his relation with the client evoked as a strategy to identify CRB (Kohlenberg and Tsai, 1991). Recently, the therapist had found his own relationship with the client to be boring and felt impatient for sessions to end, because the client always complained about the same things. From that moment on the therapist chose using other topics for conversation as a goal for CRB2. In subsequent sessions the client continued to complain about her job, her friends and her colleagues, and remarked that she had skipped work because of how bad she felt in the workplace (CRB1). The therapist hypothesized that she was using her depression as an excuse to skip work. She went out for walks or to go shopping or on other errands, but didn't go to work. The therapist shaped more appropriate explanations (**Rule 5**). The patient avoided going to work not because she was depressed, but because a long, hard day awaited her, and she avoided seeing her colleagues because they pressured her to work. Upon arriving very late for one session (CRB1) she justified the delay saying she didn't feel well and had fallen asleep. The therapist told her he couldn't see her then and postponed the session one week. During the remainder of treatment the patient was never late again for any session (**Rule 4**).

At one session the patient continued to complain about the same things, and the therapist noted that she never stopped complaining that her colleagues didn't help her. He then established equivalence with arriving late for a session and how the therapist had handled the situation, and asked, "*Do you think I didn't help you?*" She avoided the question and replied, "*I've been feeling really nervous these days; I feel really uncomfortable. What can I do?*" (an adaptive mand; instead of complaining she requested help). The therapist used shaping to keep the patient from using her problems as an excuse for her difficulties with her colleagues.

In another session the client noted that she had gone to the doctor's but declined to have a blood test because of the pain (CRB1). She avoided talking about work and her colleagues. At this session she complained about illnesses. The therapist felt bored by her complaints and tried to disrupt her tendency to complain and get her to make commitments with herself:

T: Are you happy?

C: No, but what can I do? I'm trying hard to be happy. (Here she makes a commitment with herself). Everything in life (referring to friendship and love) happens when it has to happen. When I see a cloudy day (referring to an emotionally bad day) I try to cheer myself up and be more positive. I'm alone, but so what?

T: Why don't you go to work? What's up at work?

C: [The client remains silent.]

T: Do you realize that you're always complaining about your job, about life, and about everything? Nobody likes that. I can understand why your friend said that. (**Rule 5**).

During this and subsequent sessions new subjects of conversation were established, first by asking the client her opinion about leisure-time activities and later by talking about subjects initiated by the client spontaneously. At the same time the therapist tried to naturally reinforce these CRB2 (**Rule 3**) by saying, "*Now your friend can't say that any more, about you not being able to hold a conversation about different things, because here you talk about everything.*" This statement compared the two settings to establish functional equivalence. The therapist also described the behavior, "*Hey, where did you read that?*" In accordance with **Rule 4**, the effects of the therapist's behavior appeared to be reinforcing because the patient talked more frequently about a variety of topics such as plants, cars or TV programs.

In the final sessions of this phase no complaining appeared (**Rule 4**). CRB2 became more frequent, and the patient remarked that she had made a new female friend and had met and gone out with new people who were friends of a friend. Without prompting, she brought up topics she had previously avoided, and expressed the following rules: "*We all make mistakes, and my mistake was to trust that guy*" (CRB2 and CRB3), "*I'm not worried about finding a life partner. It's my destiny not to get married.*" She spoke again of future plans such as going to the dentist's and the doctor's, attending driver education classes, and buying an apartment. She applied for reassignment to a different job at work and felt glad because she had been told her chances were good. She talked about the New Year's Eve party and the person she went with. She remarked, "*I'm looking forward to changing jobs so I can meet different people.*" The therapist described her as being a more pleasant person who talked about things he was interested in, and said he felt she was doing better. He then asked her:

T: What is the most important thing in your life?

C: Health and work. Life is full of obstacles you have to jump over.

T: What might make you feel bad now?

C: Losing my job.

## C) Final phase

### Sessions 40 to 48

This period comprised Sessions 41 to 45, and lasted for 3 months, from months 19 to 21. During this phase the frequency of complaining decreased while the frequency of type 2 and 3 CRB increased. For example, the client noted, *“Now that I go out with friends, I’m not going to fall apart. Life can be so nice... .”* She had a conflict with her colleagues at work and analyzed what had happened with the words, *“I’m more diplomatic now. Before I used to lose my temper, and if someone shouted at me, I shouted back. I created a confrontation with my colleagues, and that was the problem. Now I just ignore them, I just say ‘Hi’ and that’s it.”* (According to Kohlenberg and Tsai, 1995, talking about progress made is a CRB2). She also established a comparison between her colleagues at her former post and her current colleagues, and concluded that the people she worked with now were different, and so was she.

In Session 44 she spoke for the first time of getting over her depression, and made commitments with herself: *“I want to get on with my life and meet people”* (CRB2). She got in touch with a female friend she had known before and arranged to meet and do something together. She noted that she no longer had problems with her colleagues at work because she ignored them. At the following session one month later she said she had gone to the doctor’s and had had blood tests (CRB2, facing pain, which she had previously avoided). The therapist remarked, *“Wow, that used to really scare you”* (**Rule 3**). She often went to the hairdresser’s and telephoned acquaintances and old friends. She talked about her depression as a thing of the past, saying that she felt good and that all she needed to do was find people to spend time with and go out with. At the end of this session the therapist decided it was a good time to bring treatment to a close and start follow-up.

Follow-up (Sessions 46 to 48) lasted for 5 months, from month 22 to month 26. In the next session the client talked for the first time about the therapist’s office, the decor, and the objects in the office. She also talked about other things such as literature and decoration. She said, *“I need to learn more about cultural things”* and commented on the books she had bought (CRB2). The therapist felt the conversation was interesting and pleasant, and described this feeling to the patient. She talked about her colleagues and accepted that other people are different and that she needed to adapt. In other words, she seemed to be changing her concept of friendship toward a more flexible view. She remarked, *“As soon as I can, I’m moving somewhere else with a transfer to another post or a promotion.”* She also spoke of her plans for the summer. She asked the therapist to schedule her next appointment for after the summer vacation period, explaining that she felt really well. She remarked, *“Before my self-esteem was in pieces, but now I’m putting it back together again.”*

The next session was held two and a half months later, after a total of 2 years in therapy. CRB2 appeared, such as describing how she had made new acquaintances and was spending time with them in social activities. She asked, *“Remember when I said I had to meet people?”* (In other words, without prompting she compared her previous situation with her present condition.) The therapist asked, *“How have you changed?”* and she answered, *“Now I see things in a different way. This summer was different from the last few summers.”* When the therapist asked about her ex-boyfriend, she spoke calmly about the relationship and expressed some rules, *“It won’t happen to me again. Now I feel sorry for him. I was wrong, I locked myself up inside him, and that’s something you shouldn’t do. Each person has to live their life.”* The therapist asked what she had learned from therapy (a question intended to evoke CRB, according to Kohlenberg and Tsai, 1995), and the client responded, *“You have to take things in life without getting upset over them. It’s me who has to live my life. You shouldn’t brood over things and overanalyze them. You shouldn’t spend all day thinking to yourself how lonely you are.”*

In the final session (2 months later, after 26 months of therapy) the client mentioned that she had gained more weight thanks to the fact that she felt calmer. When asked about her colleagues at work, she said they left her alone. During this session she remained calm and pleasant to talk to (CRB2). She was getting along well with her family at home. She made more realistic plans. At the end of this session the possibility of terminating follow-up was raised. The last exchange with the patient, when follow-up was concluded (Kohlenberg and Tsai, 1995), illustrates an example of **Rule 5**.

T: Do you think you need to come for any more sessions?

C: I don't think so. But I thought you'd tell me when it was okay to stop.

T: Is there anything else I can help you with?

C: It's me who has to help myself. I can't complain about my life. Other people are worse off.

T: Are you happy?

C: Well, as happy as anybody is. Life has its worries too, and you just have to get over them.

T: What might get you depressed now?

C: Right now, I don't know, but I've learned something: you have to keep fighting.

T: You'll lose family members and friends—will that get you depressed?

C: I don't think so. I'll have to keep fighting.

These remarks reflected more positive CRB3, and showed that the patient accepted that painful things happen in life, and that she had made a commitment to fight to deal with them.

#### **D) Telephone follow-up**

One year and three months after the final session the patient was contacted by phone. She said she felt well. She had the same job but planned to apply for promotion. She got along better with her colleagues and spoke to them in the office, but had no social relations with them outside working hours. During the previous summer she had gone to the beach on vacation for a few days with some friends and had gone swimming. (She had previously avoided wearing a bathing suit.) She went out on weekends with female and male friends. Her relations with her family were better. The client asked the therapist about his own family for the first time. She remarked that she had had a conflict with some friends and said she had dealt with it. She felt she needed no further help.

### **RESULTS AND CONCLUSIONS**

An acceptance-based psychotherapeutic procedure such as FAP was useful in treating a depressive disorder of the characteristics seen in this patient. The results were maintained for a period of one year and three months. More importantly, during the follow-up period the client adjusted to the values and changes that therapy had generated.

Intervention took place in three phases, as proposed by Kohlenberg and Tsai (1995). During the initial phase CRB1 were frequent. Although all such behaviors were frequent, treatment centered mainly on the client's resistance to accepting her situation and herself, her complaints about what had happened, her apathy and reluctance to make new social contacts. As the therapist used shaping, leading the client to describe the experiences she avoided and to give her explanation of the facts, the frequency of CRB began to change, with an increase in CRB2. We believe three key moments can be identified in the patient's course during this phase. The first was when shaping was used to help her to face her new social relations (attending a wedding). The second was when she showed aggressive behavior during a session (after being asked if she had heard from her ex-boyfriend). The third occurred during Session 17, when she admitted she had been abused and that the relationship had deteriorated badly.

During the intermediate phase new CRB1 appeared. The client began to have problems in her relations with others, and began to complain about her job and the people she worked with. At first the complaints were frequent and recurrent, and we feel they formed part of the same response class as in the preceding phase. One of the most notable moments during the intermediate phase was the positive change seen during Session 31, when she recognized that she was making progress, expressed more appropriate rules, and began to change her concept of happiness to make it more consistent with her situation. It was at this time that she realized she could be happy without getting married and having children. However, some backsliding was seen in the following session. Complaining became more frequent again, problems in her relations with others worsened, and in particular, she became resistant to talking about these problems and avoided mentioning what had happened with other people and at work. These difficulties with her social relations also appeared during the sessions, as for example when she arrived late for an appointment and blamed the delay on her emotional problems. In addition, her conversations became repetitive and tedious even for the therapist. During these sessions the therapist considered changing the therapeutic strategy to favor conversations about alternative topics by using natural reinforcement differentially. After this change in strategy, complaining disappeared, the client's social relations and desire to meet new people increased, she made new plans for the future, and became more forthcoming about explaining about conflicts she had experienced and about her future plans.

During the final phase complaining became less frequent and CRB2 became more frequent. She maintained good social relations, accepted other people and made plans. Her conversation became more varied and pleasant, her self-concept improved and she gained weight. There were also improvements in CRB3: she accepted her past and the problems she had had in life. In the follow-up phone conversation one year and three months later, the client continued to adjust to the values that had arisen during therapy and continued to be more accepting of others.

The long duration of the intervention may have been due to the severity of the client's problem. For persons who have received abuse, have been socially isolated and who have few coping skills when they seek professional help, interventions may not be as simple or as brief as for other persons.

Depression is a complex problem that is hard to treat. The patient we describe in this report had a limited social repertoire. Patients who are depressed seem to have deficient social skills, and this in turn makes their social relations more likely to fail. According to Biglan (1991) a low level of social reinforcement is crucial to the onset and maintenance of depression. We feel that an intervention based on in-vivo, face-to-face work with the client during sessions is effective in cases such as that described here, when the client shows strong resistance to change. Like Korner, Kohlenberg and Parker (1996), we do not claim that other types of intervention (counseling, homework, cognitive therapy, training in social skills, etc.) would be ineffective. We share the view of Friman, Hayes and Wilson (1998), who note that interventions in vivo are more potent and yield better results than indirect or contrived interventions.

Our functional analysis of the patient's problem was based on models proposed by Dougher and Hackbert (1994), Kohlenberg, Tsai and Kohlenberg (1996), and Naugle and Follette (1998). Our functional analysis made it possible to choose appropriate goals for intervention. In view of the results, the choice of clinically relevant behaviors seems to have been appropriate.

The patient's resistance to accepting the facts about her life prevented her from getting over her problems. We feel it was appropriate to choose an acceptance-based procedure for this type of problem. Acceptance-based interventions have been shown to be more effective than rational control in pain tolerance (Hayes, Bissett, Korn, Zettle, Rosenfarb, Cooper, and Grundt, 1999) and chronic pain (Augustson, 1999), and we suspect they may be effective for all types of distress in general. As noted by Cordova and Kohlenberg (1994), FAP promotes acceptance through self-observation (CRB3) and reduces feelings of guilt by evoking emotional responses during the session. We feel that the intervention

developed for our patient favored acceptance by exposing her to her own emotional responses during the sessions, and by offering her a chance to explain and observe the events that had taken place in her own life. We are convinced that favoring acceptance yields a number of benefits. As argued by Cordova and Kohlenberg (1994), contact is increased with lost reinforcers, potentially more productive actions are increased, and aversive arousal is reduced.

We are aware that clinically relevant behaviors appear more frequently than many therapists believe, and that therapy can be effective only if the therapist is sensitive to these types of behaviors during the session (Rule 1), as described by Kohlenberg and Tsai (1991). Moreover, we feel that the relevance of observing the effect of the therapist's behavior on the client's behavior is one of the most important contributions of this approach to psychotherapy. We suggest that observing the psychologist's behavior may also have benefits in other clinical settings such as interventions for developmental delay, speech therapy and education. In closing, we concur with Pérez Alvarez (1996a) in that the difference between functional analytic psychotherapy and behavior therapy lies in their differing conceptualization of the therapeutic relationship.

### REFERENCES

- American Psychiatric Association (1994/1995). *DSM-IV. Manual diagnóstico y estadístico de los trastornos mentales*. Barcelona: Masson.
- Augustson, E.M. (1999). Issues of Acceptance in Chronic Pain Populations. *The Behavior Analyst Today*, 1.1, 14-17.
- Biglan, A. (1991). Distressed behavior and its context. *The Behavior Analyst*, 13, 157-169
- Bolling, M.Y.; Kohlenberg, R.J. and Parker, C.R. (1999). Behavior Analysis and Depression. In M.J. Dougher (Ed.). *Clinical Behavior Analysis*. Reno: Context Press.
- Cordova, J.V. and Koerner; K. (1993). Persuasion criteria in research and practice: gathering more meaningful psychotherapy data. *The Behavior Analyst*, 16, 317-330.
- Cordova, J.V. and Kohlenberg; R.J. (1994). Acceptance and the therapeutic relationship. In S.C. Hayes; N.S. Jacobson; V.M. Follette and M.J. Dougher (Eds.). *Acceptance and Change: content and context in psychotherapy*. Reno: Context Press.
- Dougher, M.J. and Hackbert, L. (1994). A behavior-analytic account of depression and a case report using acceptance-based procedures. *The Behavior Analyst*, 17, 321-334.
- Ferro, R. and Valero, L. (1998). Psicoterapias Conductistas: nuevos enfoques clínicos. *Psicologemas*, 23, 31-62.
- Friman, P.C.; Hayes, S.C. and Wilson, K.G. (1998). Why behavior analysts should study emotion: The example of anxiety. *Journal of Applied Behavior Analysis*, 31, 137-156.
- Hayes, S.C.; Bissett, R.T.; Korn, Z.; Zettle, R.D.; Rosenfarb, I.S.; Cooper, L.D. and Grundt, A.M. (1999). The impact of acceptance versus control rationales on pain tolerance. *The Psychological Record*, 49, 33-48.

- Hayes, S.C.; Kohlenberg, B.S. and Melancon, S.M. (1989). Avoiding and Altering Rule-Control as a Strategy of Clinical Intervention. In S.C. Hayes (Ed.) *Rule-Governed Behavior. Cognition, Contingencies, and Instructional Control*. New York: Plenum Press. (Pp.: 359-385).
- Hayes, S.C.; Strosahl, K.D. and Wilson, K.D. (1999). *Acceptance and Commitment Therapy. An Experimental Approach to Behavior Change*. New York: Guilford.
- Hayes, S.C. and Wilson, K.G. (1993). Some applied implication of a contemporary behavior-analytic account of verbal events. *The Behavior Analyst, 16*, 283-301.
- Hayes, S.C.; Zettle, R.D. and Rosenfarb, I. (1989). Rule-Following. In S.C. Hayes (ed.). *Rule-governed behavior. Cognition, contingencies, and instructional control*. New York: Plenum Press.
- Koerner, K.; Kohlenberg, R.J. and Parker, R. (1996). Diagnosis of Personality Disorder: A Radical Behavioral alternative. *Journal of Consulting and Clinical Psychology, 64*, 1169-1176.
- Kohlenberg, R.J.; Hayes, S.C. and Tsai, M. (1993). Radical behavioral psychotherapy: Two contemporary examples. *Clinical Psychology Review, 13*, 579-592.
- Kohlenberg, R.J. and Tsai, M. (1991) *Functional analytic psychotherapy. Creating intense and curative therapeutic relationships*. New York: Plenum Press.
- Kohlenberg, R.J. and Tsai, M. (1994a). Improving cognitive therapy for depression with functional analytic psychotherapy: Theory and case study. *The Behavior Analyst, 17*, 305-319.
- Kohlenberg, R.J. and Tsai, M. (1994b) Functional Analytic Psychotherapy: A Radical Behavioral Approach to Treatment and Integration. *Journal of Psychotherapy Integration, 4*, 174-201.
- Kohlenberg, R.J. and Tsai, M. (1995) Functional Analytic Psychotherapy: A behavioral approach to intensive treatment. In W. O'Donohue and L. Krasner (Eds.) *Theories of Behavior Therapy*. Washington: American Psychological Association.
- Kohlenberg, R.J. and Tsai, M. (1998). Healing interpersonal trauma with the intimacy of the relationship. In V.M. Follette; J.I. Ruzek and F.R. Abueg (Eds.). *Cognitive-behavioral Therapies for Trauma*. New York: Guilford.
- Kohlenberg, R.J., Tsai, M. and Kohlenberg, B.S. (1996). Functional Analysis in Behavior Therapy. In M. Hersen; R.M. Eisler and P.M. Miller (Eds.). *Progress in Behavior Modification*. New York: Brooks/Cole Publishing.
- Michael, J. (1993). Establishing operations. *The Behavior Analyst, 16*, 191-206.
- Naugle, A.E. and Follette, W.C. (1998). A Functional Analysis of Trauma Symptoms. In V. M. Follette; J.I. Ruzek and F.R. Abueg (Eds.). *Cognitive-Behavioral Therapies for Trauma*. New York: Guilford.
- Paul, R.H.; Marx, B.P. and Orsillo, S.M. (1999). Acceptance-based psychotherapy in the treatment of an adjudicated exhibitionist: a case example. *Behavior Therapy, 30*, 149-162.
- Pérez Alvarez, M. (1996a). *La Psicoterapia desde un punto de vista conductista*. Madrid: Biblioteca Nueva.

Pérez Alvarez, M. (1996b). *Tratamientos Psicológicos*. Madrid: Ed. Universitas, S.A.

Skinner, B.F. (1957/1981) *Conducta Verbal*. México: Trillas.

Sundberg, M.L. (1993). The Application of Establishing Operations. *The Behavior Analyst*, 16, 211-214.

Zettle, R.D. and Young, M.J. (1987). Rule-following and human operant responding: conceptual and methodological consideration. *The Analysis of Verbal Behavior*, 5, 3-39.

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## Behavioral Activity and Tic Disorder

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Previous approaches to functional assessment of tic and habit disorders have centred largely around environmental contingencies or interceptive sensory processes as positive reinforcers. The current article argues rather that ongoing telic behavioral activity is functionally linked to tic onset and so type of behavioral activity and overall action plan at the time of ticcing should also be assessed. Evidence is presented from past studies in support of a link between tic location and type of activity and the way this activity is appraised. It is further proposed that intervention strategies for reversing tic habits should include a more holistic behavioral restructuring of muscle use rather than just an exclusive focus on developing antagonistic muscle actions as competing responses.

Keywords: tic disorder, habit disorders, habit reversal, holistic behavioural restructuring, antagonistic muscle actions

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### BEHAVIORAL TREATMENTS FOR TIC DISORDERS

Recent studies have shown that behavior therapy (BT) can be successfully applied to the management of Tourette's syndrome (TS), tic and habit disorders (O'Connor, 2005). The results rival those achieved with medication and given the problems of compliance with medication and the perils of neuroleptic use with children (Peterson & Azrin, 1993), behavioural programs could in theory become the treatment of choice for these disorders. But despite small scale studies showing successful outcome in a range of tic subtypes (Peterson & Azrin, 1992), behavioural treatments are far from being accepted in psychiatry as a mainstream intervention. Clinician consensus strongly favours a neurobiological model of treatment with psycho-education and eclectic supportive counselling as an adjunct (Peterson & Cohen, 1998). A contributing reason for the lack of acceptance by clinicians of behavioural analysis and therapy may be the lack of a convincing model of behavioral processes operating in tic aetiology.

### BEHAVIORAL PRINCIPLES AND BEHAVIORAL PROCESS IN TICS

Whereas most BT methods naturally espouse behavioral principles, the techniques appeal to a number of diverse behavioral mechanisms, some in apparent contradiction to one another. For example, the technique of "massed practice" which has shown some early success (Feldman & Werry, 1966), attempts to negatively reinforce ticcing through building up reciprocal inhibition, whilst techniques of relaxation emphasize lowering tension rather than increasing it, also with apparent success (Bergin, Waranch, Brown, Carson, & Singer, 1998). Conversely, exposure and response prevention would encourage tolerating the urge to tic without either tensing or relaxing the tic affected muscle group (Verdellen, Keijsers, Cath, & Hoogduin, 2004).

Other behavioral intervention strategies have relied more or less exclusively on different aspects of contingency management to control tics. But even here the contingencies vary considerably and can include environmental, social or attentional task demand (Miltenberger, Fuqua, & Woods, 1998). Hence the theoretical considerations driving functional analysis in BT may often be in conflict, and may hamper development of a standard model of managing behavioural processes in tics. Although there is consensus that tics and habit disorders are auto-reinforced, there is disagreement as to the role of negative versus positive automatic reinforcement contingencies. For example, some authors report social reinforcement as a key maintaining factor (Watson & Sterling, 1998) whilst others report lack of attentional state as a precursor (Roane, Piazza, Cercone, & Grados, 2002). So, applying time out to negatively reinforce ticcing within a social reinforcement model may conflict with according additional attention to positively

reinforce task engagement as a means of reducing tic frequency. As Miltenberger et al. (1998) have noted, the paucity of systematic behavioural and functional analysis of tic behaviour means that little is known about the function of behaviours treated with BT.

Indeed, the most successful behavioural package to date, “habit reversal” (HR) (Azrin & Nunn, 1973) includes a rationale based on several mechanisms. The original multicomponent program drew on techniques derived from conditioning theory, awareness training, contingency management, motivational training, social support, symbolic rehearsal, and motor skills learning of a new motor pattern (the antagonist response) in addition to tension and stress management. The key element of HR is reversing the tic through learning an incompatible antagonist response. But even the incompatible response may serve diverse and conflicting functions, ex. strengthening of antagonist muscles, heightening awareness, counter-conditioning, operating in non-specific ways and even acting as a punishment schedule (Turpin, 1983; Miltenberger et al., 1998). The shortened versions of the HR procedure still represent conflicting rationales and their active components rely variously on: awareness training, incompatible response training and social reinforcement (Woods, Miltenberger, & Lumley, 1996).

Interestingly, the original rationale of Azrin and Nunn (1973) was more psychophysiological than behavioral, proposing that tics were adaptations of a startle or abnormal trauma reactions integrated into normal response chaining and thereafter auto-reinforced due to minimal awareness. So an upshot of this confusion over behavioral process is that there is still much debate over the actual effective components in BT for tics.

#### **TIC FUNCTION AND FUNCTIONAL ANALYSIS**

Recently a more unified behavioural model of mechanisms driving tic onset has centred on the tension and on the heightened sensory activation occurring prior to the tic (Evers & van de Wetering, 1994). Unlike conditioning and to some degree neurobiological models, the sensori-motor model sees a positive function for tics in their release of tension. But in this model tension release is not just a positive habit reinforcer but part of a more general sensori-motor regulation. Consequently, interventions based on this model aim at either stress management and tension reduction or use an exposure and response prevention model similar to the approach designed to treat obsessional fears and ritualistic behaviour (Verdellen et al., 2004). Here the reinforcement for ticcing is essentially viewed along an intrinsic or interoceptive dimension in contrast to earlier notions of discrete external environmental reinforcers. Indeed functional analysis in tic disorders can seem one-dimensional when focused almost exclusively on ABC sequences looking for social, environmental or attentional triggers, and may arrive at individual case formulations which do not easily generalize to other cases, since they lack theoretical underpinning. Although attempts have been made within some habit disorders such as trichotillomania to provide more comprehensive, cognitive, emotional and sensory profiles (Mansuetto, Goldfinger Golomb, Mc Combs Thomas, & Townsley Stemberger, 1999), there is a paucity of such approaches in tic disorders. As Forget and Otis (1980) noted, after a review of how apparent contingencies of tic behaviour can be misleading, systematic functional analysis is essential prior to intervention, and we may need a more holistic notion of the tic as a behavioral act to comprehensively assess its function and process.

The current paper argues that the optimal focus of functional and behavioral analysis for tic behaviour should be on the activity of the person at the time of ticcing rather than exclusively on environmental or interoceptive contingencies. It is further argued that characteristic sensori-motor activity may be the key trigger for ticcing, and this produces, amongst other results, chronically heightened tension and accompanying sensations as a precursor to ticcing. However, it is argued that tension by itself does not explain ticcing, but that this tension itself needs to be viewed in a wider context of a (tic disorder specific) style of motor preparation. Implications of the model for behavioral evaluation and treatment methods are illustrated.

### TICING AND TENSION

One consistent component associated with tics is muscle tension. In fact, tics can be considered a form of short-term tension regulation comparable to how obsessive compulsive rituals neutralize anxiety. Even Azrin and Nunn, in their 1973 paper, cite this tension reduction factor as a recognized component. Subsequently, Hoogduin, Verdellen, and Cath (1997) noted that tension was consistently reported in their tic patients. O'Connor, Gareau, and Borgeat (1995) reported some psychophysiological evidence for difficulty in regulating tension in tic affected muscles. The original HR program emphasized relaxation to relieve tension instead of ticcing, and even by itself, relaxation can reduce tic frequency. From a physiological point of view, tics like all reflexes require a degree of muscle contraction prior to onset. But what is muscle tension and how is it built up?

### TENSION AND ACTION

Non-neuropathological muscle tension is effectively preparation for action. As such, it fits within the motor activity schema of : planning, preparation, execution and feedback of continuous movement. What is prepared, how and for how long depends on the action goal (or lack of goal). Planning coordinated action relies on the constant shifts required to effect the continuous correction of feedback and feedforward information necessary to regulate precise coordination and targeting (Kelso, 1994).

Many factors can lead preparation astray. Other pathologies besides chronic tics suffer from chronic motor tension, for example, tension is recognized as a key complaint in generalized anxiety disorder (GAD) (DSM-IV; APA, 1994). In the case of GAD, the muscle tension frequently represents preparation for an anticipated worse case scenario and the muscle tension can reduce post treatment (O'Connor, Gareau, Gaudette, & Robillard, 1999). One can also prepare for the right action but inappropriately. There is mounting evidence that people with tics and habit disorder may invest more than necessary in preparing for an action, such that the action may be impaired or inhibited. For example, more of the motor cortex lights up with a simple motor action in people with tics compared to controls (Biswal et al., 1998). Also people with tics have problems inhibiting movement and difficulties preparing for complex tasks. In addition, preparation may not be optimally linked to response execution (O'Connor et al., 2005).

### STYLE OF PLANNING : DEFICIT OR STRATEGY

These results at first glance suggest problems with executive functioning, but there is no firm evidence of such blanket neuropsychological deficit. On the other hand, what we do know is that people with tics and habit disorders adopt a particular style of action characterized by over-preparation and over-activity (O'Connor et al., 2005). This style includes planning too much activity, doing too many tasks at the same time, and over-investing in too much effort (both emotionally and physically). Although such a pattern may be considered hyperactive, it is driven not impulsively, but often compulsively by perfectionist concerns about personal image and standards. This style of action seems characteristic of tic and habit disorder and is linked with the self standards and personal organization subscale of Frost's Multi-dimensional perfectionist scale (Frost, Marten, Lahart, & Rosenblate, 1990; O'Connor, 2005).

The consequence of adopting this habitual style of action from a purely motor psychophysiology perspective is that arousal and performance regulation may be compromised or inhibited. Indeed, the most reliably reported performance problems in TS appear on motor and visuo-motor tasks (Schultz, Carter, Scahill, & Leckman, 1999); exactly where this style of planning action would most delay or impede response regulation. Conversely, simple response speed appears to be faster in TS without necessarily an

accuracy trade off (O'Connor, Robert, Dubord, & Stip, 2000). So this differential effect on performance supports a strategy rather than a deficit model.

The tension reduction and learned association model of tics can come together quite nicely in an integrated model proposing that a tension producing style of action elicits inappropriate tension and preparation which then leads on to ticcing as a means of short-term tension release (see Figure 1). So we may ask why does tension produce tics in TS and not in, say, GAD or other disorders with high tension levels. Again the answer lies in the type of preparation the tension represents. Tension in TS seems characterized by a frustration action cycle where the muscle is inappropriately prepared prior to execution. Within an activity model, the person with a tic is preparing too quickly and impatiently for an immediate response but at the same time preparing more muscles with more effort than necessary. This preparation is inappropriate so the tic action relieves in part, through local tension release, this unnecessary activation in the absence of an immediate goal. In GAD, as noted, the tension may be part of preparation in anticipation of a more distant future event, and so does not create the same immediate frustrated action cycle. If this behavioral process of inappropriate action planning precedes ticcing, then behavioral evaluation may benefit from greater focus on muscle use and ultimately background activity to identify source of tension preceding tic, and hopefully then alleviate it.

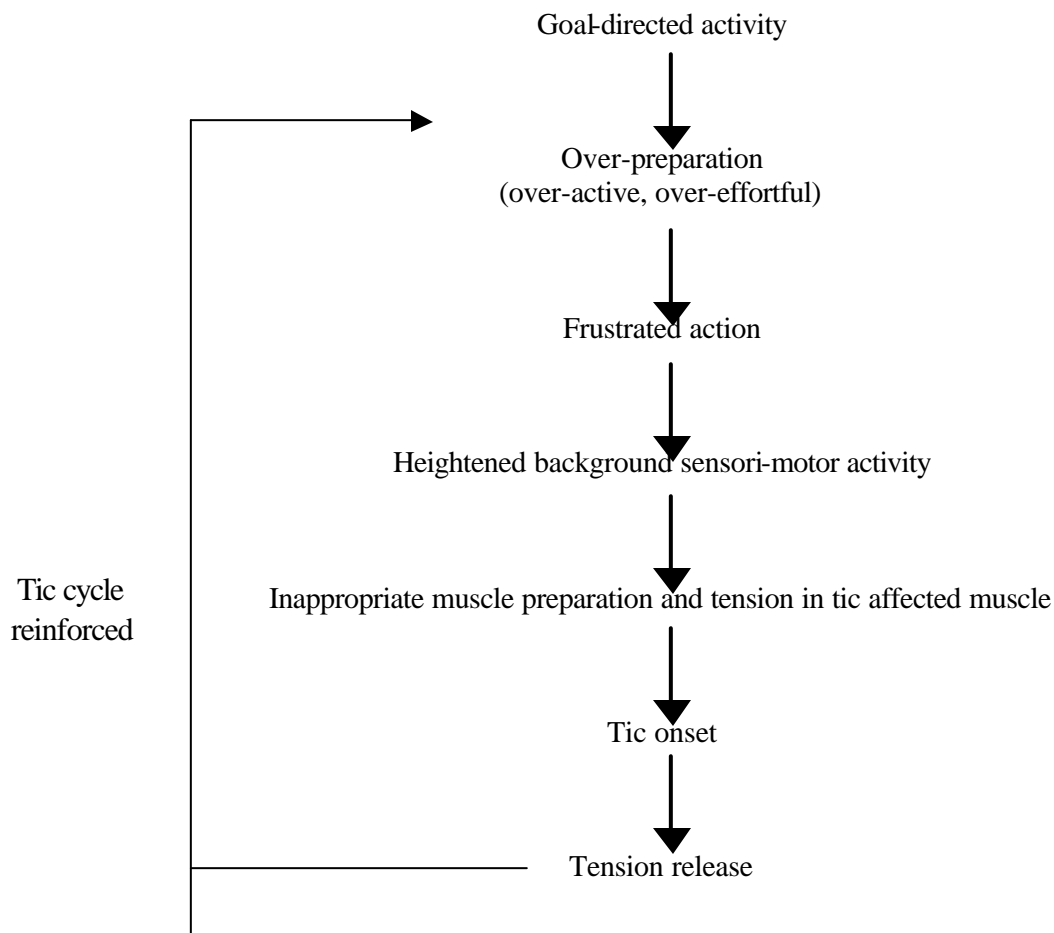


Fig. 1. Activity-tension tic cycle.

### Functional analysis and situational variability

As noted earlier, there have been few attempts to systematically apply functional analysis to ticcing, and most such analyses have been conducted in line with behavioral principles that assume environmental contingencies. But people with tics do show a high and low risk profiles, and clinicians have for sometime noted anecdotally that, for example, ticcing is less likely when the person is engaged in a task (Leckman & Cohen, 1999).

The circumstances eliciting tics and habits can be characterized according to the overall state (low mood) or situations (or anticipations about situations) in which the person finds themselves. Christensen, Ristvedt, and Mackenzie (1993) noted a series of emotional precursors to the onset of hair pulling. Azrin and Nunn (1977) recognized that different strategies need to be applied in the use of competing responses depending on different situations. Several authors have noted that tics and habits are elicited by negative states, including depression, lack of self-worth and boredom (Dean, Nelson, & Moss, 1992).

In a series of studies examining situational variables, O'Connor, Gareau, and Blowers (1993, 1994) initially monitored high, medium and low risk situations in 13 clients with tics and found that all clients showed high, medium and low risk situation profiles linked to tic onset, but that these profiles showed little consistency across clients. High-risk situations could be either arousing or relaxing situations, ex. one client was most likely to tic when arguing, another when relaxing at home in front of the TV. However, this situational blurring was clarified when considering evaluations associated with the situations, since the thoughts and feelings accompanying tic onset, regardless of situation, most frequently concerned impatience, frustration and not performing as desired. Furthermore, even planning to enter a high risk tic situation could by itself elicit the tic and constitute a high risk activity, suggesting a strong potential role of preparation in tic production.

In subsequent clinic work, we realized that recording activity level was more parsimonious than seeking situational contingencies. For example, the same two people could be in front of the television but one thinking of all the housework to be done, the other following the television program. So not only activity level but also action plan (that is what the person was planning to do in any given situation) seemed important to consider when creating tic related profiles. Driving for one person could be a relaxing break from routine but for another, stressful if he or she had planned to make the journey as fast as possible. Previous functional analysis has tended to ignore activity as a tic trigger.

Several studies have suggested that tics, in particular phonic tics, might be contingent on activities rather than stimulus conditions. Roane et al. (2002) explored a number of reinforcement contingencies and cues for a young man's verbal tic including: environmental factors, when alone, task demand, play, automatic reinforcement, preference objects and (tangible, musical, auditory, oral) stimulation. Although no external contingencies seemed associated with tic onset, naturalistic observation revealed that the tics were absent when lying down and more frequent in an upright position. The authors concluded that the tic was auto-reinforcing but did not consider the significance of lying down as a coping activity for the patient, since they were unable to determine the mechanism attenuating the tic when lying down. But the authors emphasize the limitations of analyses restricted to environmental analysis.

Carr, Taylor, Wallander, and Reiss (1996) found no stimulus contingency for a vocal tic in an 11 year old male student, except that it worsened when he was spoken to in a disapproving manner, but improved when he was involved in academic study, suggesting a role of social activity. Watson and Sterling (1998) found a vocal tic related to eating and social activity but focused rather on the social reinforcement as the principal maintaining factor rather than the eating. Woods, Friman, and Teng (2001) reported a controlled study showing that talking, in particular about tics, increased the likelihood of vocal but not motor tics. Other case studies have anecdotally pointed to the importance of activity cues as well

as environmental contingencies in single case formulations (e.g., Fuata & Griffiths, 1992; Scott, Schulman, & Hojnacki, 1994).

**BEHAVIORAL ACTIVITY ASSOCIATED WITH TIC ONSET**

In a subsequent study (O'Connor, Brisebois, Robillard, & Loisele, 2003), we set out to examine activity profiles linked to tic onset in people suffering from chronic tics and habit disorders, and to compare these profiles amongst different subgroups of tics and habit disorders.

Seventy six people aged 18 to 62 (38 male and 38 female; mean age = 38.2, SD = 10.0; 70% with partners; mean chronicity of problems = 24.6 years, SD = 11.02) diagnosed with either chronic tic, TS, or habit disorder participated in the study. We distinguished two exclusive diagnostic categories: *Habit disorders*, encompassing hair pulling (n=15), teeth grinding (with daytime component) (n=6), skin scratching (n=4) and nail or finger biting (n=15); and *simple chronic tics*, comprising shoulder movement (n=5), head motion (n=18), and eye blinking (n=15). The participants completed with an evaluator a form ranking the three most frequent high-risk activities and the three most frequent low-risk activities cues linked to tic or habit onset. Figure 2 shows a more recently modified evaluation form.

Description of the situation or activity	Goal of action plan	General tension Level (0-5)*	Specific muscles contracted
Driving the car	To arrive at destination as soon as possible	4½	Arms : 4 Neck : 4 Hands : 5 Shoulder : 3

Figure 2a Example of assessment of high risk activity for tic onset

Description of the situation or activity	Goal of action plan	General tension Level (0-5)*	Specific muscles contracted
Watching a film	To be engaged in the story	2½	Eyes : 3 Neck : 3 Face : 2

Figure 2b Example of assessment of low risk activity for tic onset

**Classification of activities**

The individual reports on the high- and low-risk activities had enough characteristics in common to enable them to be regrouped into the 12 activity categories (study activity, intellectual work, grooming, manual work, passive attendance, eating, relaxing, leisure pursuits, socialization, sport activity, in transit, waiting for an appointment). The same categorization was used for both high- and low-risk activities.

Each activity was allocated to one category. A small proportion of the activities (8 out of 456) did not fit into any of these categories and so were not included in the analysis. The test-retest reliability of the categorization assessed at two points, two months apart, was 1.00. The initial category sorting was replicated by an independent rater. Inter-rater agreement tests conducted on a subset comprising 15 subjects yielded kappa values ranging from 0.60 ( $p < .02$ ) to 1.00 ( $p < .00$ ).

Study referred to activity where the goal was to study, and the activity was to selectively acquire knowledge or information. Passive attendance referred to activity involving watching or listening in the role of a spectator, but not as active learner or participant. Physical exercise applied when the goal of the activity was engaging in sport or exercise activity. Relaxation was a category reserved for resting or lying, or sitting down for the express purpose of relaxing. Socialization involved active interpersonal or group contact within a formal or informal social occasion, such as interacting with others at a social setting or a party. The goal of grooming behavior was self-care, including showering, washing, brushing teeth, combing hair. Leisure activity involved active pleasant pastimes such as engaging hobbies. Waiting was a classification which applied when the person was actively waiting for an appointment or an event where waiting was the main purpose. In transit applied where the principal goal was to travel between places or appointments. Manual work involved achieving a material goal through physical effort. Intellectual work involved the active pursuit of an intellectual occupation or profession. Eating behavior was classified where the specific goal at the time of the tic or habit onset was to eat. Obviously, there were some borderline categorizations. For example, was eating out with a group of friends, social or eating activity? Was a job involving active listening and processing information (working in a complaints department or as a counsellor) active study or intellectual work? But the boundary disputes were generally resolved by consensus amongst raters based on an understanding of the principal goal of activity at the time of tic onset. If there was no consensus, the item was eliminated.

A two-way chi-square compared the presence or absence of activity types in high- and low-risk categories between the two tic/habit disorder groups. Separate analyses were conducted for low- and high-risk activities. If the overall chi-square was significant, the adjusted residuals (non-parametric equivalent of z-scores) for the cell percentage of each subgroup were examined. An adjusted residual score greater than 1.96 for a given subgroup percentage indicated that the subgroup differed significantly from the overall group percentage.

Table 1. Summary of findings relating tic and habit onset to behavioral activity.

Activity type	High risk tic/habit onset	Low risk tic/habit onset
Social activities (party, social occasion)	Eye / face / mouth tics	Hair pulling, nail biting, skin scratching
Manual work (digging, holding, operating machine)	Shoulder / upper arm tics	Other complex habits
Passive listening / relaxing doing nothing	Nail biting, scratching	Eye blinks
Active study or intellectual activity	Hair pulling, nail biting	Head / eye tics

From O'Connor et al., 2003. Behavioral activity associated with onset in chronic tic and habit disorders. *Behavior Research and Therapy*, 41, 241-249.

A summary of significant results is given in Table 1. For nail biting and hair pulling, tic habits were mostly recorded during study or active listening activities, whereas eye blinks and head tics were

generally absent during both study or active listening and passive listening tasks. Conversely, eye tics were more likely during social occasions whereas hair pulling was less likely during social interactions. Shoulder tics were more likely during manual work and less likely during passive listening. But relaxation was a high risk activity for scratching. Interestingly, eating was a low risk activity for scratching tics.

We also elicited appraisals related to the high- and low-risk activities which were classified into nine constructs: active-inactive; calm-tense; satisfied-dissatisfied; interest-bored; in control-not in control; judged-not judged; energized-tired; and open-reserved. Again, a few entries (5 out of 311) did not belong in any construct category and were omitted. Inter-rater agreement was measured for all categories, again using 15 subjects; kappa values were between 0.53 ( $p < .04$ ) and 1.00 ( $p < .00$ ) (see Figure 3).

The tense/relaxed construct seemed the most relevant to the manifestation of both tic/habit disorders. A tense state was associated with onset of the disorder in 64 out of 76, or 84% of participants. A high-risk activity was most likely to be appraised as active and as tense by those with simple tics, in particular eye and head tics, while appraisal of a high-risk activity as inactive was most likely in habit disorder (nail biting, hair pulling, scratching). In particular, appraisals of boredom were associated with a high risk of hair pulling and scratching, but were likely not to constitute a high-risk appraisal for people with a head movement tic. The appraisal of a high-risk activity as unsatisfying was made by 88% of people with head tics and 67% with teeth grinding, and 48% of all other participants.

		Activities							
		Low risk			High risk				
		1	2	3	4	5	6		
Feelings about or evaluations of low risk activities (1-3)		Reading in bed	Watching television	Singing alone	Playing competitive sport	Driving my car	Arguing my point	Feelings about or evaluations of high risk activities (5-7)	
Likelihood of tic absent		1	2	2	5	6	7	Likelihood of tic present	
Calm		1	3	2	6	5	7	Preoccupied	
Confident		1	2	1	6	7	5	Insecure	

Figure 3 Example of evaluation grid for high and low risk tic activities

### *Implications of the behavioral activity analysis*

This study demonstrated the existence of an idiosyncratic pattern of high- and low-risk behavioral activities for individuals with tic and habit disorder. Moreover, there were also consistent differences in profile between habit disorders and tics. Further analyses indicated that habit disorders (especially hair pulling, scratching and nail biting) shared common activity profiles, which distinguished them from eye tics. Manual work activity was associated with head movements, shoulder movements and teeth grinding. Hair pulling was associated with intellectual activity and onset of eye tics seemed to occur more during socialization. Some of the habit disorders were cued by boredom and somebody with the hands unoccupied may, of course, be more likely to perform a manual habit, just due to occasion. On the other hand, the physical location of the tic did seem to have some functional connection with the ongoing activity. Face tics were more likely during socialization where the task demand focus is often on the face. Shoulder tics were more associated with work activities where strain on the arm and shoulder is likely. Since an hypothesized immediate result of ticcing is a temporary relief of tension in the specific implicated muscle groups, it may be reasonable to suppose that habitual activities influence distribution of tension and hence determine the local development of tension-releasing tic habits.

### *Elaboration of the activity model*

The current analysis of activity then goes beyond the tension reduction motive of the sensorimotor regulation model to suggest that tics are not just learnt responses auto-reinforced by sensory or tension release, but that their location and occurrence depends on background behavioral context; above all activity level and telic action plan. If the person blinks excessively in a social activity, or burps repetitively when eating, or moves the legs up and down continuously when studying, then clearly the tic needs to be considered in a wider behavioral context and not just as an isolated response.

Tic onset occurs against a general background of chronic tension. The tic onsets in one group of muscles since the muscle implicated in the tic seems linked to muscle usage within a precise activity and action plan. Although in TS tics can move around the body, this fact would still support the activity model as long as the tic occurs in muscles linked to a precise action-frustration cycle, and the tics occur in voluntary muscles linked by usage or by expression to a high risk tic activity. Sometimes the functional link between a person's activity, goal and tic location and development is self-evident. For example, a masseuse develops a twitch in her most forceful dominant hand when she is trying to rush a massage, a trombone player develops a tic in his lips, mouth and tongue during a hasty rehearsal. In other cases the link may be indirect and more symbolical. Take for example the case of a person who grimaces and makes a sound like "tsk tsk" with her mouth when anticipating problems. The sound and movement resemble an expression of negative self-judgement and frustration and so represent a symbolic link with her main activity which is in this case "evaluating the problem."

The tic-affected muscle might be implicated in an expression of emotion or action adapted for use in the high-risk situation or activity. For example, a client with an eye tic whose style of action involves always speaking forcefully and over-involving face and cheek muscles in speech, feels he must fixate his addressee in order to not miss information in an encounter. He considers quick blinking an asset to help communicate in interpersonal encounters. So the tic action may serve part of a more general behavioral purpose and be linked to cognitive as well as physical goals. Obviously a defensive or startle reaction, as proposed by the Azrin and Nunn (1973) learning model, would count as one such purpose, but only as one example and not a "universal" category of tic associated activity. Tics may also become incidentally associated with a goal directed movement through erroneous learning. A person may blink with the cheek muscles rather than just the eyelids or study putting tension in the legs, so leading to a leg twitch.

At first sight, it might appear that this link with muscle use applies selectively to certain complex tics which are more clearly purposeful, but not to more simple tics. But the activity model would hold that all tics occur as part of an action plan. Of course, tension may be present in muscles irrelevant to the task, as long as they are activated by the task demand. In all cases, the tic would be activated by sustained chronic preparation in the service of an identifiable activity.

### *Clinical implications*

In clinical terms, intervention strategies could optimally address reversing the habit not so much from an isolated antagonistic action point of view, but from a general behavioral restructuring point of view, touching on reorganizing preparation, planning and coping in high risk tic situations. Such restructuring might initially be inspired by looking at how the person prepares and organizes action during low risk activities. For example, opening the eyes wide while softly blinking as a competing response to eye blinking (Miltenberger, Fuqua, & McKinley, 1985) could be contextualized as a behaviour permitting more social contact. Maintaining an upright chin and tensing neck muscles in a forward direction to counteract a head and shoulder tic could be integrated into a more goal-directed and possibly more economical set of movements involving a redistribution of tension in preparation for a manual task. In part, such restructuring is already sometimes carried out under the guise of habit reversal strategies and it has been previously noted that competing responses do not always need to be anatomically antagonistic to the tic muscle (Verdellen et al., 2004). There have also been direct attempts at modifying overall behavioral activity as a means of tic control, for example, Lamontagne (1978) reported that modifying social behavior through increased social exposure reduced tic onset, in particular vocal tics. Paquin (1977) reported a decrease in ticcing through use of imagined mastery scenarios of tic situations, and Clarke, Bray, and Kehle (2001) combined self-modelling and feedback of self-behavior with HR to reinforce adoption of competing responses.

The impact then of a behavioral analysis focusing more on activity level, and the goal or plan of the action is to give a clearer functional link between overall behavioral activity, tension and tic function. Such analysis provides a more comprehensive and hence acceptable and expedient way to eliminate the tic through overall behavioral restructuring as opposed to the HR rationale of searching for isolated antagonistic responses which are not always obvious or socially acceptable.

The model also accounts for how tics may apparently substitute and interchange in TS according to activity (Seligman, 1991) and how some tics appear to be "contingentless" using conventional functional analysis focusing on environmental factors, and also how, for example, simply changing activity or engaging attentionally within the same social or stressful environment can reduce or enhance tic activity. The activity model integrates tension reduction and sensori-motor regulation models with learned association accounts of tic aetiology as well as potentially accounting for the few consistent neuropsychological findings of apparent visuo-motor impairment in TS.

### *Conclusion*

Essentially a learned behavioral strategy involving over-activity and over-preparation leads to the development of inappropriate tension in localized muscles during specific activities. The behavioral strategy leads to frustration and inappropriate motor preparation which is relieved by ticcing but which in turn, in the long run, reinforces sensori-motor dysregulation. The tic behavior may also be auto-reinforced by environmental and other contingencies and by limited awareness. But in particular the cycle might be reinforced by further behavioral coping strategies such as tensing or camouflaging or avoidance or other safety behaviors.

The activity model also offers several avenues to pursue further for its validation or disconfirmation. The model would predict that: a) all tics would be consistently linked to some activities and not others; b) the activities in question would directly or indirectly involve inappropriate tension in tic affected muscles; c) modifying overall behavioral style of planning through behavioral restructuring would decrease tension and hence the likelihood of tic onset and also beneficially affect other aspects of sensori-motor dysregulation in tic disorders.

### References

- American Psychiatric Association (1994) *Diagnostic and statistical manual of mental disorders*, 4<sup>th</sup> edn, revised. Washington, DC: American Psychiatric Press.
- Azrin, N. H., & Nunn, R. G. (1973). Habit-reversal: A method of eliminating nervous habits and tics. *Behaviour Research and Therapy*, 11, 619-628.
- Azrin, N. H., & Nunn, R. G. (1977). *Habit control in a day*. New York: Simon & Schuster.
- Bergin, A., Waranch, H. R., Brown, J., Carson, K., & Singer, H. S. (1998). Relaxation therapy in Tourette syndrome: A pilot study. *Pediatric Neurology*, 18(2), 136-142.
- Biswal, B., Ulmer, J. L., Krippendorf, R. L., Harsch, H. H., Daniels, D. L., Hyde, J. S., & Haughton, V. M. (1998). Abnormal cerebral activation associated with a motor task in Tourette syndrome. *American Journal of Neuroradiology*, 19(8), 1509-1512.
- Carr, J. E., Taylor, C. C., Wallander, R. J., & Reiss, M. L. (1996). A functional analytic approach to the diagnosis of a transient tic disorder. *Journal of Behavior Therapy and Experimental Psychiatry*, 27(3), 291-297.
- Christensen, G. A., Ristvedt, S. L., & Mackenzie, T. B. (1993). Identification of trichotillomania cue profiles. *Behavioral Research and Therapy*, 31, 315-320.
- Clarke, M. A., Bray, M. A., & Kehle, T. J. (2001). A school-based intervention designed to reduce the frequency of tics in children with Tourette's syndrome. *School Psychology Review*, 39(1), 11-22.
- Dean, J. T., Nelson, E., & Moss, L. (1992). Pathological hair pulling: A review of the literature and case reports. *Comprehensive Psychiatry*, 33(2), 84-91.
- Evers, R. A. F., & van de Wetering, B. J. M. (1994). A treatment model for motor tics based on a specific tension-reduction technique. *Journal of Behavior Therapy and Experimental Psychiatry*, 25(3), 255-260.
- Feldman, R. B., & Werry, J. S. (1996). An unsuccessful attempt to treat tics by massed practices. *Behaviour Research and Therapy*, 4, 111-117.
- Forget, J., & Otis, R. (1980). Le traitement d'une habitude nerveuse par l'utilisation de divers procédés comportementaux. *Revue de Modification du Comportement*, 10(2), 51-68.
- Frost, R. O., Marten, P., Lahart, C., & Rosenblate, R. (1990). The dimensions of perfectionism. *Cognitive Therapy and Research*, 14(5), 449-468.

- Fuata, P., & Griffiths, R. A. (1992). Cognitive behavioural treatment of a vocal tic. *Behaviour Change*, 9(1), 14-18.
- Hoogduin, K., Verdellen, C., & Cath, D. (1997). Exposure and response prevention in the treatment of Gilles de la Tourette's syndrome: four case studies. *Clinical Psychology and Psychotherapy*, 4(2), 125-137.
- Kelso, J. A. S. (1994). The informational character of self-organized co-ordination dynamics. *Human Movement Science*, 13, 393-413.
- Lamontagne, Y. (1978). Treatment of a tic by prolonged exposure. *Behavior Therapy*, 9, 647-651.
- Leckman, J. F., & Cohen, D. J. (1999). *Tourette's syndrome: Developmental psychopathology and clinical care*. New York: John Wiley & Sons.
- Mansueto, C. S., Goldfinger Golomb, R., McCombs Thomas, A., & Townsley Stemberger, R. M. (1999). A comprehensive model for behavioral treatment of trichotillomania. *Cognitive and Behavioral Practice*, 6, 23-43.
- Miltenberger, R. G., Fuqua, R. W., & McKinley, T. (1985). Habit reversal with muscle tics: Replication and component analysis. *Behavior Therapy*, 16, 39-50.
- Miltenberger, R. G., Fuqua, R. W., & Woods, D. W. (1998). Applying behaviour analysis to clinical problems: Review and analysis of habit reversal. *Journal of Applied Behavior Analysis*, 31, 447-469.
- O'Connor, K. (2005). *Cognitive-behavioral management of tic disorders*. Chichester: John Wiley & Sons Ltd.
- O'Connor, K. P., Brisebois, H., Robillard, S., & Loiselle, J. (2003). Behavioral activity associated with onset in chronic tic and habit disorders. *Behavior Research and Therapy*, 41, 241-249.
- O'Connor, K. P., Gareau, D., & Blowers, G. H. (1993). Changes in construals of tic-producing situations following cognitive and behavioral therapy. *Perceptual and Motor Skills*, 77, 776-778.
- O'Connor, K. P., Gareau, D., & Blowers, G. H. (1994). Personal constructs associated with tics. *British Journal of Clinical Psychology*, 33, 151-158.
- O'Connor, K. P., Gareau, D., & Borgeat, F. (1995). Muscle control in chronic tic disorders. *Biofeedback and Self-Regulation*, 20(2), 111-121.
- O'Connor, K. P., Gareau, D., Gaudette, G., & Robillard, S. (1999). Relaxation and the treatment of generalized anxiety disorder. Association for the Advancement of Behavior Therapy Congress, Toronto, November.
- O'Connor, K. P., Lavoie, M., Robert, M., Dubord, J., Stip, E., & Borgeat, F. (2005). Brain-behavior relations during motor processing in chronic tic and habit disorder. *Cognitive and Behavioral Neurology*, 18(2), 79-88.
- O'Connor, K. P., Robert, M., Dubord, J., & Stip, E. (2000). Automatic and controlled processing in chronic tic disorders. *Brain and Cognition*, 43, 349-352.

- Paquin, M. J. (1977). The treatment of a nailbiting compulsion by covert sensitization in a poorly motivated client. *Journal of Behavior Therapy and Experimental Research*, 8, 181-183.
- Peterson, A. L., & Azrin, N. H. (1992). An evaluation of behavioral treatments for Tourette syndrome. *Behavior Research and Therapy*, 30(2), 167-174.
- Peterson, A. L., & Azrin, N. H. (1993). Behavioral and pharmacological treatment for Tourette's syndrome: A review. *Applied and Preventive Psychology*, 2, 231-242.
- Peterson, B. S., & Cohen, D. J. (1998). The treatment of Tourette's syndrome: Multimodal, developmental intervention. *Journal of Clinical Psychiatry*, 59, 62-72.
- Roane, H. S., Piazza, C. C., Cercone, J. J., & Grados, M. (2002). Assessment and treatment of vocal tics associated with Tourette's syndrome. *Behavioral Modification*, 26, 482-498.
- Schultz, R. T., Carter, A. S., Scahill, L., & Leckman, J. F. (1999). Neuropsychological findings. In J.F. Leckman & D.J. Cohen (eds), *Tourette's syndrome – tics, obsessions, compulsions. Developmental psychopathology and clinical care*. New York: John Wiley & Sons.
- Scott, J. R., Schulman, D. E., & Hojnacki, R. M. (1994). Functional analysis and unsuccessful treatment of Tourette's syndrome in a man with profound mental retardation. *Behavior Therapy*, 25(4), 721-738.
- Seligman, A. (1991). *Echolalia*. Chalfont, CA: Hope Press.
- Turpin, G. (1983). The behavioral management of tic disorders: A critical review. *Advances in Behavior Research and Therapy*, 5, 203-245.
- Verdellen, C. W. J., Keijsers, G. P. J., Cath, D. C., & Hoogduin, C. A. L. (2004). Exposure with response prevention versus habit reversal in Tourette's syndrome: A controlled study. *Behaviour Research and Therapy*, 42, 501-511.
- Watson, T. S., & Sterling, H. E. (1998). Brief functional analysis and treatment of a vocal tic. *Journal of Applied Behavior Analysis*, 31, 471-474.
- Woods, D. W., Friman, P. C., & Teng, E. J. (2001). Physical and social impairment in persons with repetitive behaviour disorders. In D.W. Woods & R.G. Miltenberger. (eds), *Tics disorders, trichotillomania, and other repetitive behaviour disorders: Behavioral approaches to analysis and treatment* (pp. 33-52). Norwell, MA: Kluwer Academic Press.
- Woods, D. W., Miltenberger, R. G., & Lumley, V. A. (1996). Sequential application of major habit-reversal components to treat motor tics in children. *Journal of Applied Behavior Analysis*, 29(4), 483-493.

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## Understanding Addiction as a Pathology of Temporal Horizon

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The seemingly irrational behavior exhibited by individuals with addiction may be understood by considering their temporal horizon. In this paper, we reviewed published literature and current research concerning how delay discounting, a measure of temporal horizon, has been employed to understand addiction. Specifically, studies of delay discounting among addicted individuals and other psychiatric populations, current controversies in the delay discounting literature, and new developments were reviewed. Addicted individuals discount the long-term consequences of their behavior at a higher rate than matched controls. Current controversies illustrate the need for continued research. Given the rising interest in using delay discounting to understand addictive behaviors, in terms of both overt behavior and at the level of brain activity, we believe research in this field will continue to produce substantial progress for the next several years.

Keywords: temporal horizon, delay discounting, impulsivity, neuroeconomics, trait, state

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Addiction is a serious public health problem that is projected to cost over \$245 billion to the US economy annually (NIDA InfoFacts: Costs to Society, 2005). One of the greatest challenges in understanding addiction is the seemingly irrational behavior exhibited by those affected. For example, it is hard to understand why an individual who knows about the risk of contracting a life-threatening disease would choose to use a hypodermic needle that some other individual has just used to inject drugs. We believe that such behavior and other persistent problems among individuals with addiction may be understood by considering their temporal horizon. Consider a study from our group where we asked opioid-dependent individuals and matched controls to complete a story that started: "After awakening, Bill began to think about his future. In general, he expected to..." The specific events that each participant used to complete their story were not important. Instead we were interested in the time frame of their story. Opioid-dependent individuals referred to a future of nine days on average, while the controls referred to a future of 4.7 years (Petry, Bickel, & Arnett, 1998). This striking difference becomes a lens by which to view the behavior of the addicted. If one's temporal horizon entails only the next nine days, then considering the long-term consequences of sharing injecting equipment is not relevant because the consequences of those actions fall beyond that temporal view. In that regard, these consequences may be discounted such that they are for all intents and purposes non-existent.

Our view is that the seemingly irrational behavior of addicted individuals may be usefully considered as an extreme and continuing constriction of temporal horizon. In this paper, we will review how the behavioral economic concept of delay discounting has been employed to understand addiction. We will then review the extant literature on the discounting behavior among individuals who exhibit addictive behaviors, followed by examination of whether the extreme discounting among addicted individuals is a state or trait, and consideration of whether extreme temporal discounting is reflective of impulsivity or temporal horizon. Finally, we will examine the implications of using discounting to understand addiction in the new scientific field of neuroeconomics.

### *Delay Discounting*

Discounting of delayed reinforcers refers to the observation that behavioral effects of a reinforcer are modulated by the delay to its receipt (Logue, 1988). Said another way, the value of a delayed reinforcer is discounted (reduced in value or considered to be worth less) compared to the value of an immediate reinforcer. Indeed, discounting of delayed rewards seems intuitive because most individuals would prefer a reinforcer (e.g., \$1,000) now rather than that same reinforcer later (Kirby, 1997). The degree of discounting has been considered to be a measure of the continuum between impulsivity and self-control.

Studies examining delay discounting in human subjects typically employ procedures similar to those used in psychophysical experiments (Richards, Mitchell, de Wit, & Seiden, 1997). Psychophysical procedures typically present participants with a standard stimulus and then present them with a stimulus that is adjusted until they consider the two stimuli to be equivalent (Stevens, 1975). Similarly, procedures used in delay-discounting experiments present subjects with a choice between a standard larger-later reward (e.g., \$1,000 delivered in 1 year) and an immediate reward whose magnitude is adjusted until the participant subjectively considers the two rewards to be of approximately equal worth (e.g., Green, Fry, & Myerson, 1994). This point of equivalence is the indifference point for that particular delay interval. When indifference points are obtained for a variety of delays, an indifference curve may be plotted. Indifference curves permit empirical determination of the shape of the discounting function and the rate at which delayed rewards are discounted.

Economics has traditionally assumed that the shape of the discounting function was exponential; that is, for each unit of time that constitutes the delay to delivery, the value of a reward decreases, or is discounted, by a fixed proportion (Kirby, 1997). However, exponential discounting has not been empirically supported by behavioral research conducted with nonhuman and human subjects. Instead, these studies demonstrated that the shape of the delay-discounting function was hyperbolic (e.g., Madden, Bickel, & Jacobs, 1999; Richards, Zhang, Mitchell, & de Wit, 1999). Hyperbolic discounting refers to the devaluation of delayed rewards proportional to their delay (Ainslie & Haslam, 1992); that is, for each unit of time that constitutes the delay to delivery, the reward's present value decreases by an increasingly smaller proportion (Kirby, 1997).

The discounting rate can be calculated by applying the following hyperbolic -decay equation developed by Mazur (1987):

Equation 1

$$v_d = \frac{V}{(1 + kd)}$$

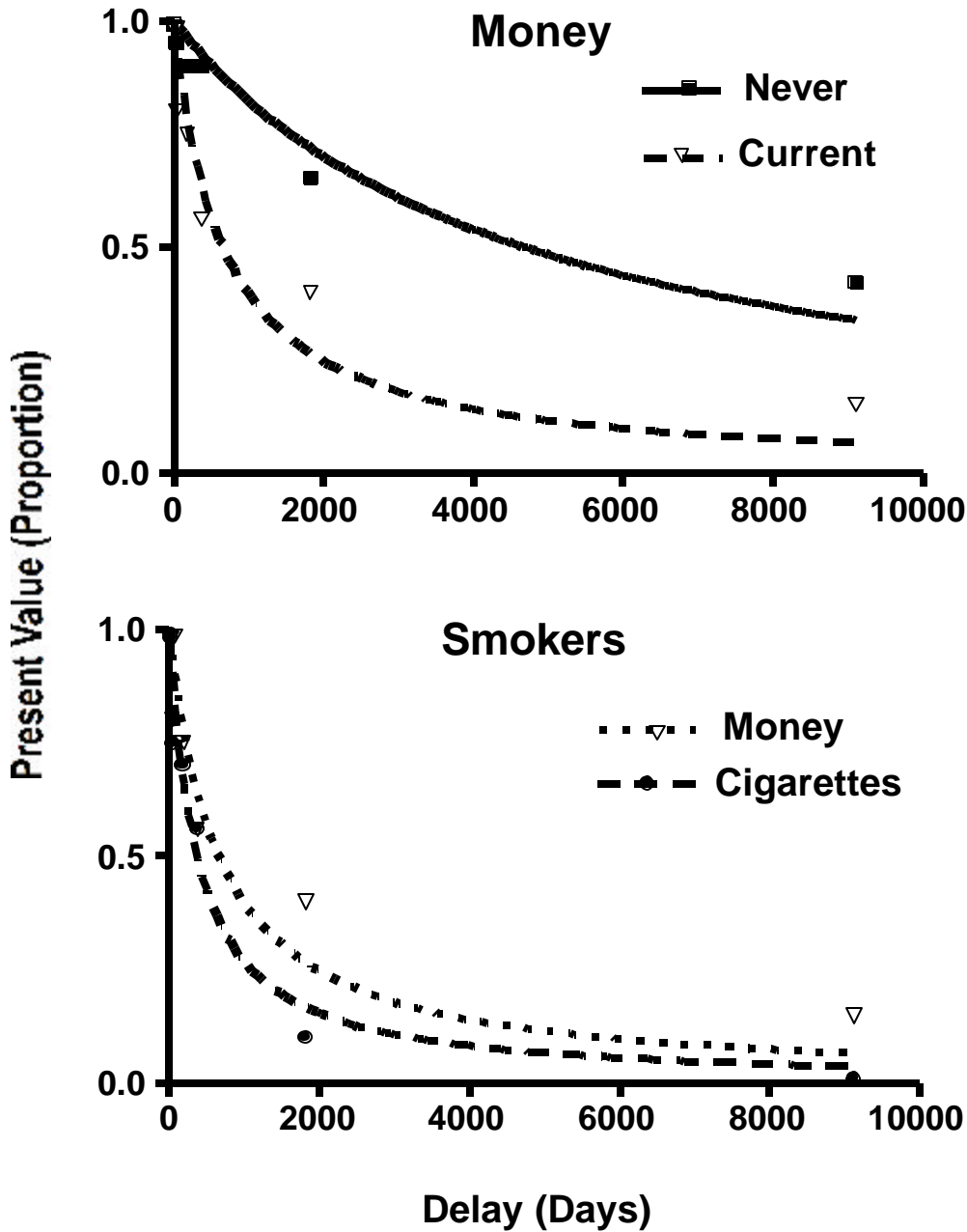
In Equation 1,  $v_d$  is the present discounted value of a delayed reward (i.e., the indifference point),  $V$  is the objective value of the delayed reward,  $k$  is an empirically derived constant proportional to the degree of delay discounting (i.e., discounting rate), and  $d$  is delay duration. Empirically determined indifference curves have been demonstrated to be hyperbolic. Equation 1 has been found to accurately model empirically determined hyperbolic discounting functions (accounting for more than 85% of the variance) when food is used with nonhumans (Rodriguez & Logue, 1988) and real and hypothetical money are used with human subjects (Green, et al., 1994; Johnson & Bickel, 2002; Kirby, 1997; Kirby, Petry & Bickel, 1999; Madden, Begotka, Raiff, & Kastern, 2003; Madden, Petry, Badger, & Bickel, 1997; Myerson & Green, 1995; Rachlin, Raineri, & Cross, 1991). Given the utility of Equation 1 and that the discounting of delayed rewards has been demonstrated across species, it seems reasonable to assume that delay discounting is an evolutionarily conserved behavioral process (Bickel & Johnson, 2003; Daly & Wilson, 2005).

### *Delay Discounting and Addictive Behaviors*

#### **Tobacco Dependence**

Nine studies examined delay discounting among cigarette smokers. In Bickel, Odum, and Madden's (1999) examination of discounting among cigarette smokers and matched controls, cigarette smokers discounted a hypothetical \$1,000 more than matched controls, and cigarette smokers discounted hypothetical \$1,000 worth of cigarettes more than hypothetical money (see Figure 1). Mitchell (1999) replicated some of these results by showing that smokers discounted real money more than controls. In the third study, Reynolds (2004) combined and re-analyzed data from two of his studies (the 4th and 5th) that examined discounting among adolescent and young adult smokers (Reynolds, Karraker, Horn, &

Richards, 2003; Reynolds, Richards, Horn, & Karraker, 2004). He hypothesized that if a high rate of discounting was a predisposing factor for smoking, then there would not be differences between adolescent and young smokers on discounting measures. Alternatively, if smoking more cigarettes daily resulted in greater discounting, then young adult smokers should discount more than adolescents. The results supported the latter hypothesis, and showed that number of cigarettes consumed was correlated with the rate of delay discounting. In these re-analyses, discounting was also greater in current smokers than those who never smoked.



*Figure 1.* The top panel presents hyperbolic discounting functions for money among current smokers and never smokers. The bottom panel presents discounting functions for money and cigarettes among current smokers. Points represent median indifference points and lines represent the best-fitting functions calculated using non-linear regression. Adapted from Bickel et al., 1999.

In the sixth study, Baker, Johnson, and Bickel (2003) comprehensively compared discounting of cigarette smokers to matched controls. This study examined discounting of hypothetical monetary gains and losses at three magnitudes (\$10, \$100, and \$1,000); real money rewards at two magnitudes (\$10, \$100); gains and losses in hypothetical health at one magnitude; and, in smokers only, gains and losses of cigarettes at three magnitudes. This study repeated each measure one week later to assess its stability. Thus, this study allowed a comparison of real vs. hypothetical money and an assessment of the reliability of the measures and the magnitude and sign effects. The magnitude effect refers to the inverse relationship between the objective magnitude of the delayed reward and the degree of discounting (Chapman, 1996). For example, the discount rate would be higher for a choice between \$10 now and \$15 in one year than for a choice between \$1,000 now and \$1,500 in a year. The sign effect refers to the observation that rewards are discounted at a higher rate than are comparably valued losses (e.g., Thaler, 1981). Thus, participants would prefer a smaller immediate loss to a larger delayed loss (e.g., Loewenstein, 1988), though exceptions have been reported (Shelly, 1994). The results of this study demonstrated that cigarette smokers discounted all magnitudes of all commodities more than matched controls (Baker et al., 2003). Second, real money and hypothetical money were not significantly different (replicating prior results). Third, the results were replicated when participants were re-tested one week later (see also Simpson & Vuchinich, 2000, who replicated discounting of money at one-week intervals in non-dependent individuals). Fourth, the magnitude and sign effects were observed across commodities and participant groups. Fifth, this study demonstrated that health outcomes were discounted hyperbolically with clear evidence of the magnitude and sign effects. These findings support the notion that discounting by humans is applicable to a wide variety of reinforcers.

The greater discounting observed among cigarette smokers was evident across different magnitudes of three types of reinforcers (cigarettes, money, and health), suggesting that higher rates of discounting among smokers may be associated with more than just the drug of dependence. The effect observed with health discounting was also observed in a seventh study (Odum, Madden, & Bickel, 2002). The eighth study examined the relationship between discounting of monetary rewards and the number of cigarettes smoked and nicotine consumed. The researchers reported that greater discounting was associated with more cigarettes smoked and greater nicotine consumption. They did not detect an overall difference in discounting between smokers and controls. However, given that the group of smokers in that study included individuals who both smoked and discounted very little (Ohmura, Takahashi, & Kitamura, 2005), the failure to detect a difference may have resulted from limited statistical power. In the ninth study, Mitchell (2004) examined the effects of 24-hour abstinence from tobacco smoking on discounting. In addition to money discounting, an interesting variant of the discounting procedure was employed in which smokers chose between cigarettes now or money later. Relative to usual smoking, 24 hours of smoking abstinence resulted in greater discounting of the immediate cigarette vs. later money choices, but had no effect on the discounting of money. The absence of the effect of brief abstinence on money vs. money choice is inconsistent with a prior comparable study conducted with opioid-dependent individuals (Giordano, Bickel, Loewenstein, Jacobs, Marsch, & Badger, 2002) in which brief abstinence increased discounting in heroin vs. heroin and money vs. money choices.

### **Opioid Dependence**

Five studies compared the delay discounting of opiate abusers and matched controls. In the first study by Madden and colleagues (1997), participants chose between hypothetical monetary rewards available

immediately or following a delay. Delayed rewards were \$1,000, and the immediate amount was adjusted until choices reflected indifference. The participants also chose between immediate and delayed heroin, using the same procedures. The amount of delayed heroin was derived by estimating the local street value of heroin, and then determining how much heroin could be purchased with \$1000. Across the opiate-dependent and control participants, the hyperbolic discounting equation accounted for 80% to 99% of the variance. Opiate-dependent participants discounted money at higher rates than controls, and discounted heroin more than money. Differences between opioid-dependent individuals and matched controls have also been found when real rewards were available (Kirby et al., 1999). In this study, participants were matched on several demographics including, age, gender, and education. Participants were informed before the delay-discounting task that they had a one in six chance of receiving the reward that they had chosen on a randomly selected trial. Distributions of discounting were compared between the opioid-dependent and matched controls. The rate of discounting for opioid-dependent individuals was significantly greater than the rate of discounting in matched controls. Overall, discounting rates of opioid-dependent individuals were about twice that of the matched controls.

In the third study, Bretteville-Jensen (1999) investigated the discounting of hypothetical money among actively injecting heroin and amphetamine users, ex-users, and matched controls. The participants were asked to imagine they had a winning lottery ticket, worth 100,000 Norwegian Kroner (Nkr; approximately \$14,600 in US dollars). Then they were asked to decide how much money someone would have to give them now for the winning ticket if it was going to be paid out now, in one week, or after one year. Actively injecting users discounted the payment delayed by one year more than former users and former users discounted more than matched controls. In addition, 20% of the active users reported that they would have sold the winning ticket for less than 100,000 Nkr when the payment was delayed by only one week. In comparison only 2% of matched controls and 4% of former users would have accepted a loss with this delay.

Two additional studies (the 4th and 5th) examined delay discounting among heroin abusers and matched controls. In the first of these studies, delay discounting among several drug-abusing populations was compared to matched controls. Participants chose between immediate or delayed money gains, health losses, and losses of freedom (Petry, 2003). Hypothetical delayed money gains were \$100 and \$1,000. In health choices, participants were asked to imagine they had a disease that would produce negative symptoms for one year after a delay of 25 years. They were then asked to estimate the longest time period they would tolerate the negative symptoms now to avoid the onset of the symptoms 25 years from now. Similarly, for freedom losses the participants were asked to imagine they were sentenced to serve a one-year sentence in jail after a 25-year delay and then to estimate the longest time period they would serve now to avoid the sentence 25 years from now. Results indicated that heroin abusers discounted money, health, and freedom at higher rates than matched controls (Petry, 2003). Across the drug-abusing and control participants, the hyperbolic discounting equation accounted for 91% to 96% of the variance. In a related study, discounting of delayed monetary rewards was examined with heroin abusers and matched controls when there was a 1 in 6 chance of receiving a reward from a randomly selected trial (Kirby & Petry, 2004). Reward size was varied from \$25 to \$85 dollars. Active heroin users discounted delayed monetary rewards at over six times the rate of matched controls. In this study, discounting of delayed rewards was a function of both delay and amount. That is, larger rewards did not tend to be discounted as much as smaller rewards (i.e., the magnitude effect) and rewards with a short delay did not tend to be discounted as much as rewards following a long delay (i.e., hyperbolic discounting).

### **Alcohol Dependence**

Five studies have explored the relationship between delay discounting and alcohol abuse. Vuchinich and Simpson (1998) compared discounting of delayed hypothetical rewards of \$1,000 and \$10,000 among heavy drinkers and light drinkers and among heavy drinkers with alcohol problems and light drinkers.

Discounting values were consistently higher for heavier drinkers than for lighter drinkers. Because distributions of discounting values were not normally distributed, the authors presented average discounting values for the 25th, 50th, and 75th percentile of light drinkers vs. heavy drinkers. At each percentile, the heavy drinkers discounted at a higher rate than the light drinkers. When heavy drinkers with problems were contrasted with light drinkers in this same manner these differences were exaggerated.

In the second study, Petry (2001a) examined delay discounting among alcoholics, currently abstinent alcoholics, and matched controls. Participants chose between immediate or delayed hypothetical monetary gains of \$100 and \$1,000. The participants also chose between immediate and delayed alcohol. At all magnitudes of alcohol, alcoholics had the highest discounting rates, currently abstinent alcoholics showed moderate discounting rates, and matched controls showed the lowest discounting rates. For monetary gains, the same pattern was found at the \$100 magnitude, but the differences were negligible at the \$1000 magnitude. Alcoholics and control participants discounted delayed \$100 gains at almost twice the rate that they discounted delayed \$1000 gains. Interestingly, the former alcoholics did not show this magnitude effect.

The third study compared delay discounting among abstinent alcoholics and matched controls (Bjork, Hommer, Grant, & Danube, 2004). Participants chose between an immediate reward and a standard \$10 delayed reward, and received a randomly selected reward from one of their choices. Discounting was significantly higher in the abstinent alcoholics than in the matched controls for delays ranging from 7 to 365 days. Overall, the rate of discounting was 4 times greater for abstinent alcoholics than controls. Post-hoc analyses, which took into account severity of alcoholism (e.g., co-occurrence of psychiatric dysfunction, parental history of alcoholism), did not detect significant differences in discounting. One potential issue of concern with this secondary analysis was that only male participants were considered.

In the fourth study, Petry, Kirby, and Kranzler (2002) compared delay discounting among healthy males and females with or without parental histories of alcoholism. Overall, the differences in discounting between individuals with or without parental histories of alcoholism were negligible. However, when females' delay discounting performances were viewed separately, parental histories of alcoholism were associated with higher rates of discounting. This pattern was not identified for the discounting rates of the male participants. Interestingly, discounting rates among females with parental histories of alcoholism were similar to discounting rates among males.

In a related fifth study (Kirby & Petry, 2004), discounting of delayed monetary rewards was examined with alcohol abusers and matched controls when there was a 1 in 6 chance of receiving a reward from a randomly selected trial. Reward size was varied from \$25 to \$85 dollars. Active and currently abstinent alcohol users discounted delayed monetary rewards at rates that were not significantly different from matched controls. However, given that Kirby and Petry's (2004) heterogeneous group of alcohol abusers included individuals who had a large range of usage patterns, from binge-drinking to daily use, the failure to detect a difference may have resulted from limited statistical power.

### **Cocaine Dependence**

Four studies compared delay discounting among cocaine abusers and matched controls. In the first study, Coffey, Gudleski, Saladin and Brady (2003) examined delay discounting of hypothetical \$1000 money gains among cocaine abusers and matched controls. Delay discounting of \$1000 worth of cocaine among cocaine abusers was also examined. Cocaine abusers in this study met the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV; American Psychiatric Association, 1994) criteria for cocaine dependence. Overall, cocaine abusers discounted the value of hypothetical money gains at a higher rate than matched controls. In addition, cocaine was discounted at a higher rate than money among

cocaine abusers.

In a second related study, delay discounting among cocaine and heroin abusers was compared to delay discounting among matched controls. Participants chose between hypothetical immediate or delayed, money gains (\$100 and \$1000), health losses, and losses of freedom (Petry, 2003). Cocaine abuse was defined as use of cocaine at least eight times per month with loss of control and reports of drug related problems. Results indicated that cocaine and heroin abusers discounted money, health, and freedom at higher rates than matched controls. Cocaine and heroin abusers discounted hypothetical \$100 money gains more steeply than \$1000 money gains. Discounting of hypothetical losses of freedom and health showed lower discounting than hypothetical money gains. However, as Petry (2003) noted, this may be related to a sign effect. That is, losses may be discounted at a different rate than gains. In a third study, Kirby and Petry (2004) examined the discounting of delayed monetary gains with cocaine abusers and matched controls. Active and currently abstinent cocaine users discounted delayed monetary rewards at rates that were higher than matched controls.

The fourth study examined delay discounting of a hypothetical \$1,000 reward among current cocaine users, currently abstinent ex-cocaine users, and matched controls. Current and ex-users were currently in treatment for cocaine dependence. For a participant to be qualified as an ex-user, the participant was required to have reported not using cocaine in the past 30 days. To qualify as a current-user, participants were required to have reported using cocaine in the past 30 days. Current and ex-cocaine users discounted at higher rates than matched controls. Significant differences in discounting between current and ex-cocaine users were not found (Heil, Johnson, Higgins, & Bickel, 2005). Perhaps, extreme discounting is either an enduring trait or the time course for reversal is longer than one month.

### **Gambling**

Four studies have examined delay discounting among pathological gamblers. In the first study (Alessi & Petry, 2003), discounting of delayed rewards was regressed on several variables in a population of gamblers. Severity of gambling was a successful predictor of discounting rates. However, other demographics such as, age, gender, and years of education were not predictors of discounting rates. The second study (Dixon, Marley, & Jacobs, 2003) compared delay discounting among pathological gamblers and matched controls. Gamblers discounted significantly more than the matched control participants. Across the pathological gamblers and control participants, the hyperbolic discounting equation accounted for 93% to 89% of the variance.

Two studies (the 3rd and 4th) examined comorbid gambling and drug abuse. Petry and Casarella (1999) examined delay discounting for hypothetical \$1,000 gains among drug abusers with and without gambling problems, and matched controls. Drug abusers with gambling problems discounted delayed rewards more than either of the other two groups. Second, Petry (2001b) compared patterns of delay discounting among pathological gamblers with and without drug abuse problems to patterns of delay discounting among matched controls. Pathological gamblers with drug abuse problems discounted delayed rewards significantly more than the other two groups. The results of these two studies support findings that suggest risk-taking populations (e.g., heroin addicts) may contain sub-populations (e.g., needle sharing heroin addicts) that show particularly high rates of delay discounting (Odum et al., 2000).

### **Other psychiatric disorders**

Three studies have examined delay discounting among individuals with other psychiatric disorders. Most recently, we conducted a study (Gatchalian, Yi, Johnson, Baker, & Bickel, in prep.) of discounting for delayed monetary rewards (\$10, \$100 real and \$10, \$100, \$1000 hypothetical) among participants with and without depression. Rates of discounting were higher among depressed participants compared to

non-depressed participants. The second study (Petry, 2002) compared discounting of delayed hypothetical rewards of \$100 and \$1,000 among substance abusers with or without antisocial personality disorder (APD), and matched controls. Substance abusers discounted rewards at a higher rate than non-substance abusers. Substance abusers with APD discounted delayed outcomes at a higher rate than substance abusers without APD.

The third study (Crean, de Wit, & Richards, 2000) compared rates of delay discounting between two sub-groups of an outpatient psychiatric population (i.e., participants with high or low impulsivity). Rates of delay discounting were higher among patients that demonstrated high levels of impulsive behavior than for patients that exhibited low levels of impulsive behavior. Rates of delay discounting were not significantly correlated with other measures of impulsivity (with the exception of their measure of probability discounting).

### **Summary**

In this section, 29 studies were reviewed that examined delay discounting among several groups. Several general patterns of importance to the general theme of this paper emerged from this review. First, delay discounting was higher in drug-abusing groups than in matched control groups. Second, delay discounting was higher in currently drug-abusing groups than in currently abstinent groups of ex-abusers. Third, sub-groups within currently drug-abusing groups that tend to engage in particularly high rates of delay discounting can be identified. The next section of this paper addresses empirical evidence of delay discounting as a measure of a trait (i.e., a static characteristic) and/or a state (i.e., a variable condition).

### *Current Controversies*

#### **Discounting: State or Trait**

The existing literature provides mixed evidence concerning whether delay discounting can be best described as either a state (i.e., a variable condition) or a trait (i.e., a static characteristic). At this time, the evidence does not suggest that delay discounting can be exclusively described as either a state or a trait; however, certain studies in isolation do seem to provide evidence for delay discounting as either a state or a trait. Evidence that delay discounting can be changed following abstinence offers an indication that delay discounting is a state. Evidence that delay discounting rates predict an increased probability of drug use offers an indication that delay discounting is a trait. Here we will review the literature to illuminate the evidence supporting arguments from both sides of this controversy. First, we will review four representative studies that examined cross-sectional data concerning abstinence and rates of delay discounting in ex-users. Second, two studies that examined within-subject deprivation data among current drug users will be reviewed. Finally, a non-human animal study that suggests a possible role for delay discounting, as a trait, in determining the future probability of drug use will be analyzed.

In the first cross-sectional study, Bickel et al. (1999) examined delay discounting in current, never-, and ex-smokers who were matched on demographic categories that have previously been shown to influence delay discounting. Ex-smokers reported being abstinent for at least one year before the study. Bickel and colleagues found that ex- and never-smokers discounted delayed rewards less than current smokers. Differences in discounting among ex- and never smokers were not statistically significant. The second study (Petry, 2001a) examined delay discounting among recently abstinent (at least one month) alcohol-dependent individuals, current alcohol-dependent individuals, and controls. Abstinent alcoholics discounted money at a rate that was lower than rates among current alcoholics and higher than discounting rates among controls. In the third study, Bretteville-Jensen (1999) compared delay-discounting rates among current, ex, and never-users of heroin and amphetamine. In this study, the researchers did not ask participants how long they were abstinent. Similar to the pattern of results

reported by Petry, ex-injectors of heroin and amphetamine were found to discount money at lower rates than current users and at higher rates than never users.

In a recent paper (the fourth study), delay discounting was assessed in currently using and recently abstinent cocaine-dependent outpatients and non-drug-using matched controls (Heil et al., 2005). Delay discounting among currently using cocaine-dependents did not differ significantly from discounting among recently abstinent users; however, combined both groups discounted at a higher rate than matched controls. The authors suggested that the short duration of abstinence (i.e., 30 days) might explain the lack of a significant difference between the cocaine-dependent groups.

The results from the four cross-sectional studies we reviewed did not provide clear evidence to conclude whether or not drug use and/or abstinence from drug use affects rates of delay discounting. One possible interpretation of the evidence is that delay discounting can be described as a state that may be affected by drug use. However, even if this interpretation is accepted, suggesting that drug use may increase rates of delay discounting or that abstinence may have a decreasing effect on rates of discounting seems to be a matter of semantics. Further, because these studies were cross-sectional in nature, alternative interpretations of these findings can also be used to argue that discounting is a trait. That is, individuals who have low discounting rates may have had greater success in achieving abstinence.

Given the limitations of cross-sectional data, it is not surprising that researchers have conducted studies in which drug use was experimentally manipulated and delay discounting was measured multiple times among the same participants. For example, the first study in this line of research utilized a within-subject design in which rates of delay discounting among opiate-dependent outpatients maintained on buprenorphine (a pharmacotherapy for the treatment of heroin and other opiate dependence) were measured under satiated and deprived conditions (Giordano et al., 2002). Giordano and colleagues reported that opioid-dependent outpatients discounted delayed heroin and money gains more steeply during deprivation conditions (i.e., five days after receiving a quintuple buprenorphine dose) than during satiation conditions (i.e., 2 hours after receiving buprenorphine). Mitchell (2004) conducted the second study in this line of research, examining the effects of nicotine deprivation on rates of delay discounting for money and cigarettes among cigarette smokers. Results of this study revealed that deprivation affected discounting rates, but only when the choices were drug-related. In other words, preference for immediate money over delayed money did not change as a function of short-term nicotine deprivation; however, preference for immediate cigarettes over delayed money increased under deprived conditions relative to satiated.

Although at present the literature on the effects of deprivation status on delay discounting is limited, the findings from the available two studies indicate that short-term deprivation increases rates of delay discounting among drug-dependent individuals. Additional research employing prospective within-subject designs, in which discounting is measured pre- and post-abstinence, seems advisable given the paucity of studies examining this topic. This research may provide valuable insight into the directional relationship between drug use and discounting rates and may determine whether treatment itself has an impact on rates of delay discounting.

One study investigated the role of delay discounting in determining the probability of future drug use in non-human animals (Perry, Larson, German, Madden, & Carroll, 2005). The authors measured rates of delay discounting for food rewards among female rats. Based on delay discounting performances, individual rats were categorized into low or high impulsivity groups. In the second part of the experiment, the two groups were exposed to training sessions for cocaine self-administration. Seventy-seven percent of the rats within the high-impulsivity and only 25% of the rats within the low-impulsivity groups met criteria for acquisition.

The evidence from Perry et al.'s (2005) study can be interpreted as evidence that delay discounting is a stable characteristic (i.e., a trait) that can be used to predict the acquisition of drug use. However, similar to the cross-sectional studies reviewed above, the results of this study are open to multiple interpretations. As Perry and colleagues noted, other factors could covary with, or underlie, group differences in discounting. If an environmental factor covaried with discounting, then the results from this study could support the argument that delay discounting is a trait.

In summary, the argument for delay discounting as a state is supported by evidence that short-term deprivation appears to increase rates of delay discounting and long-term abstinence appears to be related to lower rates of delay discounting. The argument for delay discounting as a trait is supported by evidence that measures of delay discounting predict future acquisition of drug use. After illuminating the current evidence from both sides of the controversy, it cannot be decisively concluded whether delay discounting should be considered primarily a state or a trait, and perhaps it is both.

### **Discounting: Impulsivity or Temporal Horizon**

An additional controversy within the delay discounting literature is whether delay discounting can be best described as a measure of impulsivity or temporal horizon. Impulsivity has typically been described as acting without conscious thought or consideration of consequences. Delay discounting has often been identified as a behavioral measure of impulsivity. Indeed, numerous studies have examined the relationship between delay discounting and various traditional measures of impulsivity, such as the Eysenck Personality Questionnaire (Eysenck & Eysenck, 1978) and the Barratt Impulsiveness Scale (Barratt, 1985). Previously, measures of temporal horizon (e.g., Stanford Time Perception Inventory, Zimbardo, 1992; Future Time Perspective, Wallace, 1956) have been considered to be corollary measures of impulsivity (see Bickel & Marsh, 2001 for review). However, recent evidence challenges the view that delay discounting is a measure of impulsivity and suggests that discounting may be more accurately described as a measure of temporal horizon.

In one representative study, Odum et al. (2000) assessed delay discounting for money and heroin among opioid-dependent individuals who share needles and opioid-dependent individuals who do not share needles. The Eysenck Personality Questionnaire was administered to both opioid-dependent groups. Delay discounting of money was significantly greater among opioid-dependent needle-sharers than among opioid-dependent individuals who do not share needles. The two groups did not differ significantly on the impulsivity subscale of the Eysenck Personality Questionnaire. The discordance between measures of delay discounting and impulsivity suggests that delay discounting may not be a direct measure of impulsivity. One possibility is that delay discounting can be more accurately understood as a measure of temporal horizon.

Temporal horizon can be generally thought of as a window of time over which reinforcers are integrated. The following two scenarios illustrate the relationship between temporal horizon and the value of reinforcement. Imagine eating a single bite of pizza now, followed by another bite 30-s later, followed by a third bite in another 30-s. Now imagine consuming the same overall amount of pizza with each bite being consumed 24 hours apart. The greater subjective value of the first scenario suggests that reinforcers have effects that are not integrated over an unlimited duration of time. Importantly, viewing delay discounting as a measure of temporal horizon also suggests that the subjective value of a previous reward should decrease as it becomes more remote in a way that is similar to the discounting of rewards that are delayed.

A recent study that supports a temporal-horizon interpretation of delay discounting was conducted by Yi, Gatchalian, and Bickel (in press). Yi et al. examined discounting of past monetary gains and losses as well as discounting of future monetary gains and losses. Overall, discounting of future outcomes and past

outcomes produced similar results. Past discounting data were orderly and followed the same principles as future discounting (i.e., hyperbolic discounting, the magnitude effect, and the sign effect). While impulsivity does not appear to offer an explanation for the way that past events are valued, temporal horizon may explain the discounting of both past and future outcomes. Replication of these results is necessary, and like the state or trait controversy, the controversy of whether discounting is a measure of impulsivity or of temporal horizon remains to be further clarified.

### *The Neuroeconomics of Discounting: A New Development*

The literature on delay discounting has grown extensively in recent years and has contributed to understanding addictive behaviors. A new development in delay discounting research is known as the Neuroeconomics of Discounting. Neuroeconomics is a multi-disciplinary approach to the study of how economic behavior is related to neuronal processes and structures. The observation that eight out of 50 abstracts presented at the 2005 conference of the Society for Neuroeconomics mentioned delay discounting exemplifies the current interest in this area of research. McClure, Laibson, Loewenstein, and Cohen (2004) conducted a study published in *Science* where the neural correlates of delay discounting among non-drug-using participants were examined. The results revealed that 1) the limbic system (i.e., a part of the brain generally believed to be involved in emotion and reinforcement) was preferentially activated when subjects chose immediate options, and 2) the prefrontal cortex (i.e., a part of the brain generally believed to be involved in planning and abstract thinking) showed activation regardless of the length of delay. Many questions remain to be answered in future studies. For example, do drug-dependent and non-drug-abusing individuals show different patterns of brain activation during delay discounting procedures? Do drug-dependent individuals show different patterns of brain activation during delay discounting procedures when they are drug-satiated and drug-deprived? Among drug abusers, are there different patterns of brain activation when discounting delayed money versus when discounting delayed drugs?

### *Conclusions*

The present review of how delay discounting has been used to understand addiction demonstrates that this topic has generated significant interest among researchers. Recent research has continued to provide evidence that addicted individuals discount the long-term consequences of their behavior at a higher rate than matched controls. These findings can be used to understand the harmful behavior of addicted individuals. It remains to be determined whether there are procedures that can directly change rates of discounting and whether such procedures would be useful in therapy. A review of current controversies further illustrated the need for continued research in this area. Clarification of these controversies might challenge conventional views on how variables are categorized (e.g., state vs. trait) and may require a subtle and interactive view. Given the current interest in using delay discounting to understand addiction, in terms of both overt behavior and at the level of brain activity, we believe the next several years will continue to produce substantial progress in this field.

### **References**

- Ainslie, G., & Haslam, N. (1992). Hyperbolic discounting. In G. Loewenstein & J. Elster (Eds.), *Choice over time* (pp. 57-92). New York: Russell Sage Foundation.
- Alessi S. M., & Petry, N. M. (2003). Pathological gambling severity is associated with impulsivity in a delay discounting procedure. *Behavioural Processes*, 64(3), 345-354.
- American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4<sup>th</sup> ed., Text Revision). Washington, DC: Author.

- Baker, F., Johnson, M. W., & Bickel, W. K. (2003). Delay discounting in current and never-before cigarette smokers: Similarities and differences across commodity, sign, and magnitude. *Journal of Abnormal Psychology, 112*(3), 382-392.
- Barratt, E. S. (1985). Impulsiveness defined within a systems model of personality. In C. D. Spielberge & J. N. Butcher (Eds.), *Advances in personality assessment* (Vol. 5, pp. 113-132). Hillsdale, NJ: Erlbaum.
- Bickel, W. K., & Johnson, M. W. (2003). Delay discounting: A fundamental behavioral process in drug dependence. In G. Lowenstein, D. Read & R. Baumeister (Eds.), *Time and decision: Economic and psychological perspectives on intertemporal choice* (pp. 419-440). New York: Russell Sage Foundation.
- Bickel, W. K., & Marsch, L. A. (2001). Toward a behavioral economic understanding of drug dependence: Delay discounting processes. *Addiction, 96*, 73-86.
- Bickel, W. K., Odum, A. L., & Madden, G. J. (1999). Impulsivity and cigarette smoking: Delay discounting in current, never, and ex-smokers. *Psychopharmacology, 146*, 447-454.
- Bjork, J. M., Hommer, D. W., Grant, S. J., Danube, C. (2004). Impulsivity in abstinent alcohol-dependent patients: relation to control subjects and type 1-/type 2-like traits. *Alcohol, 34*(2-3), 133-150.
- Bretteville-Jensen, A. L. (1999). Addiction and discounting. *Journal of Health and Economics, 18*, 393-407.
- Chapman, G. B. (1996). Temporal discounting and utility for health and money. *Journal of Experimental Psychology: Learning, Memory & Cognition, 22*, 771-791.
- Coffey, S. F., Gudleski, G. D., Saladin, M. E., & Brady, K. T. (2003). Impulsivity and rapid discounting of delayed hypothetical rewards in cocaine-dependent individuals. *Experimental and Clinical Psychopharmacology, 11*(1), 18-25.
- Crean, J. P., de Wit, H., & Richards, J. B. (2000). Reward discounting as a measure of impulsive behavior in a psychiatric outpatient population. *Experimental and Clinical Psychopharmacology, 8*(2), 155-162.
- Daly, M., & Wilson, M. (2005). Carpe diem: Adaptation and devaluing the future. *The Quarterly Review of Biology, 80*(1), 55-60.
- Dixon, M. R., Marley, J., Jacobs, E. A. (2003). Delay discounting by pathological gamblers. *Journal of Applied Behavior Analysis, 36*(4), 449-458.
- Eysenck, S. B. G., & Eysenck, H. J. (1978). Impulsiveness and venturesomeness: Their position in a dimensional system of personality description. *Psychological Reports, 43*, 1247-1255.
- Gatchalian, K. M., Yi, R., Johnson, M. W., Baker, F., & Bickel, W. K. (in prep). Delay discounting among individuals with major depression.
- Giordano, L., Bickel, W. K., Loewenstein, G., Jacobs, E. A, Marsch, L., & Badger, G.J. (2002). Mild opioid deprivation increases the degree that opioid-dependent outpatients discount delayed heroin and money. *Psychopharmacology, 163*, 174-182.

- Green, L., Fry, A. F., & Myerson, J. (1994). Discounting of delayed rewards: A life-span comparison. *Psychological Science, 5*, 33-36.
- Heil, S. H., Johnson, M. W., Higgins, S. T., & Bickel, W. K. (2005). Delay discounting in currently using and currently abstinent cocaine-dependent outpatients and non-drug-using matched controls. *Addictive Behaviors* [Epub ahead of print] PMID:16236455.
- Johnson, M. W., & Bickel, W. K. (2002). Within-subject comparison of real and hypothetical money rewards in delay discounting. *Journal of the Experimental Analysis of Behavior, 77*(2), 129-146.
- Kirby, K. N. (1997). Bidding on the future: Evidence against normative discounting of delayed rewards. *Journal of Experimental Psychology: General, 126*, 54-70.
- Kirby, K., & Petry, N. M. (2004). Heroin and cocaine abusers have higher discount rates for delayed rewards than alcoholics or non-drug-using controls. *Addiction, 99*(4), 461-471.
- Kirby, K. N., Petry, N. M., & Bickel, W. K. (1999). Heroin addicts have higher discount rates for delayed rewards than non-drug using controls. *Journal of Experimental Psychology: General, 128*, 78-87.
- Loewenstein, G. (1988). Frames of the mind in intertemporal choice. *Management Science, 34*, 200-214.
- Logue, A. W. (1988). Research on self-control: An integrating framework. *Behavioral and Brain Sciences, 11*, 665-709.
- Madden, G. J., Begotka, A. M., Raiff, B. R., & Kastern, L. L. (2003). Delay discounting of real and hypothetical rewards. *Experimental and Clinical Psychopharmacology, 11*(2), 139-145.
- Madden, G. J., Bickel, W. K., & Jacobs, E. A. (1999). Discounting of delayed rewards in opioid-dependent outpatients: Exponential or hyperbolic discounting functions? *Experimental and Clinical Psychopharmacology, 7*(3), 284-293.
- Madden, G. J., Petry, N. M., Badger, G. J., & Bickel, W. K. (1997). Impulsive and self-control choices in opioid-dependent patients and non-drug-using control participants: Drug and monetary rewards. *Experimental and Clinical Psychopharmacology, 5*(3), 256-262.
- Mazur, J. E. (1987). An adjusting procedure for studying delayed reinforcement. In M. L. Commons, J. E. Mazur, J. A. Nevin & H. Rachlin (Eds.), *Quantitative analysis of behavior*. (Vol. 5, pp. 55-73). Hillsdale, NJ: Erlbaum.
- McClure, S. M., Laibson, D. L., Loewenstein, G., & Cohen, J. D. (2004). Separate neural systems value immediate and delayed monetary rewards. *Science, 306*(5695), 503-507.
- Mitchell, S. H. (1999). Measures of impulsivity in cigarette smokers and nonsmokers. *Psychopharmacology, 146*, 455-464.
- Mitchell, S. H. (2004). Effects of short-term nicotine deprivation on decision-making: Delay, uncertainty, and effort discounting. *Nicotine & Tobacco Research, 6*(5), 819-828.
- Myerson, J., & Green, L. (1995). Discounting of delayed rewards: Models of individual choice. *Journal of the Experimental Analysis of Behavior, 64*, 263-276.
- NIDA InfoFacts: Costs to Society. (2005). Retrieved November 8, 2005, from the National Institute on

- Drug Abuse, Trends & Statistics Web site: <http://www.nida.nih.gov/Infofacts/costs.html>
- Odum, A. L., Madden, G. J., Badger, G. J., & Bickel, W. K. (2000). Needle sharing in opioid-dependent outpatients: Psychological processes underlying risk. *Drug and Alcohol Dependence*, *60*, 259-266.
- Odum, A. L., Madden, G. J., & Bickel, W. K. (2002). Discounting of delayed health gains and losses by current, never-and ex-smokers of cigarettes. *Nicotine & Tobacco Research*, *4*, 295-303.
- Ohmura, Y., Takahashi, T., & Kitamura, N. (2005). Discounting delayed and probabilistic monetary gains and losses by smokers of cigarettes. *Psychopharmacology*, *16*, 1-8.
- Perry, J. L., Larson, E. B., German, J. P., Madden, G. J., & Carroll, M. E. (2005). Impulsivity (delay discounting) as a predictor of acquisition of IV cocaine self-administration in female rats. *Psychopharmacology*, *178*(2-3), 193-201.
- Petry, N. M. (2001a). Delay discounting of money and alcohol in actively using alcoholics, currently abstinent alcoholics, and controls. *Psychopharmacology*, *154*(3), 243-250.
- Petry, N. M. (2001b). Pathological gamblers, with and without substance use disorders, discount delayed rewards at high rates. *Journal of Abnormal Psychology*, *110*(3), 482-487.
- Petry, N. M. (2002). Discounting of delayed rewards in substance abusers: Relationship to antisocial personality disorder. *Psychopharmacology*, *162*(4), 425-432.
- Petry, N. M. (2003). Discounting of money, health, and freedom in substance abusers and controls. *Drug and Alcohol Dependence*, *71*(2), 133-141.
- Petry, N. M., Bickel, W. K., & Arnett, M. (1998). Shortened time horizons and insensitivity to future consequences in heroin addicts. *Addiction*, *93*, 729-738.
- Petry, N. M., & Casarella, R. (1999). Excessive discounting of delayed rewards in substance abusers with gambling problems. *Drug and Alcohol Dependence*, *56*(1), 25-32.
- Petry, N. M., Kirby, K. N., & Kranzler, H. R. (2002). Effects of gender and family history of alcohol dependence on a behavioral task of impulsivity in healthy subjects. *Journal of Studies on Alcohol*, *63*(1), 83-90.
- Rachlin, H., Raineri, A., & Cross, D. (1991). Subjective probability and delay. *Journal of the Experimental Analysis of Behavior*, *55*, 233-244.
- Reynolds, B. (2004). Do high rates of cigarette consumption increase delay discounting? A cross-sectional comparison of adolescent smokers and young-adult smokers and nonsmokers. *Behavioral Processes*, *67*(3), 545-549.
- Reynolds, B., Karraker, K., Horn, K., & Richards, J. B. (2003). Delay and probability discounting as related to different stages of adolescent smoking and non-smoking. *Behavioral Processes*, *64*(3), 333-344.
- Reynolds, B., Richards, J. B., Horn, K., & Karraker, K. (2004). Delay discounting and probability discounting as related to cigarette smoking status in adults. *Behavioral Processes*, *65*(1), 35-42.

- Richards, J. B., Mitchell, S. H., de Wit, H., & Seiden, L. S. (1997). Determination of discount functions in rats with an adjusting-amount procedure. *Journal of the Experimental Analysis of Behavior*, 67(3), 353-366.
- Richards, J. B., Zhang, L., Mitchell, S. H., & de Wit, H. (1999). Delay or probability discounting in a model of impulsive behavior: Effect of alcohol. *Journal of the Experimental Analysis of Behavior*, 71, 121-143.
- Rodriguez, M. L., & Logue, A. W. (1988). Adjusting delay to reinforcement: Comparing choice in pigeons and humans. *Journal of Experimental Psychology: Animal Behavior Processes*, 14, 105-117.
- Shelly, M. K. (1994). Gain/loss asymmetry in risky intertemporal choice. *Journal of Studies on Alcohol*, 59, 124-159.
- Simpson, C. A., & Vuchinich, R. E. (2000). Reliability of a measure of temporal discounting. *Psychological Records*, 50(1), 3-16.
- Stevens, S. S. (1975). *Psychophysics*. New York: Wiley.
- Thaler, R. (1981). Some empirical evidence on dynamic inconsistency. *Economic Letters*, 8, 201-207.
- Vuchinich, R. E., & Simpson, C. A. (1998). Hyperbolic temporal discounting in social drinkers and problem drinkers. *Experimental and Clinical Psychopharmacology*, 6(3), 292-305.
- Wallace, M. (1956). Future time perspective in schizophrenia. *Journal of Abnormal Social Psychology*, 52, 240-245.
- Yi, R., Gatchalian, K. M., & Bickel, W. K. (in press). Discounting of past outcomes. *Experimental and Clinical Psychopharmacology*.
- Zimbardo, P. G. (1992). *Stanford Time Perception Inventory Manual*. Stanford, CA: Stanford University, Department of Psychology.

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## Functional Analysis and Food Refusal: A Brief Review

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In their article, Iwata et al. (1982/1994) developed a functional analysis methodology that underscored the need for behavior analysts to conduct functional analyses in order to identify maintaining conditions and develop effective function-based treatments for problematic behavior. Since the Iwata et al. (1982/1994) article, behavior analysts have stressed the importance of conducting functional analyses when developing treatments for food refusal. The primary purpose of this paper was to review the use of functional analysis (e.g., Iwata et al., 1982) in interventions aimed at treating food refusal in children as seen in the *Journal of Applied Behavior Analysis (JABA)* (1982-2005). The search found 22 articles. Those articles were reviewed to first, identify studies that reported using a functional analysis prior to the development of a treatment and second, examine the treatments implemented in each study. Keywords: Functional analysis, food refusal, feeding problems.

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Childhood mealtime problem behavior occurs in many healthy infants and children but it is more common in children with disabilities (e.g., Luiselli, 1989), including but not limited to children with physical disabilities, mental retardation, and prolonged illness (e.g., Palmer, Thompson, & Linscheid, 1975; Reilly, Skuse, & Poblete, 1996). A feeding problem is identified when a child is unable or refuses to eat or drink sufficient quantities to maintain nutritional status (e.g., Babbitt, Hoch, & Coe, 1994; Budd et al., 1992). Feeding problems can encompass a variety of behaviors including, but not limited to, lack of independent self-feeding skills, disruptive behavior (e.g., tantrums, aggression) during mealtimes, eating too much or too little, and limited intake due to selectivity by type or texture of food, resulting in dietary inadequacies. (e.g., Cooper et al., 1995; Luiselli, 1989; O'Brien, Repp, Williams, & Christophersen, 1991; Sisson & Van Hasselt, 1989).

Food refusal is a type of feeding problem. Food refusal can be conceptualized as a form of non-compliance in which the child refuses to eat a sufficient volume or variety of food (Kerwin, Ahearn, Eicher, & Burd, 1995). Persistent and chronic eating problems, especially food refusal behaviors, have significant negative impact on a child's health and growth (e.g., Luiselli & Gleason, 1987). Children who consume insufficient amounts of food are at a higher risk for excessive weight loss, lethargy, malnutrition, diminished physical and cognitive function, and growth retardation (Budd et al., 1992; Oates, Peacock, & Forrest, 1985; Howard & Cronk, 1983; Riordan, Iwata, Finney, Wohl, & Stanley, 1984). Despite the potential seriousness of food refusal, little is known about possible variables maintaining food refusal and similar feeding problems (e.g., Piazza et al., 2003). Understanding the functional characteristics of food refusal may be helpful in developing treatments that more precisely match the sources of reinforcement that maintain the problems.

A second rationale for applying functional analysis to the assessment of food refusal is that selecting a function-based treatment may increase the chances of the new behavior maintaining after the departure of the researcher.

Functional analysis methodologies, initially applied to self-injurious behavior (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994), was adapted to analyze environment-behavior interactions that maintained a wide variety of behavior, such as aggression (e.g., Wacker et al., 1990), destructive behaviors (e.g., Slifer, Ivancic, Parrish, Page, & Burgio, 1986), stereotypy (e.g., Wacker et al., 1990), and tantrums (e.g., Carr & Newson, 1985).

In their article on behavior analytic research, Iwata et al. (1982/1994) formulated a comprehensive and standardized functional analysis methodology that underscored the need for behavior analysts to conduct functional analyses in order to identify conditions maintaining problematic behavior (e.g., Mace, 1994), so as to facilitate development of effective function-based treatments (e.g., Iwata et

al., 1994). Since the Iwata et al. (1982) article, other behavior analysts have stressed the importance of conducting functional analyses for identifying effective treatments (e.g., Hanley, Iwata, & McCord, 2003; Northup et al., 1991; Wacker et al., 1994). In addition, other analysts have stressed the importance of conducting functional analyses when developing treatments for food refusal (e.g., Reed et al., 2004; Sevin, Gullota, Sierp, Rosica, & Miller, 2002; Shore, Babbitt, Williams, Coe, & Snyder, 1998).

Using a functional analysis in the treatment of food refusal is important for several reasons: First, several researchers (e.g., Ahearn, Kerwin, Eicher, Shantz, & Swearingin, 1996; Hoch, Babbitt, Coe, Krell, & Hackbert, 1994; Piazza et al., 2003) have hypothesized that feeding problems are, at least in part, learned behaviors that develop as a result of a child's interactions with the environment. For example, regardless of feeding problem, parents use a variety of consequences to encourage their children to eat. Parents may terminate the meal when the child displays refusal behaviors such as crying, tantrums, and hitting the feeding utensil. Parents may also provide attention, such as saying, "eat your spinach it will make you strong", or play the "airplane" game contingent on the child displaying food refusal behaviors. More than not the parents may even present the child with a more preferred food, such as cereal, when the child refuses to eat a less preferred food.

Second, understanding the functional characteristics of feeding problems may increase the probability that effective interventions directly addressing the function(s) of the problem behavior will be developed, because different forms of treatment may be indicated based on the function of the behavior. Even though children engage in food refusal behaviors, the function of the behaviors may be different for each child. Conducting a functional analysis may help researchers discover condition(s) maintaining food refusal and develop individualized, function-based treatments. In turn, this gives the researchers more confidence their treatment recommendations are valid.

The primary purpose of this paper is to review the use of functional analysis (e.g., Iwata et al., 1982) in behavioral interventions aimed at treating food refusal in children as seen in the *Journal of Applied Behavior Analysis (JABA)* (1982-2005). Although a number of journals are relevant to this topic (e.g., the *Journal of Autism and Developmental Disorders*), *JABA* was selected for review because it: (1) has published over 100 articles focusing on food refusal, (2) is one of the highest ranked and most often cited journals in behavioral psychology, and (3) has displayed effective methods for promoting behavior changes in children (e.g., Lattin & Mace, 1993).

### Method

The author searched *PsychInfo* (1982-2005) using the keywords "JABA" and "food refusal", and found 106 abstracts. Those abstracts were then reviewed to identify articles that included children (2-11 years of age) who exhibited food refusal behaviors. Those articles were examined to identify studies that included behavioral techniques aimed at improving food acceptance behavior among children engaging in food refusal; 22 studies were found. Those 22 articles were reviewed to identify studies that reported using a functional analysis prior to the development of a treatment. The author also examined the treatments implemented in each study.

### Results

Surprisingly few of the reviewed studies conducted a functional analysis of food refusal, even though such procedures (i.e., functional analyses) have proven useful in developing effective interventions for other behavior problems mentioned previously (e.g., Fisher, Piazza, & Page, 1989; Mace & Lalli, 1991; Piazza, Hanley, & Fisher, 1996). Of the 22 food refusal articles reviewed, only two studies (e.g., Najdouski, Wallace, Doney, & Ghezzi, 2003; Piazza et al., 2003) reported conducting a functional analysis of food refusal. Both studies demonstrated that a functional analysis can be helpful in

the identification of variables maintaining food refusal, as well as the identification of effective treatments.

The study conducted by Piazza et al., (2003) applied the functional analysis described by Iwata et al. (1982/1994) to inappropriate mealtime behaviors of 15 children with feeding problems. However, the authors did not develop a function-based treatment after conducting the functional analysis. The authors suggested that a functional analysis may be useful in identifying variables that affect feeding problems.

The study conducted by Najdouski et al. (2003) extended the results of Piazza et al., (2003) by developing a function-based treatment based on their functional analysis results. The authors applied the functional analysis procedure described by Iwata et al. (1982/1994) to the food refusal of a 5-year-old child with autism. The results of the functional analysis showed that negative reinforcement maintained the child's food refusal therefore the authors implemented an escape extinction procedure. Results showed that in addition to identifying an effective function-based treatment, the treatment effectively increased food acceptance, and the data demonstrated both maintenance for at least three months post-research and generalization to other novel foods.

Out of the 22 studies reviewed, primarily two types of behavioral interventions, escape extinction and differential reinforcement were used to treat food refusal in the reviewed studies (e.g., Hoch et al., 1994; Hyman et al., 1986; Riordan et al., 1984). I will briefly discuss the two types. The first type of intervention used with food refusal was escape extinction, such as non-removal of the spoon and physical guidance. These procedures prevent the child from avoiding opportunities to eat by either having the feeder hold the utensil to the child's mouth until acceptance, or physically guiding the mouth open contingent upon refusal. The second type of intervention used with food refusal was differential reinforcement. This procedure reinforces food consumption by providing the child with access to a preferred food and social praise contingent on accepting and swallowing bites of a non-preferred food.

Seventeen of the 22 studies reported using escape extinction with reinforcement (e.g., Gulotta, Piazza, Patel, & Layer, 2005; ) For example, Gulotta et al. (2005) documented the effectiveness of holding the spoon to the child's mouth until the child accepted the bite whereas Riordan et al. (1984) documented the effectiveness of physically guiding the mouth open contingent upon refusal. Both studies reinforced food acceptance. Although these interventions differ procedurally, they both combine extinction of an escape response (i.e., food refusal). In sum, data from the reviewed studies suggest that an escape extinction procedure is effective in increasing food consumption.

Five of the 22 studies reported using only a differential reinforcement procedure (e.g., Coe, et al., 1997; Hoch et al., 1994; Patel, Piazza, Martinez, Volkert, & Santana, 2002; Riordan et al., 1984). However, the authors of the studies suggested that differential reinforcement alone was not effective in increasing food acceptance. For example, Patel et al. (2002) reported that differential reinforcement alone was not effective for increasing consumption. However, when the authors implemented an escape extinction component the participants' food acceptance increased. Hoch et al. (1994) reported similar results in that reinforcement for acceptance alone was not effective at increasing consumption to an acceptable level. In sum, data from the reviewed studies suggest that differential reinforcement alone was not effective in increasing food acceptance.

In summary it is important to remember that the selection of an appropriate treatment for food refusal is dependent not only upon the effectiveness of the treatment but the functional characteristics of food refusal as well, because there are likely multiple etiologies of food refusal behavior.

## Discussion

An inspection of research on severe behavior disorder in *JABA* provides evidence of the overall effects of the functional analysis methodology on the behavior analytic field (e.g., Wacker et al., 1994). Even though a decade of research has increased confidence in the effectiveness of the functional analysis treatment model and has encouraged its widespread use (e.g., Mace, 1994), it has been used infrequently in the assessment of feeding problems (e.g., Piazza et al., 2003).

An interesting discovery to this review is that even though only two of the reviewed studies reported using a functional analysis procedure, over half of the reviewed studies (e.g., Patel, Piazza, Layer, Coleman, & Swartzwelder, 2005; Piazza et al., 2003; Reed et al., 2004; Sevin et al., 2002; Shore et al., 1998) suggested that functional analyses of conditions maintaining food refusal may be helpful in the identification of effective treatments for food refusal, and more studies should conduct functional analyses prior to developing treatments for food refusal.

In spite of the indications that there may be a behavioral component to food refusal, very little research has attempted to systematically evaluate conditions maintaining food refusal. Such research would be useful in several aspects. First, it would provide methods for developing function-based treatment. Second, direct assessment with children would suggest methods for studying parent-child interactions during mealtimes. This would hopefully lead to the design and evaluation of parent training programs that may help remediate and prevent food refusal problems whose origin is primarily or partially behavioral in nature (e.g., Patel et al., 2005; Riordan et al., 1984). Third, using functionally appropriate treatments may increase the chances of the new eating behavior maintaining after the departure of the researcher. For example, of the reviewed studies only the two studies (e.g., Najdouski et al., 2003; Piazza et al., 2003) that reported using a functional analysis procedure also reported long-term follow-up data. Lastly, systematically observing changes in food refusal behaviors across assessment conditions provides researchers more confidence that their treatment recommendations are valid.

"Instead of attempting to determine the appropriateness of an intervention based on its name, structure, or presumed aversiveness, perhaps researchers should systematically determine the effectiveness of function-based interventions." (Hanley, Piazza, Fisher, & Maglieri, 2005, p. 63). In summary, an analysis of the behavioral function of food refusal may lead to more effective treatments, and further research is needed in this area. In order to add to our understanding of feeding disorders, future studies may want to include a functional analysis as a first step in developing function-based treatments.

## References

- \*Ahearn, W. H., Kerwin, M. E., Eicher, P. S., Shantz, J., & Swearingin, W. (1996). An alternating treatments comparison of two intensive interventions for food refusal. *Journal of Applied Behavior Analysis*, 29, 321-332.
- Ayllon, T., & Michael, J. (1959). The psychiatric nurse as a behavioral engineer. *Journal of the Experimental Analysis of Behavior*, 2, 323-334.
- Babbitt, R. L., Hoch, T. A., & Coe, D. A. (1994). Behavioral feeding disorders. In D. Tuchman & R. Walters (Eds). *Pediatric feeding and swallowing disorders: Pathology, diagnosis, and treatment*. San Diego, CA: Singular Publishing Group.

- Bijou, S. W., Peterson, R. F., & Ault, M. H. (1968). A method to integrate descriptive and experimental field studies at the level of data and empirical concepts. *Journal of Applied Behavior Analysis, 1*, 175-191.
- Budd, K. S., McGraw, T. E., Farbisz, R., Murphy, T. B., Hawkins, D., Heilman, N, et al. (1992). Psychosocial cocomitants of children's feeding disorders. *Journal of Pediatric Psychology, 17*, 81-94.
- Carr, E. G., & Newsom, C. (1985). Demand-related tantrums. *Behavior Modification, 9*, 403-426.
- \*Coe, D. A., Babbitt, R. L., Williams, K. E., Hajmihalis, C., Snyder, A. M., Ballard, C., et al. (1997). Use of extinction and reinforcement to increase food consumption and reduce expulsion. *Journal of Applied Behavior Analysis, 30*, 581-583.
- \*Cooper, L. J., Wacker, D. P., McComas, J. J., Brown, K., Peck, S. M., Richman, D., et al. (1995). Use of component analyses to identify active variables in treatment packages for children with feeding disorders. *Journal of Applied Behavior Analysis, 28*, 139-153.
- \*Dawson, J. E., Piazza, C. C., Sevin, B. M., Gulotta, C. S., Lerman, D., & Kelley, M. L. (2003). Use of the high-probability instructional sequence and escape extinction in a child with food refusal. *Journal of Applied Behavior Analysis, 36*, 105-108.
- Fisher, W. W., Piazza, C. C., & Page, T. (1989). Assessing independent and interactional effects of behavioral and pharmacological interventions for a client with dual diagnosis. *Journal of Behavior Therapy and Experimental Psychiatry, 20*, 241-250.
- \*Greer, R. D., Dorow, L., Williams, G., McCorkle, N., & Asnes, R. (1991). Peer-mediated procedures to induce swallowing and food acceptance in young children. *Journal of Applied Behavior Analysis, 24*, 783-790.
- \*Gulotta, C. S., Piazza, C. C., Patel, M. R., and Layer, S. A. (2005) Using food redistribution to reduce packing in children with severe food refusal. *Journal of Applied Behavior Analysis, 38*, 39-50.
- \*Hagopian, L. P., Farrell, D. A., & Amari, A. (1996). Treating total liquid refusal with backward chaining and fading. *Journal of Applied Behavior Analysis, 29*, 573-575.
- Hanley, G. P., Iwata, B. A., & McCord, B. E. (2003). Functional analysis of problem behavior: A review. *Journal of Applied Behavior Analysis, 36*, 147-185.
- Hanley, G. P., Piazza, C. C., Fisher, W. F., & Maglieri, K. A. (2005). On the effectiveness of and preference for punishment and extinction components of function-based interventions. *Journal of Applied Behavior Analysis, 38*, 51-65.
- Hoch, T. A., Babbitt, R. L., Coe, D. A., Krell, D. M., & Hackbert, L. (1994). Contingency contracting: Combining positive reinforcement and escape extinction procedures to treat persistent food refusal. *Behavior Modification, 18*, 106-128.
- Howard, R. B., & Cronk, C. (1983). Nutrition and development. In M. D. Levine, W. B. Carey, A. C. Crocker, & R. T. Gross (Eds.), *Developmental behavioral pediatrics* (pp. 412-426). Philadelphia: Saunders.

- Hyman, S. L., Coyle, J. T., Parke, J. C., Porter, C., Thomas, G. H., Jankel, W., et al. (1986). Anorexia and altered serotonin metabolism in a patient with argininosuccinic aciduria. *Journal of Pediatrics*, *108*, 705-709.
- Iwata, B., A., Dorsey, M. F., Slifer, K. J., Bauman, K. E., & Richman, G. R. (1994). Toward a functional analysis of self-injury. *Journal of Applied Behavior Analysis*, *27*, 197-209. (Reprinted from *Analysis and Intervention in Developmental Disabilities*, *2*, 3-20, 1982).
- Iwata, B. A., Pace, G. M., Dorsey, M. F., Zarcone, J. R., Vollmer, T. R., Smith, R. G., et al. (1994). The functions of self-injurious behavior: An experimental-epidemiological analysis. *Journal of Applied Behavior Analysis*, *27*, 215-240.
- \*Kahng, S., Boscoe, J. H., & Byrne, S. (2003). The use of an escape contingency and a token economy to increase food acceptance. *Journal of Applied Behavior Analysis*, *36*, 349-353.
- \*Kahng, S., Tarbox, J., & Wilke, A. E. (2001). Use of a multi-component treatment for food refusal. *Journal of Applied Behavior Analysis*, *34*, 93-96.
- \*Kerwin, M. E. Ahearn, W. H. Eicher, P. S. & Burd, D. M. (1995). The costs of eating: A behavioral economic analysis of food refusal. *Journal of Applied Behavior Analysis*, *28*, 245-260.
- Laties, V. G., & Mace, F. C. (1993). Taking stick: The first 25 years of the Journal of Applied Behavior Analysis. *Journal of Applied Behavior Analysis*, *25*, 513-525.
- Luiselli, J. K. (1989). Behavioral assessment and treatment of pediatric feeding disorders in developmental disabilities. In M. Hersen, R. M. Eisler, & P. M. Miller (Eds.), *Progress in behavior modification* (pp. 91-131). Newbury Park, CA: Sage.
- Luiselli, J. K., & Gleason, D. J. (1987). Combining sensory reinforcement and texture fading procedures to overcome chronic food refusal. *Journal of Therapy and Experimental Psychiatry*, *18*, 149-155.
- Mace, F. C. (1994). The significance and future of functional analysis methodologies. *Journal of Applied Behavior Analysis*, *27*, 385-392.
- Mace, F. C., & Lalli, J. S. (1991). Linking descriptive and experimental analyses in the treatment of bizarre speech. *Journal of Applied Behavior Analysis*, *24*, 553-562.
- \*Najdouski, A. C., Wallace, M. D., Doney, J. K., & Ghezzi, P. M. (2003). Parental assessment and treatment of food selectivity in natural settings. *Journal of Applied Behavior Analysis*, *36*, 383-386.
- Northup, J., Wacker, D., Sasso, G., Steege, M., Cigrand, K., Cook, J., et al. (1991). A brief functional analysis of aggressive and alternative behavior in an out clinic setting. *Journal of Applied Behavior Analysis*, *24*, 509-522.
- Oates, R. K., Peacock, A., & Forrest, D. (1985). Long-term effects of nonorganic failure to thrive. *Pediatrics*, *75*, 36-40.
- O'Brien, S., Repp, A. C., Williams, G. E., & Christophersen, E. R. (1991). Pediatric feeding disorders. *Behavior Modification*, *15*, 394-418.

- Palmer, S., Thompson, R. J., & Linscheid, T. R. (1975). Applied behavior analysis in the treatment of childhood feeding problems. *Developmental Medicine and Child Neurology*, 17, 333-339.
- \*Patel, M. R., Piazza, C. C., Kelly, M. L., Ochsner, C. A., & Santana, C. M. (2001). Using a fading procedure to increase fluid consumption in a child with feeding problems. *Journal of Applied Behavior Analysis*, 34, 357-360.
- \*Patel, M. R., Piazza, C. C., Layer, S. A., Russell Coleman, R., & Swartzwelder, D. M. (2005). A systematic evaluation of food textures to decrease packing and increase oral intake in children with pediatric feeding disorders. *Journal of Applied Behavior Analysis*, 38, 89-100
- \*Patel, M. R., Piazza, C. C., Martinez, C. J., Volkert, V. M., & Santana, C. M. (2002). An evaluation of two differential reinforcement procedures with escape extinction to treat food refusal. *Journal of Applied Behavior Analysis*, 35, 363-374.
- \*Piazza, C. C., Fisher, W. W., Brown, K. A., Shore, B. A., Patel, M. R., Katz, R. M., et al. (2003). Functional analysis of inappropriate mealtime behaviors. *Journal of Applied Behavior Analysis*, 36, 187-204.
- Piazza, C. C., Hanley, G. P., & Fisher, W. W. (1996). Functional analysis and treatment of cigarette pica. *Journal of Applied Behavior Analysis*, 29, 437-450.
- \*Piazza, C. C., Patel, M. R., Gulotta, C. S., Sevin, B. M., & Layer, S. A. (2003). On the relative contributions of positive reinforcement and escape extinction in the treatment of food refusal. *Journal of Applied Behavior Analysis*, 36, 309-324.
- \*Reed, G. K., Dolezal, D. N., Cooper-Brown, L. J., & Wacker, D. P. (2005). The effects of sleep disruption on the treatment of a feeding disorder. *Journal of Applied Behavior Analysis*, 38, 243-245.
- \*Reed, G. K., Piazza, C. C., Patel, M. R., Layer, S. A., Bachmeyer, M. H., Bethke, S. D., et al. (2004). On the relative contributions of noncontingent reinforcement and escape extinction in the treatment of food refusal. *Journal of Applied Behavior Analysis*, 37, 27-42.
- Reilly, S., Skuse, D., & Poblete, X. (1996). Prevalence of feeding problems and oral motor dysfunction in children with cerebral palsy: A community survey. *Journal of Pediatrics*, 129, 877-882.
- \*Riordan, M. M., Iwata, B. A., Finney, J. W., Wohl, M. K., & Stanley, A. E. (1984). Behavioral assessment and treatment of chronic food refusal in handicapped children. *Journal of Applied Behavior Analysis*, 17, 327-341.
- \*Sevin, B. M., Gulotta, C. S., Sierp, B. J., Rosica, L. A., & Miller, L. J. (2002). Analysis of response covariation among multiple topographies of food refusal. *Journal of Applied Behavior Analysis*, 35, 65-68.
- \*Shore, B. A., Babbitt, R. L., Williams, K. E., Coe, D. A., & Snyder, A. (1998). Use of texture fading in the treatment of food selectivity. *Journal of Applied Behavior Analysis*, 31, 621-633.
- Sisson, K. A., & Van Hasselt, V. B. (1989). Feeding disorders. In J. K. Luiselli (Ed.), *Behavioral medicine and developmental disabilities* (pp. 45-73). New York: Springer-Verlag.

- Slifer, K. J., Ivancic, M. T., Parrish, J. M., Page, T. J., & Burgio, L. (1986). Assessment and treatment of multiple behavior problems exhibited by a profoundly retarded adolescent. *Journal of Behavior Therapy and Experimental Psychiatry*, 17, 203-213.
- Wacker, D. P., Berg, W. K., Cooper, L. J., Derby, M., Steege, M. W., Northup, J., et al. (1994). The impact of functional analysis methodology on outpatient clinic services. *Journal of Applied Behavior Analysis*, 27, 405-407.
- Wacker, D. P., Steege, M. W., Northup, J., Sasso, G., Berg, W., Reimers, et al. (1990). A component analysis of functional communication training across three topographies of severe behavior problems. *Journal of Applied Behavior Analysis*, 23, 417-429.
- \*Werle, M. A., Murphy, T. B., & Budd, K. S. (1993). Treating chronic food refusal in young children: Home-based parent training. *Journal of Applied Behavior Analysis*, 26, 421-433.

#### Author's Note

References marked with an asterisk (\*) indicate studies included in the meta-analysis

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## Using Operant Techniques With Humans Infants

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The purpose of the current article is to highlight the importance of operant techniques in developmental research. Although many researchers employ operant techniques within their individual fields of study, the pervasive nature of these techniques is not often acknowledged in the general literature. The present article describes the history of the use of operant techniques in developmental contexts and summarizes current basic research using this approach across a variety of disciplines. In addition, the recent use of operant techniques to explore cognitive development and the unique advantages it brings to this field over more traditional approaches are highlighted. Finally, the application of these techniques to clinical contexts is presented to demonstrate the usefulness of operant procedures with clinical populations.

Keywords: Infants, premature infants, operant techniques, operant learning, cognitive processes, development.

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Operant learning has long been used as a tool for investigation of a wide range of issues. A substantial portion of current learning theory, as well as clinical and basic research applications, draws from this body of work. The use of operant techniques in developmental investigations, while substantial, is not often discussed or acknowledged in the general literature, and awareness of the application of these techniques to clinical situations is also sometimes seen as inadequate. In addition, the use of operant techniques to explore the development of cognitive concepts has been gaining momentum and may help address some of the interpretative problems that arise from using other measures, such as habituation of an orienting response. The goal of the present article is to describe the history of the use of operant techniques in developmental contexts, summarize current basic research using this approach, address the issue of using operant procedures in the evaluation of cognitive concepts, and then present briefly a set of clinical investigations that have used these techniques in examining issues of interest to the developmental research community.

### *An Abbreviated History of Operant Learning in Infants*

The first attempts to demonstrate the basic principles of operant learning in human infants were published primarily during the 1950's and 1960's. Prior to this time, many developmental psychologists believed that an infant's brain lacked the developmental maturity needed to acquire traditional operant learning and classical conditioning. As technology became more sophisticated and researchers became more astute in choosing behaviors that were appropriate for an infant's unique behavioral milieu, researchers began to demonstrate that infants could display the basic principles of operant learning. For example, Lipsitt and colleagues studied multiple aspects of infant sucking behaviors using operant conditioning (Clifton, Siqueland, & Lipsitt, 1972; for review see Lipsitt, Crook, & Booth, 1985; Lipsitt & Kaye, 1964; Lipsitt, Kaye, & Bosack, 1966; Siqueland & Lipsitt, 1966), as well as other aspects of operant conditioning, relating sucking and heartbeat (e.g., Lipsitt, Reilly, Butcher, & Greenwood, 1976). (See also Weisberg & Rovee-Collier, 1998, pp. 325-333, for a review of the early history of operant learning in human infants).

A review of the literature following those seminal studies reveals a wide variety of flexible operant learning tools for use with infants, in terms of both the operant response and the type of reinforcement used. For example, infants will display operant head-turning to suck on a nonnutritive nipple (Siqueland, 1968), for auditory-visual reinforcement (Berg & Boswell, 1998; Goodsitt, Morgan, & Kuhl, 1993; Montgomery & Clarkson, 1997) and for social interaction (Tyler & McKenzie, 1990). Infants will show operant sucking for the sound of a heart beat (DeCasper & Sigafos, 1983) or for the sound of

singing (DeCasper & Carstens, 1981). Infants have been trained to use their hands to operate various manipulanda, including a sphere-shaped switch, touch-sensitive panels and touch-sensitive computer monitors (Bailey, Deni, & Finn-O'Connor, 1988; Darcheville, Rivière, & Wearden, 1993; Gerhardstein, Kraebel, Gillis, & Lassiter, 2002; Rheingold, Stanley, & Cooley, 1962; Simmons & Lipsitt, 1961) as well as engage in arm pulls for auditory-visual reinforcement (Alessandri, Sullivan, Imaizumi, & Lewis, 1993; Timmons, 1994). Infants can show operant kicking for only visual reinforcement, only auditory reinforcement, or for both (Kraebel, Fable, & Gerhardstein, 2004; McKirdy & Rovee, 1978; Rovee & Rovee, 1969). Neonates will show operant directional motility for tactile and kinesthetic reinforcement from a stuffed toy that simulates a rhythmic breathing pattern (Thoman & Ingersoll, 1993). Infants have also shown operant vocalization for both social reinforcement (Ramey & Ourth, 1971; Todd & Palmer, 1968) and nonsocial reinforcement (Tomlinson-Keasey, 1972), although it should be noted that there is a debate as to whether vocalizations for social reinforcement follow principles of operant learning; see Poulson and Nunes (1988) and Bloom (1979) for critiques of this literature.

### *Use of Operant Techniques in Basic Developmental Research*

The demonstration that infants display the basic principles of operant learning across a variety of tasks has allowed researchers to use operant procedures as a tool to explore various aspects of human infant development. Operant learning procedures have been used to examine emotional/social development, perceptual development, and learning and memory processes. For example, in the area of emotional/social development, Gerwitz (1972) presented a theory of infant human attachment based on principles of operant conditioning, and several researchers have examined correlations between different aspects of temperament and infants' performance in operant tasks (Dunst & Lingerfelt, 1985; Fagen, Ohr, Singer, & Fleckenstein, 1987).

In the realm of perceptual development, operant training has been used to examine infants' auditory thresholds for pure tones and noise bursts (Berg, 1991; Berg & Boswell, 1995), as well as their ability to discriminate harmonic tonal complexes (Montgomery & Clarkson, 1997). de Schonen (1990) demonstrated that operant procedures could be used to assess discrimination of faces, and Dunst (1984) used operant procedures to examine visual attention. Aspects of feature detection and visual search (Treisman, 1988, 1991; Treisman & Gelade, 1980) have also been examined using operant procedures (Bhatt & Rovee-Collier, 1997; Bhatt, Rovee-Collier, & Weiner, 1994; Gerhardstein, Liu, & Rovee-Collier, 1998; Gerhardstein, Renner, & Rovee-Collier, 1999; Rovee-Collier, Hankins, & Bhatt, 1992). For example, Adler, Inslight, Rovee-Collier, and Gerhardstein (1998) trained 3-month-old infants to kick to move a mobile displaying either 'R' or 'P' characters. The important difference, from the perspective of Treisman's account of visual search, is that the R is a P with an extra feature (and conversely, the P is an R with one feature removed). Thus, Treisman's theory predicts (and Treisman and Gelade have shown) that an R will "pop-out" from a background of P-distractors, but that the reverse arrangement will not elicit a pop-out effect, resulting in what Treisman termed a "search asymmetry". Adler et al. (1998) found that 3-month-olds show the same asymmetry in search for these features: Following training with a mobile displaying all 'R' characters, the infants gave a recognition response to a mobile displaying one familiar 'R' and 6 novel 'P' characters, but the reverse situation did not elicit a recognition response. Other investigations using the mobile method have investigated various aspects of visual search in infants (Bhatt et al., 1994; Gerhardstein et al., 1998; Rovee-Collier, Bhatt, & Chazin, 1996), and using a touch screen operant method in children (Gerhardstein et al., 2002; Gerhardstein & Rovee-Collier, 2002). These investigations have firmly established that infant visual perception includes an active, although not mature (Bhatt & Rovee-Collier, 1994; Gerhardstein et al., 2002; Gerhardstein & Rovee-Collier, 2002) system for rapid detection of perceptually important visual features.

The use of operant procedures to understand human infant development has had its largest impact in the area of learning and memory. For example, DeCasper and Carstens (1981) and Floccia, Christophe

and Bertoncini (1997) examined the influence of different learning contingencies using nonnutritive sucking in infants less than 3 days old. Hildreth and Hill (2003) examined the role of retrieval processes in infants' retention of newly acquired and reactivated memories. The most prolific contributor, however, to understanding learning and memory processes in human infants using an operant procedure is Carolyn Rovee-Collier (Rovee & Fagen, 1976; Rovee-Collier & Capatides, 1979; Rovee-Collier, Hayne, & Colombo, 2001; Rovee-Collier & Sullivan, 1980; Rovee-Collier, Sullivan, Enright, Lucas, & Fagen, 1980). Rovee-Collier has focused on issues related to infant memory for much of her career, and the interested reader should refer to Rovee-Collier et al. (2001) for a lengthy presentation of investigations of the development of memory using operant conditioning. Rovee-Collier and her colleagues have studied the influence of retention intervals (Sullivan, Rovee-Collier, & Tynes, 1979) as well as massed and distributed practice (Enright, Rovee-Collier, Fagen, & Caniglia, 1983; Vander Linde, Morrongiello, & Rovee-Collier, 1985) on learning and memory processes. They have explored the role of reactivation treatments/reminder cues in memory processes (e.g. Boller, Rovee-Collier, Borovsky, O'Connor, & Shyi, 1990; Fagen, Yengo, Rovee-Collier, & Enright, 1981; Hill, Borovsky, & Rovee-Collier, 1988; Rovee-Collier & Sullivan, 1980; Rovee-Collier et al., 1980), and they have examined the role of contextual influences on learning and memory (Rovee-Collier, Griesler, & Earley, 1985). Finally, the work of Rovee-Collier and her colleagues has been pivotal in addressing theories of multiple memory systems (Gerhardstein, Adler, & Rovee-Collier, 2000; Rovee-Collier et al., 2001).

### *Use of Operant Techniques to Examine Cognitive Processes*

The use of operant procedures to examine infant development has recently expanded into realm of cognitive development. Below, we review a list of these procedures, with the tacit understanding that this is not an exhaustive list, and that the work of a number of the researchers listed above would also occur as part of such a list.

#### *Categorization*

The development of categorization has been investigated using multiple techniques (see Wasserman & Rovee-Collier, 2001 for review). Bomba and Siqueland (1983) published one of the first such investigations, examining infants' use of prototypes in a shape category test. Greco, Hayne, and Rovee-Collier (1990) used the mobile conjugate reinforcement procedure to investigate 3-month-olds' capacity for categorization. Greco et al. trained infants to kick to move an overhead crib mobile using a 4-day procedure. The infants saw three mobiles during each of three daily sessions (in a different order each day). The mobiles all displayed a set of toy blocks with a large numeral "2", but differed in terms of the color of the blocks (red, blue, or green). Infants were then tested on the 4th day (24-hour delay) with the same "2" blocks, but in a novel color (e.g., yellow). Pilot testing had established that infants were capable of discriminating between all of the colors used, but the infants in the test following multiple color exposure showed a strong retention (recognition) response to the novel-colored "2" blocks. Infants tested with blocks showing an "A" on each face, however, gave a non-retention (discrimination) response after the delay, showing that the details of the mobile were encoded and could influence responding. This finding of discrimination performance eliminated the possibility that the infants in the novel-color group were simply generalizing after three days of training, and overall, this investigation showed that the operant procedure is capable of eliciting a categorical response even after a relatively long delay.

#### *Serial Order*

Tests of serial order appeared in the adult memory literature as early as Ebbinghaus (1964), and have elicited much scrutiny, but it was traditionally thought that infants younger than one year were not capable of this type of short-term memory. Gulya, Rovee-Collier, Galluccio, and Wilk (1998) examined this issue in 3- and 6-month-old infants using the mobile operant training approach. Infants were trained

using a sequence of mobiles (ABC) each day for three days, and then tested to see which of the three would serve as an effective memory retrieval cue on the fourth day. If a 3- or 6-month-old infant was not cued prior to the test, mobile A was the best cue. If an infant received mobile A as a 1-min cue prior to the test, mobile B, but not C, elicited responding. If A and B were presented as cues, only mobile C functioned to cue infants' responding. These test groups demonstrate that this type of short-term memory is functioning in young infants and can be accessed through the use of an operant procedure.

### *Object Knowledge*

A number of aspects of visual recognition of objects have been investigated using operant conditioning. Gerhardstein and colleagues have used the mobile procedure to test 3-month-old infants' ability, following training with various levels of viewpoint, to perceive the invariant (3D) form of an object. This was accomplished by training the infants to kick to move a computerized mobile (for details, see Kraebel et al., 2004) that controlled the range of motion of the objects on the mobile, and then testing for recognition with either the same view as presented during training, a novel view of the same object, or a novel object. Infants proved to be able to transfer training from a learned view to a novel view, for both simple (West, Kraebel, & Gerhardstein, 2005) and complex, multi-part (Kraebel & Gerhardstein, 2005) objects, but only when the range of views presented during training was sufficiently large. Restricted training ranges did not elicit recognition responses when novel views were presented during the test session.

### *Advantages of Operant Techniques in Examining Cognitive Concepts*

The difficulty of conducting research into cognitive development with young infants is compounded by the limited types of response that they are capable of producing (Haith, 1998). Infants are simply not able to produce the linguistically-based responses that studies using adult participants typically rely on (e.g., "this object is a member of that category"). This lack of language limits researchers to non-verbal measures, predominantly "looking-time" procedures, as a means of assessing infants' understanding of their world. Investigations using standard looking-time procedures typically present an infant with a visual stimulus and then measure the amount of time spent looking at the stimulus over a series of infant-controlled trials. Once the infant has reached a pre-determined habituation criterion, a test stimulus is presented. An increase in looking time to the test stimulus is presumed to reflect renewed interest/attention and evidence of discrimination between the initial habituation stimulus and the test stimulus. Recently, a debate has emerged as to the type of inferences that can be drawn from looking-time data (Cohen, 2004; Mareschal, 2000). Haith (1998) argued that adult-centric cognitive constructs (such as "expectations", "representations", and "surprise") should not be invoked unless perceptual accounts are ruled out (but see Baillargeon, 2000; Spelke, 1998).

To illustrate this point, Wynn (1992) investigated 5-month-olds' understanding of simple addition and subtraction. In a "1+1" condition, infants were shown a doll that was subsequently hidden behind an occluding screen. Next, the infants saw a hand bringing a second doll into the infant's view, which was then placed behind the occluder (thereby adding one doll to the total). The occluder was removed, revealing either one doll or two dolls. Infants looked longer at the one doll outcome, presumably because they were surprised to see only one doll in this "1+1" condition. In the "2-1" condition, infants were initially shown two dolls that were subsequently hidden by an occluder. Infants then saw a hand remove one of the dolls from behind the occluder (thereby subtracting one doll from the total). The occluder was removed, leaving either one or two dolls. Infants looked longer at the two-doll outcome, again, presumably because they were surprised to see two dolls in this "2-1" condition. Wynn inferred from these looking-time data that young infants possess an understanding of numeric concepts.

The conclusion that 5-month-old infants have an understanding of simple mathematical operation may, however, be premature. Haith (1998) argued that the infants in Wynn (1992) could be responding to a perceptual mismatch to some initial sensory memory of the individual dolls prior to being hidden away from view. When the occluder was removed in the “1+1” condition revealing only one doll, the infants could have simply detected the mismatch between the sensory memory of two dolls and the actual perception of one doll. The mismatch resulted in an increase in looking times, but that increase was not necessarily due to an understanding of the “1+1” addition operation. Cohen and Marks (2002) argued that Wynn’s findings could be better explained by a familiarity preference and a preference for a greater number of objects. These perceptual accounts offer a more direct explanation of Wynn’s looking-time data without the need to posit the existence of the cognitive concept of numbers in young infants.

The use of operant learning techniques offers an advantage over the traditional looking time studies when assessing cognitive facilities. In traditional looking-time procedures, often only a few seconds separates the habituation phase from the test phase. Given such a brief time frame, sensory level responding may contribute to any observed differences in looking-time. In typical operant learning procedures, such as the mobile reinforcement procedure, infants’ responding at test is not dependent on any immediate sensory-level changes between training and test because the infants are tested 24 hr after training. Thus, responses from the infants at test must be due to a long-term representation (therefore, not sensory level impressions) stored in memory. This represents a significant advantage of an operant procedure to assess a higher level cognitive concept, such as object knowledge, because it allows the experimenter, by manipulating an object’s characteristics between training and test, to determine which characteristics make up the infant’s memorial representation of that object (see Rovee-Collier & Gerhardstein, 1997).

It is important to recognize, however, that the issue of applying adult-centric cognitive constructs in young infants must be done cautiously in all paradigms, including operant-learning studies. Gewirtz and Pelaez-Nogueras (1992) argued that many researchers who use instrumental conditioning with infants inappropriately employ higher-level constructs such as “expectancies” to explain their data without careful consideration of well-established principles of reinforcement. Fagen, Morrongiello, Rovee-Collier, and Gekoski (1984) investigated expectancies in 3-month-olds using the mobile operant-learning procedure. Fagen et al.’s infants were trained and tested over four days to kick to move a crib mobile. Infants (in Exp. 1) were placed in one of three groups: AAAA in which infants were shown the same mobile across the four days; ABCD in which infants were shown a different mobile on each of the four days; and ABCA in which the infants were shown the same mobile only on the first and last day. The infants in AAAA steadily increased their kicking rate on each day, which has been well-documented. The infants in ABCD also increased their rate of kicking; they learned to “expect” a different mobile on each day, according to Fagen et al. (1984). The infants in ABCA did not show an increase in kicking on the fourth day. Fagen et al. (also Fagen, 1993) argued that the principles of reinforcement would have predicted a rise in response on the fourth day because mobile A was reinforced on the first day. Fagen et al. concluded that the mobile A on the last day violated infants’ expectation of receiving a different mobile on each day and therefore the mobile failed to elicit a kicking response. (Fagen et al. replicated the findings in a second experiment using similar conditions but with 3 days of training.)

Gewirtz and Pelaez-Nogueras (1993) and Schlinger (1993), however, disputed Fagen’s (1993) “expectancy” account. Gewirtz and Pelaez-Nogueras (1993) argued that Fagen invoked expectancy to explain the increased response observed in Fagen et al.’s (1984) ABCD group, but an increase in responding was also used to support the expectancy account. Schlinger (1993) observed that infants in the ABCD condition increased responding even after the first day of operant training. This could be interpreted under the expectancy account as showing that the infants already “expected” a different mobile on the second day, which would not be logical. Gewirtz and Pelaez-Nogueras (1993) also alluded

to intermittent periods of reinforcement and nonreinforcement in Fagen et al.'s (1984) procedure that could explain the findings without invoking expectancy.

Ainsworth, Blehar, Water, and Wall's (1978) classic work on infant attachment offers another example of a study in which multiple interpretations may exist for the recorded data. The procedure in this investigation was to have the caretaker leave the infant alone in a room while the infant's level of discomfort was measured to infer the type of attachment present between parent and child (e.g., an insecure attachment). The problem according to Gewirtz and Pelaez-Nogueras (1992) is that this type of measure neglects the reinforcement history of the infant's distress response (e.g., the extent to which the infant's crying behavior is reinforced by the reappearance of the caretaker). The response of the infant may be unrelated to the type of attachment with the caretaker and may be better predicted by the schedule of reinforcement between infant and caretaker, thus alleviating the need to propose an attachment construct as an explanation of the distress response.

Given recognition of the caution needed in interpreting data aimed understanding cognitive concepts, the question then becomes, at what point would positing a cognitive construct in pre-verbal infants be appropriate? It is obvious that infants are on their way to becoming cognitively-based beings. Cognitive constructs, however, such as "expectation" are very different for infants, children, and adults; they increase in complexity over time. Haith (1998) emphasized the need for graded concepts of cognitive processes to better understand how these constructs develop (e.g., detecting mismatches between perception and memory leads to the development of detecting quantity changes, which at some point, leads to grasping of simple arithmetic operations). This approach will push research away from the dichotomous presence/absence of a cognitive construct, and toward addressing how constructs develop.

#### *Use of Operant Techniques in Clinical Applications*

Operant tasks have also been utilized to examine learning and memory in clinical populations. Ohr and Fagen (1991) examined the ability of 3-4-month-old infants with Down's syndrome to learn to kick for visual reinforcement (movement of a crib mobile) and to retain this learned response across a one-week retention interval. They found that infants with Down's syndrome were able to learn and retain the task at levels comparable to those of age-matched infants without Down's syndrome. Wishart (1991), using similar procedures and 1-24-month-old infants in a longitudinal design, found that as development progressed, infants with Down's syndrome utilized counterproductive learning behaviors; older infants showed a preference for reinforcing events generated randomly, and a decline in their contingent response rates. Wishart reported that this dependence on non-contingent reinforcement could be reduced, and the level of conditioned responding increased, by enhancing the success rate of early learning. This enhancement appeared to provide consolidation advantages for the infants' learning as well. Dunst, Cushing, and Vance (1985) applied an operant technique to examine the ability of profoundly retarded, multiply handicapped infants to learn to make specific head turns for visual reinforcement (a multicolored display). Their results showed that although the infants were able to show contingent learning, the use of physical prompts accelerated the acquisition of the response, particularly under conditions of free-operant responding.

Operant tasks have also been employed as diagnostic tools to assess sensory capabilities in infants. Clinical tests of hearing loss (Primus, 1987, 1988; Shaw & Nikolopoulos, 2004; Widen & Keener, 2003) are one such example. Visual reinforcement audiometry (VRA) is consistently used as a method to assess hearing levels in infants. The general procedure involves presenting auditory stimuli to the left or right of an infant's head and observing whether the infant turns their head in the appropriate direction to the sound. The head turn, in many cases is then reinforced with visual stimulation. With continued learning and reinforcement, discrimination between sounds is possible, allowing more detailed examination of hearing deficiencies.

*Use of Operant Techniques for Testing Prenatal and Perinatal Infants*

One area of particular interest in the context of potential clinical applications is the use of operant techniques to test learning and memory in extremely young infants, in particular, prenatal infants prior to their conceptual birth date. The literature contains only a few studies of this clinical population; they are reviewed in some detail as their potential utility for the development of future tests in extremely young infants is substantial.

Thoman and Ingersoll (1993) conducted what appears to be the only investigation of learning in premature infants using operant techniques. Note that the animal literature presents a more complete picture in terms of prenatal learning; for an example, see Smotherman (1982). Thoman and Ingersoll created a "breathing bear" toy, which inflated and deflated at a rate consistent with each individual infant's respiratory rate. The bear also provided potentially comforting tactile stimulation (fur), and previous work had confirmed that full-term infants preferred the breathing bear over a number of other stimuli. The experimenters found that premature infants (mean age 32 weeks at study onset) showed an operantly conditioned decrease in time to contact the breathing bear, relative to premature control infants, who showed an increase in time to contact a non-breathing bear. This finding corresponds well with that of an earlier study reporting that contingent stimulus presentation correlated with success of intervention in premature infants (Barnard & Bee, 1983), and suggests that operant conditioning may have therapeutic value in this population.

Several perinatal tests using operant procedures have been reported in the past 25 years (DeCasper & Carstens, 1981; DeCasper & Sigafos, 1983; Floccia et al., 1997). These tests have applied the work of Lipsitt and colleagues (e.g., Simmons & Lipsitt, 1961) in developing operantly conditioned sucking tests. DeCasper and Sigafos (1983) were able to train perinatal infants to suck to hear the sound of a heart beating, and demonstrated good learning using this procedure. The importance of selecting a stimulus with strong reinforcing valence, however, was underscored by a finding by DeCasper and Prescott (1984), who attempted to operantly train perinatal infants to respond preferentially to their father's voice over an unfamiliar male voice. Despite a demonstration that infants could discriminate between the two voices, the experimenters were unable to elicit a reliable conditioned response when using the father's voice as the reinforcer, suggesting that familiarity may play a role in determining the value of a stimulus as a reinforcer for young infants in the context of operant learning.

*Conclusion*

The use of operant techniques in the field of developmental psychology has enjoyed a long and fruitful history. It is important to recognize the contributions that operant procedures can offer across a wide area of study, including emotional/social development, perceptual development, learning and memory, and cognitive development. Finally, it is equally important to reemphasize the potential of operant techniques to provide assessment tools for both normal and clinical populations of infants and children.

## References

- Adler, S. A., Inslicht, S., Rovee-Collier, C., & Gerhardstein, P. (1998). Perceptual asymmetry and memory retrieval in 3-month-old infants. *Infant Behavior and Development, 21*, 253-272.
- Ainsworth, M. D. S., Blehar, M., Water, E., & Wall, S. (1978). *Patterns of Attachment*. Hillsdale, NJ: Erlbaum.
- Alessandri, S. M., Sullivan, M. W., Imaizumi, S., & Lewis, M. (1993). Learning and emotional responsiveness in cocaine-exposed infants. *Developmental Psychology, 29*, 989-997.

- Bailey, D. C., Deni, R., & Finn-O'Connor, A. (1988). Operant response requirements affect touching of visual reinforcement by infants. *Bulletin of the Psychonomic Society*, 26(2), 118-119.
- Baillargeon, R. (2000). Reply to Bogartz, Shinskey, and Schilling; Schilling; and Cashon and Cohen. *Infancy*, 1(4), 447-462.
- Barnard, K. E., & Bee, H. L. (1983). The impact of temporally patterned stimulation on the development of preterm infants. *Child Development*, 54(5), 1156-1167.
- Berg, K. M. (1991). Auditory temporal summation in infants and adults: Effects of stimulus bandwidth and masking noise. *Perception & Psychophysics*, 50(4), 314-320.
- Berg, K. M., & Boswell, A. E. (1995). Temporal summation of 500-Hz tones and octave-band noise bursts in infants and adults. *Perception & Psychophysics*, 57(2), 183-190.
- Berg, K. M., & Boswell, A. E. (1998). Infants' detection of increments in low- and high-frequency noise. *Perception and Psychophysics*, 60, 1044-1051.
- Bhatt, R. S., & Rovee-Collier, C. (1994). Perception and 24-hour retention of feature relations in infancy. *Developmental Psychology*, 30, 142-150.
- Bhatt, R. S., & Rovee-Collier, C. (1997). Dissociation between features and feature relations in infant memory: Effect of memory load. *Journal of Experimental Child Psychology*, 67, 69-89.
- Bhatt, R. S., Rovee-Collier, C., & Weiner, S. (1994). Developmental changes in the interface between perception and memory retrieval. *Developmental Psychology*, 30, 151-162.
- Bloom, K. (1979). Evaluation of infant vocal conditioning. *Journal of Experimental Child Psychology*, 27(1), 60-70.
- Boller, K., Rovee-Collier, C., Borovsky, D., O'Connor, J., & Shyi, G. (1990). Developmental changes in the time-dependent nature of memory retrieval. *Developmental Psychology*, 26, 770-779.
- Bomba, P. C., & Siqueland, E. R. (1983). The nature and structure of infant form categories. *Journal of Experimental Child Psychology*, 35, 294-328.
- Clifton, R., Siqueland, E. R., & Lipsitt, L. P. (1972). Conditioned headturning in human newborns as a function of conditioned response requirements and states of wakefulness. *Journal of experimental child psychology*, 13(1), 43-57.
- Cohen, L. B. (2004). Uses and Misuses of Habituation and Related Preference Paradigms. *Infant & Child Development*, 13(4), 349-352.
- Cohen, L. B., & Marks, K. S. (2002). How infants process addition and subtraction events. *Developmental Science*, 5(2), 186-201.
- Darcheville, J. C., Rivière, V., & Wearden, J. H. (1993). Fixed-interval performance and self-control in infants. *Journal of the Experimental Analysis of Behavior*, 60(2), 239-254.
- de Schonen, S. (1990). Hemispheric asymmetry in a face discrimination task in infants. *Child Development*, 61, 1192-1205.

- DeCasper, A. J., & Carstens, A. A. (1981). Contingencies of stimulation: Effects on learning and emotion in neonates. *Infant Behavior & Development*, 4(1), 19-35.
- DeCasper, A. J., & Prescott, P. A. (1984). Human newborns' perception of male voices: Preference, discrimination, and reinforcing value. *Developmental Psychobiology*, 17(5), 481-491.
- DeCasper, A. J., & Sigafos, A. D. (1983). The intrauterine heartbeat: A potent reinforcer for newborns. *Infant Behavior & Development*, 6(1), 19-25.
- Dunst, C. J. (1984). Infant visual attention under response-contingent and response-independent conditions. *Journal of Applied Developmental Psychology*, 5(3), 203-211.
- Dunst, C. J., Cushing, P. J., & Vance, S. D. (1985). Response-contingent learning in profoundly handicapped infants: A social systems perspective. *Analysis & Intervention in Developmental Disabilities*, 5, 33-47.
- Dunst, C. J., & Lingerfelt, B. (1985). Maternal ratings of temperament and operant learning in two- to three-month-old infants. *Child Development*, 56(3), 555-563.
- Ebbinghaus, H. (1964). *Memory: A contribution to experimental psychology*. New York: Dover (Original work published 1885).
- Enright, M. K., Rovee-Collier, C., Fagen, J. W., & Caniglia, K. (1983). The effects of distributed training on retention of operant conditioning in human infants. *Journal of Experimental Child Psychology*, 36, 209-225.
- Fagen, J. W. (1993). Reinforcement is not enough; Learned expectancies and infant behavior. *American Psychologist*, 48, 1153-1155.
- Fagen, J. W., Morrongiello, B. A., Rovee-Collier, C., & Gekoski, M. J. (1984). Expectancies and memory retrieval in 3-month-old infants. *Child Development*, 54, 394-403.
- Fagen, J. W., Ohr, P. S., Singer, J. M., & Fleckenstein, L. K. (1987). Infant temperament and subject loss due to crying during operant conditioning. *Child Development*, 58(2), 497-504.
- Fagen, J. W., Yengo, L. A., Rovee-Collier, C., & Enright, M. K. (1981). Reactivation of a visual discrimination in early infancy. *Developmental Psychology*, 17, 266-274.
- Floccia, C., Christophe, A., & Bertoncini, J. (1997). High-amplitude sucking and newborns: The quest for underlying mechanisms. *Journal of Experimental Child Psychology*, 64(2), 175-198.
- Gerhardstein, P., Adler, S. A., & Rovee-Collier, C. (2000). A dissociation in infants' memory for stimulus size: Evidence for early development of multiple memory systems. *Developmental Psychobiology*, 36, 123-135.
- Gerhardstein, P., Kraebel, K., Gillis, J., & Lassiter, S. (2002). Visual search for high-level configural differences as well as low-level critical features is highly efficient early in childhood. *Developmental Psychobiology*, 41, 241-252.
- Gerhardstein, P., Liu, J., & Rovee-Collier, C. (1998). Perceptual constraints on infant memory retrieval. *Journal of Experimental Child Psychology*, 69, 109-131.

- Gerhardstein, P., Renner, P., & Rovee-Collier, C. (1999). The role of perceptual and categorical similarity in color pop-out in infants. *British Journal of Developmental Psychology, 17*, 403-420.
- Gerhardstein, P., & Rovee-Collier, C. (2002). Visual search in infants and very young children. *Journal of Experimental Child Psychology, 81*, 194-215.
- Gerwitz, J. L. (1972). *Attachment and dependency*. Washington, DC: V.H. Winston & Sons.
- Gewirtz, J. L., & Pelaez-Nogueras, M. (1992). B. F. Skinner's Legacy to Human Infant Behavior and Development. *American Psychologist, 47*, 1411-1422
- Gewirtz, J. L., & Pelaez-Nogueras, M. (1993). "Expectancy": Sleight-of-hand mentalism, not mechanism or process. *American Psychologist, 48*, 1156-1157.
- Goodsitt, J. V., Morgan, J. L., & Kuhl, P. K. (1993). Perceptual strategies in prelingual speech segmentation. *Journal of Child Language, 20*, 229-252.
- Greco, C., Hayne, H., & Rovee-Collier, C. (1990). The roles of function, reminding, and variability in the categorization of 3-month-old infants. *Journal of Experimental Child Psychology, 22*, 278-281.
- Gulya, M., Rovee-Collier, C., Galluccio, L., & Wilk, A. (1998). Memory processing of a serial list by very young infants. *Psychological Science, 9*, 303-307.
- Haith, M. M. (1998). Who put the cog in infant cognition? Is rich interpretation too costly? *Infant Behavior and Development, 21*, 167-179.
- Hildreth, K., & Hill, D. (2003). Retrieval difficulty and retention of reactivated memories over the first year of life. *Developmental Psychobiology, 43*(3), 216-229.
- Hill, W. H., Borovsky, D., & Rovee-Collier, C. (1988). Continuities in infant memory development. *Developmental Psychobiology, 21*, 43-62.
- Kraebel, K. S., Fable, J., & Gerhardstein, P. (2004). New methodology in infant operant kicking procedures: computerized stimulus control and computerized measurement of kicking. *Infant Behavior & Development, 27*, 1-18.
- Kraebel, K. S., & Gerhardstein, P. (2005). Three-month-old infants' recognition of multi-part complex objects across changes in viewpoint. *under review*.
- Lipsitt, L. P., Crook, C., & Booth, C. A. (1985). The transitional infant: behavioral development and feeding. *The American Journal of Clinical Nutrition, 41*(2) Suppl, 485-496.
- Lipsitt, L. P., & Kaye, H. (1964). Conditioned sucking in the human newborn. *Psychonomic Science, 1*, 29-30.
- Lipsitt, L. P., Kaye, H., & Bosack, T. N. (1966). Enhancement of neonatal sucking through reinforcement. *Journal of Experimental Child Psychology, 4*(2), 163-168.

- Lipsitt, L. P., Reilly, B. M., Butcher, M. J., & Greenwood, M. M. (1976). The stability and interrelationships of newborn sucking and heart rate. *Developmental psychobiology*, 9(4), 305-310.
- Mareschal, D. (2000). Object knowledge in infancy: Current controversies and approaches. *Trends in Cognitive Sciences*, 4, 408-416.
- McKirdy, L. S., & Rovee, C. K. (1978). The efficacy of auditory and visual conjugate reinforcers in infant conditioning. *Journal of Experimental Child Psychology*, 25, 80-89.
- Montgomery, C. R., & Clarkson, M. G. (1997). Infants' pitch perception: Masking by low- and high-frequency noises. *Journal of the Acoustical Society of America*, 102, 3665-3672.
- Ohr, P. S., & Fagen, J. W. (1991). Conditioning and long-term memory in three-month-old infants with Down Syndrome. *American Journal on Mental Retardation*, 96(2), 151-162.
- Poulson, C. L., & Nunes, L. R. (1988). The infant vocal-conditioning literature: A theoretical and methodological critique. *Journal of Experimental Child Psychology*, 46(3, Spec Issue), 438-450.
- Primus, M. A. (1987). Response and reinforcement in operant audiometry. *Journal of Speech & Hearing Disorders*, 52(3), 294-299.
- Primus, M. A. (1988). Infant thresholds with enhanced attention to the signal in visual reinforcement audiometry. *Journal of Speech & Hearing Research*, 31(3), 480-484.
- Ramey, C. T., & Ourth, L. L. (1971). Delayed reinforcement and vocalization rates of infants. *Child Development*. Vol., 42(1), 291-297.
- Rheingold, H. L., Stanley, W. C., & Cooley, J. A. (1962). Method for studying exploratory behavior in infants. *Science*, 136, 1054-1055.
- Rovee, C. K., & Fagen, J. W. (1976). Extending conditioning and 24-hour retention in infants. *Journal of Experimental Child Psychology*, 21(1), 1-11.
- Rovee, C. K., & Rovee, D. T. (1969). Conjugate reinforcement of infant exploratory behavior. *Journal of Experimental Child Psychology*, 8, 33-39.
- Rovee-Collier, C., Bhatt, R. S., & Chazin, S. (1996). Set size, novelty, and visual pop-out in infancy. *Journal of Experimental Psychology: Human Perception and Performance*, 22, 1178-1187.
- Rovee-Collier, C., & Capatides, J. B. (1979). Positive behavioral contrast in 3-month-old infants on multiple conjugate reinforcement schedules. *Journal of the Experimental Analysis of Behavior*, 32, 15-27.
- Rovee-Collier, C., & Gerhardstein, P. (1997). The development of infant memory. In N. Cohen (Ed.), *The development of memory in childhood* (pp. 5-40). Hove East Sussex: Psychology Press.
- Rovee-Collier, C., Griesler, P. C., & Earley, L. A. (1985). Contextual determinants of infant retention. *Learning and Motivation*, 16, 139-157.

- Rovee-Collier, C., Hankins, E., & Bhatt, R. S. (1992). Textons, visual pop-out effects, and object recognition in infancy. *Journal of Experimental Psychology: General*, 121, 435-445.
- Rovee-Collier, C., Hayne, H., & Colombo, M. (2001). *The development of implicit and explicit memory*. Amsterdam: John Benjamins Publishing Co.
- Rovee-Collier, C., & Sullivan, M. W. (1980). Organization of infant memory. *Journal of Experimental Psychology: Human Learning and Memory*, 6, 798-807.
- Rovee-Collier, C., Sullivan, M. W., Enright, M. K., Lucas, D., & Fagen, J. W. (1980). Reactivation of infant memory. *Science*, 208, 1159-1161.
- Schlinger, H. D. (1993). Learned expectancies are not adequate scientific explanations. *American Psychologist*, 48, 1156-1157.
- Shaw, P., & Nikolopoulos, T. (2004). The effect of initial stimulus type for visual reinforcement audiometry. *International Journal of Audiology*, 43(4), 193-197.
- Simmons, M. W., & Lipsitt, L. P. (1961). An operant discrimination apparatus for infants. *Journal of the Experimental Analysis of Behavior*, 4, 233-235.
- Siqueland, E. R. (1968). Reinforcement patterns and extinction in human newborns. *Journal of Experimental Child Psychology*, 6, 431-442.
- Siqueland, E. R., & Lipsitt, L. P. (1966). Conditioned head-turning in human newborns. *Journal of experimental child psychology*, 3(4), 356-376.
- Smotherman, W. P. (1982). Odor aversion learning by the rat fetus. *Physiology & Behavior*, 29, 769-771.
- Spelke, E. S. (1998). Nativism, empiricism, and the origins of knowledge. *Infant Behavior and Development*, 21, 181-200.
- Sullivan, M. W., Rovee-Collier, C., & Tynes, D. M. (1979). A conditioning analysis of infant long-term memory. *Child Development*, 50, 152-162.
- Thoman, E. B., & Ingersoll, E. W. (1993). Learning in premature infants. *Developmental Psychology*, 29, 692-700.
- Timmons, C. R. (1994). Associative links between discrete memories in infancy. *Infant Behavior & Development*, 17, 431-445.
- Todd, G. A., & Palmer, B. (1968). Social Reinforcement Of Infant Babbling. *Child Development*, 39(2), 591-596.
- Tomlinson-Keasey, C. (1972). Conditioning of infant vocalizations in the home environment. *Journal of Genetic Psychology*, 120, 75-82.
- Treisman, A. (1988). Features and objects: The fourteenth Barlett Memorial Lecture. *Quarterly Journal of Experimental Psychology*, 40, 210-237.

- Treisman, A. (1991). Search, similarity, and integration of features between and within dimensions. *Journal of Experimental Psychology: Human Perception and Performance*, 17, 652-676.
- Treisman, A., & Gelade, G. (1980). A feature-integration theory of attention. *Cognitive Psychology*, 12, 97-136.
- Tyler, D., & McKenzie, B. E. (1990). Spatial updating and training effects in the first year of infancy. *Journal of Experimental Child Psychology*, 50, 445-461.
- Vander Linde, E., Morrongiello, B. A., & Rovee-Collier, C. (1985). Determinants of retention in 8-week-old infants. *Developmental Psychology*, 21, 601-613.
- Wasserman, E., & Rovee-Collier, C. (2001). Pick the flowers and mind your As and 2s! Categorization by pigeons and infants. In M. E. Carroll & J. B. Overmier (Eds.), *Animal research and human health: Advancing human welfare through behavioral science* (pp. 263-279). Washington, DC: American Psychological Association.
- Weisberg, P., & Rovee-Collier, C. (1998). Behavioral processes of infants and young children. In K. A. Lattal & M. Perone (Eds.), *Handbook of research methods in human operant behavior* (pp. 325-370). New York: Plenum.
- West, R., Kraebel, K. S., & Gerhardstein, P. (2005). The influence of experience on infants' long-term memory for simple 3D shapes. *under review*.
- Widen, J. E., & Keener, S. K. (2003). Diagnostic Testing for Hearing Loss in Infants and Young Children. *Mental Retardation & Developmental Disabilities Research Reviews*, 9(4), 220-224.
- Wishart, J. G. (1991). Taking the initiative in learning: A developmental investigation of infants with Down's syndrome. *International Journal of Disability, Development, and Education*, 38, 27-44.
- Wynn, K. (1992). Addition and subtraction by human infants. *Nature*, 358(6389), 749-750.

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## Do You Need To Talk About It? Prolonged Exposure for the Treatment of Chronic PTSD

Afsoon Eftekhari, Ph.D., Lisa R. Stines, Ph.D., Lori A. Zoellner, Ph.D.

Is addressing the traumatic memory a necessary component of the treatment of posttraumatic stress disorder (PTSD)? Perhaps not for everyone, but in the present paper, we suggest that prolonged exposure, a cognitive behavioral treatment that includes repeated recounting of the traumatic memory, is a viable and robust treatment option. Prolonged exposure (PE) is widely regarded as an efficacious treatment for chronic posttraumatic stress disorder (Foa, Keane, & Friedman, 2000). The present paper reviews the efficacy and effectiveness of PE for the treatment of chronic PTSD and for a broader range of trauma-related symptoms. We will also review issues surrounding the acceptability of PE to mental health providers and potential clients. We conclude with a discussion the need for dissemination, additional dismantling studies, and further cross-cultural research.

Key Words: Exposure, Treatment, PTSD, Effectiveness, Cognitive-behavioral.

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The answer to the question is at once amazing simple and yet simultaneously immensely complicated. The simple answer is “No, you don’t need to talk about it.” Not everyone who undergoes a potentially traumatic event will go on to develop chronic posttraumatic stress disorder (PTSD, Kesler et al., 2005). In fact, the vast majority of individuals who experience such an event will not develop PTSD, with resilience being the normative response (e.g., Bonnano, 2004). Furthermore, for those who develop chronic PTSD, a number of empirically supported treatment options exist that do not include components focused on recounting of the traumatic memory. These other empirically supported treatments include several serotonergic medications (i.e., sertraline and paroxetine), cognitive therapy, stress inoculation training, and eye movement desensitization and reprocessing (e.g., Brady et al., 2001; Davidson, Rothbaum, Kolk, Sikes, & Farfel, 2001; Foa, Rothbaum, Riggs, Murdock, & Tamera, 1991; Foa, Dancu, Hembree, Jaycox, Meadows & Street, 1999; Resick, Nishith, Weaver, Astin, & Feuer, 2002; Taylor, Thordarson, Maxfield, Fedoroff, Lovell, & Ogradniczuk, 2003). Yet, over the course of this paper, we are going to suggest that, for those with chronic PTSD, it probably is a good idea to talk about it and that prolonged exposure therapy is probably one of the best ways to do it.

### *What is Prolonged Exposure?*

Exposure therapy is widely regarded as an efficacious treatment for chronic posttraumatic stress disorder (PTSD; Foa, Keane, & Friedman, 2000). In fact, the International Consensus Group on Depression and Anxiety, a group of internationally recognized experts, identified exposure as the first-line psychosocial intervention and the single most important treatment strategy for reducing PTSD symptoms (Ballenger et al., 2000; Ballenger et al., 2004). Exposure-based therapy (with *in vivo* and imaginal exposure) has demonstrated efficacy with variety of trauma-exposed individuals with chronic PTSD including combat veterans (e.g., Keane, Fairbank, Caddell, & Zimering, 1989), sexual assault survivors (e.g., Foa, Rothbaum, Riggs, & Murdock, 1991), motor vehicle accident victims (e.g., Blanchard et al., 2003), mixed trauma samples (e.g., Marks, Lovell, Norshirvani, Livanuo, & Trasher, 1989; Taylor, Thordarson, Maxfield, Fedoroff, Lovell, & Ogradniczuk, 2003), adult survivors of childhood abuse (e.g., McDonagh et al., 2005) and refugees (Paunovic, & Öst, 2001).

Exposure-based techniques in the treatment of PTSD are designed to help the patient approach feared and avoided trauma-related material including memories, thoughts, feelings, and real-life situations. This process is often achieved in two primary ways: *in vivo* and imaginal exposure. *In vivo* exposure involves having the client systematically and repeatedly approach and re-engage in non-dangerous activities and situations that he or she had been avoiding. Imaginal exposure involves having

the client systematically and repeatedly recount the trauma memory, focusing on thoughts and feelings at the time of the event, with the aim of fear reduction within and between sessions. The combination of these two techniques helps the client habituate to trauma-related fears as well as the trauma memory. Furthermore, by repeatedly recounting the memory, it is believed that the patient has the opportunity to process the memory, to better differentiate past from present, and to gain an improved sense of mastery and control over the memory (see Foa & Rothbaum, 1998). A variety of theories (e.g., Bouton, 1988, 1991; Brewin, 1996, 2001; Ehlers & Clark, 2000; Foa & Kozak, 1986) propose both behavioral and cognitive mechanisms underlying fear reduction seen in exposure-based therapy.

More specifically, prolonged exposure therapy (PE) is a particular exposure-based treatment protocol developed by Edna Foa and colleagues (Foa et al., 1991). The PE protocol contains the following components: 1) psychoeducation regarding treatment rationale and common reactions to trauma; 2) breathing retraining, a form of relaxation; 3) *in vivo* exposure, or approaching avoided trauma-related but objectively safe activities, situations, or places; and 4) imaginal exposure, or repeated recounting of the traumatic memory (Foa, Hearst, Dancu, Hembree, & Jaycox, 1994; Foa & Rothbaum, 1998). The standard PE protocol involves 9-12 treatment sessions, lasting approximately 90-120 minutes, with additional sessions sometimes implemented if needed. Within the literature, there is a general confusion regarding what is and is not referred to as PE. Although the specific prolonged exposure protocol contains a variety of components, for many, PE is considered synonymous with imaginal exposure (IE): systematic and repeated recounting of the traumatic memory. Specifically with imaginal exposure, Foa and colleagues (Foa & Kozak, 1986; Foa & Riggs, 1993; Foa, Molnar, & Cashman, 1995) have proposed that persistent emotional disturbances such as PTSD following a traumatic event may indicate inadequate processing of the trauma memory and that the recovery process involves the organizing and streamlining of the memory. Yet, at present, it is unclear whether the mechanisms underlying symptom reduction associated with repeated recounting of the traumatic memory involve this increased organization and defragmentation (van Minnen, Wessel, Dijkstra, & Roelofs, 2002; Zoellner & Bittinger, 2004).

*Efficacy and Effectiveness of PE*

A growing number trials provide evidence for the efficacy and effectiveness of this specific prolonged exposure protocol (psychoeducation, relaxation, *in vivo*, and imaginal exposure) in the treatment of chronic PTSD (e.g., Feeny & Zoellner, 2005; Foa et al., 1991, Foa et al., 1999; Foa et al., 2005; Ironson et al., Resick et al., 2002; Rothbaum, in press). As discussed above, while a number of treatment outcome studies support the efficacy of exposure-based techniques and utilize various components (e.g., imaginal exposure alone), we have summarized the main trials that specifically describe their treatment as PE and include all four of the PE components as their sole intervention in Table 1. That is, these trials contain a PE alone treatment condition; where PE is not combined with cognitive restructuring, stress inoculation training, etc. Using a pre-post treatment Cohen’s d effect sizes for treatment completers, on the primary outcome measure of PTSD severity, all summarized trials report large (Cohen’s d > .8) and sustained effect sizes over time. Thus, with PE, individuals with chronic PTSD are improving on PTSD severity (Cohen’s d  $M = 2.39$ ,  $SD = .79$ , 95% CI: 1.56-3.22) and sustaining these gains over time ( $M = 2.69$ ,  $SD = .81$ , 95% CI: 1.84-3.54).

Table 1. Cohen’s d for Treatment Completers in Prolonged Exposure

Trial	Gender	PE Cell Size	Trauma Type	Measure	Length Follow-up	Pre-Post Cohen’s d	Pre-FU Cohen’s d
Foa et al. (1991)	F	10	Sexual Assault & Non-sexual	PSS-I	3 months	1.21	1.47

Foa et al. (1999)	F	23	Assault Sexual Assault & Non-sexual	PSS-I	12 months	2.04	1.99
Foa et al. (2005)	F	79	Assault Sexual Assault & Non-sexual	PSS-I	12 months	3.31	3.30
Ironson et al. (2002)	MF	9	Assault Mixed	PSS-SR	3 months	2.18	3.03
Resick et al. (2002)	F	40	Sexual Assault Sexual	CAPS	9 month	2.38	2.76
Feeny & Zoellner (2005)	F	15	Assault & Non-sexual Assault	PSS-I	5 months	3.24	3.60

*Note.* PSS-I: PTSD Symptom Scale-Interview Version; PSS-SR: PTSD Symptom Scale-Self-Report; CAPS: Clinician-Administered PTSD Scale

#### *Does PE improve other trauma-related symptoms and conditions?*

PE is also highly effective in addressing a broader range of trauma-related symptoms. To date, the majority of PE trials specifically include systematic assessment of depression, anxiety, and often global functioning as primary outcome measures. Furthermore, across these trials, PE consistently reduces both depression and anxiety and improves global functioning (e.g., Foa et al., 1991; Foa et al., 1999; Foa et al., 2005). In fact, the majority of individuals in these trials actually achieve good end-state functioning, with PTSD, depression, and anxiety dropping to non-clinical levels and sustaining these gains through follow-up. Yet, one of the questions regarding a highly fear-focused treatment such as PE is whether or not it adequately addresses a wider range of trauma-related symptoms such as trauma-related cognitions (including guilt), anger, and dissociation.

With trauma-related cognitions, a recent study by Foa and Rauch (2004) reported that PE produced clinically significant and lasting reductions in negative cognitions about one's self, the world, and self-blame. Reductions in these negative cognitions were associated with reductions in PTSD symptoms. Most notably, PE alone reduced these negative cognitions just as well as PE in combination with cognitive restructuring, suggesting that specifically targeting cognitive distortions in treatment is not necessary for cognitive change. Both Resick et al. (2002) and Taylor et al. (2003) reported similar reductions both for trauma-related cognitive distortions and trauma-related guilt following PE. For a more detailed discussion of cognitive changes seen in exposure-based therapy, see Moore, Zoellner, and Bittinger (2004).

Unlike trauma-related cognitions, where the majority of individuals with PTSD report the presence of negative cognitions, both the presence and extent of anger and dissociation symptoms are more variable. That is, not every individual with chronic PTSD presents with elevated levels of anger and dissociation. Thus, treatment effects on these variables may be obscured due to lower scores for some individuals. Consistent with this idea, Cahill and colleagues found prolonged exposure to be effective in reducing symptoms of anger, particularly for those with higher levels of anger at pre-treatment (Cahill, Rauch, Hembree, & Foa, 2003). Similar reductions have been also been reported by other investigators (e.g., Taylor et al., 2003). Even less is known about PE treatment effects on dissociation (Feeny &

Danielson, 2004), though Taylor and colleagues reported reductions in dissociation with in vivo and imaginal exposure (Taylor et al., 2003). Undoubtedly, this area of improvement in secondary outcomes is a key one for future investigation and may be an important area in differentiating the most effective treatment approaches.

Another important issue is the impact of comorbid disorders on the treatment of chronic PTSD. Most commonly, PTSD is associated with comorbid major depression, other anxiety disorders, and substance abuse disorders (Kessler et al., 2005). However, although individuals with comorbidity are often viewed as a treatment resistant group (Havik & VandenBos, 1996), a growing number of the major clinical trials allow for the presence of comorbid disorders, seeking to have less rarified and more generalizable samples (e.g., Resick et al., 2002; Feeny & Zoellner, 2005; Foa et al., 2005). For example, Foa et al. (2005) reported 67% of the sample having some form of comorbidity, with 41% meeting criteria for comorbid major depression. To examine the impact of comorbidity on PTSD treatment outcome, van Minnen and colleagues (2002) examined a range of comorbid conditions as predictors of treatment outcome in a trial of PE for treatment of PTSD among adults with various trauma histories. None of the comorbid conditions examined (including depression, general anxiety, substance use, and personality disorders) were significant predictors of treatment outcome. The authors concluded that, contrary to clinical lore, PTSD patients with comorbidity should not be excluded from treatment with PE (van Minnen, Arntz, & Keijsers, 2002). A similar picture has emerged with comorbid personality disorders, Feeny and colleagues (Feeny, Zoellner, & Foa, 2002) also found this to be the case in a study of treatment of women with chronic PTSD and borderline personality characteristics. Although the women with borderline personality characteristics were less likely to achieve good end state functioning, they did in fact benefit significantly from treatment. Likewise, Hembree and colleagues found similar results for PE even when a range of personality disorders were examined (Hembree, Cahill, & Foa, 2004).

Another important question is the efficacy of PE for particular types of trauma exposure or exposure to multiple potentially traumatic events. Less is known about its efficacy for veteran and childhood sexual abuse (CSA) samples. To date, there are no published specific PE protocol trials in veterans; however, there are several trials of exposure-based interventions (Keane et al., 1989; Boudewynes, Hyer, Woods, Harrison, McCrainie, 1990; Copper & Clum, 1989; Schnurr et al., 2003). Schnurr et al. (2003), the largest and most recent of the trials, employed a group-based exposure intervention, showing comparable results but higher dropout for the exposure than the non-exposure intervention. The group nature of the intervention makes this study difficult to compare to other exposure-based interventions, particularly in its ability to foster within and between session habituation. For individuals with chronic PTSD resulting from CSA, Resick, Nishith, and Griffin (2003) reported no differences in treatment outcome (combining PE and Cognitive Processing Therapy treatment conditions) in individuals with CSA and those without, despite a hypothesized more complex symptom presentation. Yet, Hembree, Street, Riggs, and Foa (2004) reported that history of CSA predicted greater PTSD severity following treatment (combining PE, SIT, PE-SIT treatment conditions). Furthermore, McDonagh et al. (2005) reported a higher dropout rate for an exposure-based treatment than a non-exposure based treatment for CSA survivors. However, the higher dropout for the CBT treatment appears to be elevated due to one therapist with a 60% dropout rate. It may be that therapist-specific factors are a critical component of treatment retention and possibly more so with individuals with CSA (e.g., Cloitre, Stovall-McClough, Miranda, & Chemtob, 2004).

### *Is PE effective across ethnic or cultural groups?*

Initial studies examining the efficacy of PE with various samples indicate that PE may be effective across ethnic and cultural backgrounds (e.g., Zoellner, Feeny, Fitzgibbons, & Foa, 1999; Nacasch, 2005). Most cross-cultural work to date has focused on variations of exposure-based interventions. Three studies are notable (Paunovic & Öst, 2001; Otto, Hinton, Korbly, Chea, Ba,

Gershuny & Pollack, 2003; Neuner, Schauer, Klaschik, Karunakara, & Elbert, 2004). Using culturally sensitive variations, these trials suggest the potential benefits of including exposure-based interventions for the treatment of chronic PTSD across diverse samples. In particular, Neuner and colleagues found strong effects of exposure using narrative exposure therapy (NET) with Sudanese refugees with PTSD who were still living in a potentially traumatic environment (Ugandan refugee settlement). Although NET is not identical to PE, it too involves having the patient recount the traumatic memories, through writing. At one year post-treatment, only 29% individuals receiving NET in comparison to 79% of the supportive counseling group and 80% of the education group still met criteria for PTSD. Initial findings such as these are encouraging for disseminating culturally sensitive and effective PTSD interventions.

#### *What Factors Are Associated with Poor or Worse Treatment Outcome?*

One of the striking issues with this literature is simply that the majority of patients make substantial improvements across trials. Rauch and Cahill (2003) reported that reduction in PTSD symptoms across randomized control trials for exposure-based interventions ranges from 40% to 67%, compared to 26%-42% for active controls (supportive counseling or relaxation) and 1% to 20% for wait list. Thus, readers need to be careful when interpreting the literature on the prediction of treatment outcome, carefully differentiating between predicting “poor outcome,” that is, those who do not make substantial improvements or remain at clinically symptomatic levels of functioning, and “worse outcome,” that is those who make substantial gains but not as profound as others in the trial. Furthermore, an additional caveat in this literature is that often predictor studies are underpowered to detect stable predictors, both when lumping across treatment modalities and even more so within particular treatments.

At present, no clear *a priori* predictors of treatment outcome, either for poor or worse outcome, exist for PE. That is, it is very difficult to say at pre-treatment who is and who is not a good treatment candidate. Some of the factors noted across the PTSD exposure-based treatment literature include: childhood trauma and sustaining a physical injury during adult assault predicting greater PTSD symptom severity at post-treatment (Hembree, Street, Riggs, & Foa, 2004); anxiety sensitivity and pain predicting greater PTSD severity (Fedoroff, Taylor, Asmundson, & Koch, 2000); partial responders reporting greater pre-treatment numbing, anger, depression, pain, and worse functioning than full responders (Taylor, Federoff, Koch, Thordarson, Fecteau, & Nicki, 2001); and lower duration of therapy, male gender, and higher suicide risk predicting greater PTSD severity (Tarrier, Sommerfield, Pilgrim, & Faragher, 2002). Despite the range of factors included on this list and the lack of replication across trials, obviously, the question of “what works for whom and under what circumstances” is an important one (Coyne, 2001). However, at present, our knowledge is limited and tenuous.

#### *Augmentation of PE with Other Treatment Modalities/Strategies?*

Another approach to improve patient outcomes is the addition of other treatment strategies to PE. Good randomized control trials of augmentation studies are also in their infancy, but preliminary findings are promising in some areas and disappointing in others.

#### *Augmentation of PE with pharmacotherapy.*

One of the most promising strategies is the addition of exposure-based therapy for those who have a partial medication response. Marshall, Carcamo, Blanco, and Liebowitz (2003) reported results from three case studies of augmentation of partial SSRI response with PE, with all three patients making additional treatment gains. Similarly, in a pilot study of ten Cambodian refugees with PTSD who were pharmacotherapy refractory, Otto and colleagues reported that sertraline plus exposure was more beneficial than sertraline alone (Otto, Hinton, Korbly, Chea, Ba, Gershuny, & Pollack, 2003). Finally, Cahill and colleagues recently reported the preliminary findings of a larger randomized augmentation trial

of sertraline with PE (Cahill, 2004). Augmentation of sertraline partial-response with PE not only increased but also prevented loss of good end-state functioning. Taken together, these initial studies suggest the potential benefit of a stepped-care approach for the treatment of chronic PTSD.

#### *Augmentation of PE with other psychotherapy components.*

Within the PTSD psychotherapy literature, there has been a trend toward packaging treatment components to enhance treatment outcomes. Specifically, two randomized trials sought to augment PE with an anxiety management program (i.e., stress inoculation training; Foa et al., 1999) or with cognitive restructuring (Foa et al., 2005). Neither combined treatment package produced better results than PE alone, even on measures of cognitive distortions (Foa et al., 1999; Foa & Rauch, 2004; Foa et al., 2005). However, when imaginal exposure alone, and not in combination with vivo exposure, is augmented with cognitive restructuring, there are greater sustained reductions in PTSD and cognitive distortions (Bryant, Moulds, Guthrie, Dang, & Nixon, 2003). Thus, it appears that a partial exposure package (i.e., imaginal exposure alone) can be successfully augmented with cognitive restructuring.

Another augmentation trend has been toward selecting particular subgroups of individuals to receive special treatment components or packages. For example, common augmentation programs include: for comorbid panic disorder, Multiple Channel Exposure Therapy, specifically adding interoceptive exposure (Falsetti, Resnick, & Davis, 2005); and for childhood sexual abuse, Skills Training in Affective and Interpersonal Regulation plus Modified Prolonged Exposure, specifically adding mindfulness-based approaches (Levitt & Cloitre, 2005). Early trials indicate that these combined treatment protocols lead to good PTSD symptom reduction and also good improvement on other relevant symptoms (Falsetti, Resnick, & Davis, 2005; Cloitre, Koenan, Cohen, & Han, 2002). However, to date, no randomized control trials have directly compared these augmented packages to exposure therapy alone (Cahill, Zoellner, Feeny, & Riggs, 2004). Thus, at present, we are unable to determine whether these additive components provide any incremental benefit to these specific subgroups of patients. Given that current trials often include these subgroups (e.g., individuals with comorbid anxiety disorders or CSA) and that many individuals in these subgroups do currently benefit from exposure-based treatments, a potentially more parsimonious approach may be to consider selecting individuals based on certain characteristics (e.g., anxiety sensitivity, lack of distress tolerance) that would necessitate special treatment augmentation.

#### *Will Therapists Use PE?*

Despite the known efficacy of PE for PTSD, some experts suggest there may be significant barriers to therapists' use of these techniques in practice (Foy et al., 1996). Experts in the field have explored common myths that prevent the use of PE in the treatment of PTSD (Feeny, Hembree, & Zoellner, 2003). Among the most critical are provider fears surrounding possible symptom exacerbation and increased patient dropout. In one trial, we examined whether or not there was a reliable symptom exacerbation following the onset of imaginal exposure (Foa, Zoellner, Feeny, Hembree, & Alvarez-Conrad, 2002). After beginning imaginal exposure, only a small minority of patients reported an exacerbation in PTSD symptoms, depression, or anxiety, with this exacerbation being small and brief and unrelated to treatment outcome or dropout. In terms of increased patient dropout with exposure-based therapies, Hembree and colleagues reported that in an analysis across trials, dropout rates were comparable across exposure-based therapies (20.5%) and non-exposure based (stress inoculation/cognitive) therapies (22.1%; Hembree, Foa, Dorfan, Street, Kowalski, & Tu, 2003). Thus, both the concerns about potential exacerbation and/or patient dropout appear to be more clinical lore than clinical reality.

Despite this information, some providers appear reluctant to employ prolonged exposure, in particular, imaginal exposure where patients recount the traumatic memory. Using a survey, Becker, Zayfert, and Anderson (2004) reported that while the vast majority of behaviorally trained clinicians (93%) were trained in exposure, less than one third of the community providers had received any formal training. Consistent with these numbers, only 17% of community providers reported current use of imaginal exposure with their PTSD patients compared to 66% of the behaviorally trained providers. While these rates may solely reflect that utilization of exposure interacts with training, among clinicians who were both trained and experienced with PTSD, utilization of exposure was still low. Accordingly, this survey points to the need to better understand potential utilization barriers within the clinical community.

Fortunately, exposure therapy can be easily taught to and implemented by clinical providers (Foa et al., 2005; Feeny, Hembree, & Zoellner, 2003). In a recent clinical trial of PE with assault survivors, Foa and colleagues (Foa et al., 2005) delivered the PE protocol at two sites: doctoral-level clinicians at a university-based, clinical research site and masters-level therapists at a community site (Women Organized Against Rape, Philadelphia, PA). Clinicians initially received a five-day training on the administration of PE, followed by ongoing weekly supervision. There were no differences in post-treatment outcomes across provider sites, suggesting that therapists trained in PE are able to deliver the treatment effectively. Thus, this study provides initial evidence that PE can be successfully disseminated and implemented effectively with only brief training and minimal supervision.

#### *Will Patients Choose PE?*

Anecdotally, it is almost shocking how many individuals with chronic PTSD report that, although they have been in counseling for years, they have never talked about their traumatic event with their counselor. What is further interesting is that, given the above research, this potential omission may lie more on the part of the therapist than on the part of the client. A growing body of research suggests that, within the anxiety disorders, there is a general preference of patients for psychotherapy over pharmacotherapy (Barlow, 2004; Hazlett-Stevens, Craske, Roy-Byrne, Sherbourne, Stein, & Bystritsky, 2002; Wagner, Bystritsky, Russo, Craske, Sherbourne, Stein, & Roy-Byrne, 2005). This same pattern also appears in women presenting to the emergency room following sexual or non-sexual assault, with women reporting interest in both medications and counseling but a stronger preference for counseling (Roy-Byrne, Berliner, Russo, Zatzick, & Pitman, 2003).

In our own work, we have worked to extend these initial preference studies, providing individuals with detailed and matched treatment rationales for either prolonged exposure or sertraline in the treatment of chronic PTSD. Across both undergraduate and community samples, women consistently chose PE over sertraline, with ratios greater than a 4 to 1 (Feeny & Zoellner, 2005; Zoellner, Feeny, Cochran, & Pruitt, 2003). In addition to asking women to choose between the treatment options, we also asked women to give their reasons for their treatment choice. Across studies as well, the most common reason for choosing PE was the effectiveness or perceived mechanism underlying the treatment (Cochran, Pruitt, Fukuda, Zoellner, & Feeny, 2005; Angelo, Miller, Zoellner, & Feeny, 2005). This is surprising given that, in the treatment rationales, the wording regarding the effectiveness of the two treatments was identical. When examining the women's actual reasons, it makes more sense. Women routinely reported the perceived need to deal with the traumatic memory as critical to their recovery. For example, women stated: "It makes more sense to deal with the traumatic memories. This feels like a long lasting solution to the problem;" "[PE] faces the trauma rather than hide it;" and "I have never really talked about the specifics of my rape, so I have never acknowledged the reasons for my fear and shame." Undoubtedly, the question remains if individuals with PTSD will prefer PE to other forms of empirically supported psychotherapies; regardless, it is pretty clear that clients feel a strong need to talk about the traumatic event.

*Future Directions*

With strong empirical support confirming the efficacy of PE and treatment guidelines for PTSD identifying exposure as a critical component of treatment (Ballenger et al., 2004), it is critical to identify ways in which exposure-based treatment can be easily disseminated and utilized by treatment providers. Despite experts in the area of PTSD addressing and dispelling myths regarding PE (Feeny, Hembree, & Zoellner, 2003) and evidence verifying the trainability and acceptability of PE to treatment providers (Foa et al., 2005), many providers remain hesitant. If having patients approach trauma-related reminders and recount trauma memory is effective, then why not have patients do this? Clearly, understanding and addressing therapist reluctance is critical. Intuitively, probably one of the biggest barriers may be “fear of fear” on the part of the therapist. That is, when working with a trauma survivor who has undergone a horrific event or series of events, the last thing a therapist may want to do is to be the cause of further distress or discomfort. Yet, the fears and the memories are an everyday part of the trauma survivor’s life and approaching them rather than avoiding them may be one of the best ways to help the trauma survivor through the recovery process. Ultimately, better understanding and addressing of therapist reluctance and increased training in empirically supported principles and treatments, such as PE, are necessary for assuring high standards of care for trauma survivors with chronic PTSD.

Many questions remain to be addressed. Dismantling and augmentation studies are in their infancy. It remains to be seen if all components of PE are necessary for optimal symptom reduction or when and how PE can be best augmented. Particularly, within the area of imaginal exposure, little empirical work guides clinical decision making surrounding issues such as: what form of imaginal exposure is most beneficial (e.g., talking about the memory, writing about the memory, recounting the memory in imagination), what duration of exposure is most beneficial (e.g., how long within and across sessions), what components are most necessary for fear reduction (e.g., engagement, vividness), and how active and present the therapist should be during the exposure. Further work is also needed in identifying predictors of worse or poor treatment outcome and dropout. From this work, good guidelines regarding treatment contraindications and more strategic treatment augmentation packages may be developed. Finally, a key domain that needs further exploration is the applicability of PE across different ethnic groups and cultures. In the wake of recent large-scale disasters across the world, the need for such knowledge is crucial. Prolonged exposure is clearly an effective and efficacious treatment for PTSD. Answering these above questions will only make our practice, our research guidelines, and our standards of care better.

## References

- Angelo, F. Miller, H., Zoellner, L., & Feeny, N. (2005). Qualitative analysis of women’s reasons underlying treatment preference. Manuscript in preparation.
- Ballenger, J.C., Davidson, J.R.T., Lucrubier, Y., Nutt, D.J., Foa, E.B., Kessler, R.C., & McFarlane, A.C. (2000). Consensus statement on posttraumatic stress disorder from the international consensus group on depression and anxiety. *Journal of Clinical Psychiatry*, 61(5), 60-66.
- Ballenger, J.C., Davidson, J.R.T., Lecrubier, Y., Nutt, D.J., Marshall, R.D., Nemeroff, C.B., Shalev, A.Y., & Yehuda, R. (2004). Consensus statement update on posttraumatic stress disorder from the International Consensus Group on Depression and Anxiety. *Journal of Clinical Psychiatry*, 65(1), 55-62.
- Barlow, D. H. (2004). Psychological Treatments. *American Psychologist*, 59(9), 869-878.

- Becker, C.B., Zayfert, C., & Anderson, E. (2004). A survey of psychologists' attitudes towards and utilization of exposure therapy for PTSD. *Behaviour Research and Therapy*, 42, 277-292.
- Blanchard, E. B., Hickling, E. J., Devineni, T., Veazey, C. H., Galovski, T. E., Mundy, E., Malta, L. S., & Buckley, T. C. (2003). A controlled evaluation of cognitive behavioral therapy for posttraumatic stress in motor vehicle accident survivors. *Behaviour Research and Therapy*, 41, 79-96.
- Blanchard, E.B., Hickling, E.J., Malta, L.S., Freidenberg, B.M., Canna, M.A., Kuhn, E., Sykes, M.A., & Galovski, T.E. (2004). One- and two-year prospective follow-up of cognitive behavior therapy or supportive psychotherapy. *Behaviour Research and Therapy*, 42, 745-759.
- Bonanno, G.A. (2004). Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *American Psychologist*, 59, 20-28.
- Bouton, M. E. (1988). Context and ambiguity in the extinction of emotional learning. Implications for exposure therapy. *Behavior Research and Therapy*, 26, 137-149.
- Bouton, M. E. (1991). A contextual analysis of fear extinction. In P. R. Martin (Ed.), *Handbook of behavior therapy and psychological science: An integrative approach* (pp. 435-453). New York: Pergamon General Psychology Series.
- Boudewynes, P.A., Hyer, L., Woods, M.G., Harrison, W.R., & McCrainie, E. (1990). PTSD among Vietnam veterans: An early look at treatment outcome using direct therapeutic exposure. *Journal of Traumatic Stress*, 3, 359-368.
- Brewin, C. R. (1996). Cognitive processing of adverse experiences. *International Review of Psychiatry*, 8(4), 333-339.
- Brewin, C. R. (2001). A cognitive neuroscience account of posttraumatic stress disorder and its treatment. *Behaviour Research and Therapy*, 39, 373-393.
- Bryant, R. A., Moulds, M. L., Guthrie, R.M., Dang, S. T., Nixon, R. D. (2003). Imaginal Exposure Alone and Imaginal Exposure With Cognitive Restructuring in Treatment of Posttraumatic Stress Disorder. *Journal of Consulting & Clinical Psychology*, 71(4), 706-712.
- Cahill, S. P. (March, 2004). Augmentation of sertraline with cognitive behavioral therapy in the treatment of posttraumatic stress disorder: Effects on acute treatment outcome and maintenance of treatment gains. Paper presented at the Anxiety Disorders Association of America Conference, Miami, FL.
- Cahill, S.P., Rauch, S.A., Hembree, E.A., & Foa, E.B. (2003). Effect of cognitive-behavioral treatments for PTSD on anger. *Journal of Cognitive Psychotherapy*, 17(2), 113-131.
- Cahill, S.P., Zoellner, L.A., Feeny, N.F., & Riggs, D.S. (2004). Sequential treatment of child abuse-related posttraumatic stress disorder: Methodological comment to Cloitre, Koenen, Cohen, and Han (2002). *Journal of Consulting and Clinical Psychology*, 72, 543-548.
- Cloitre, M., Koenen, K. C., Cohen, L. R., & Han, H. (2002). Skills training in affective and interpersonal regulation followed by exposure: A phase-based treatment for PTSD related to childhood abuse. *Journal of Consulting and Clinical Psychology*, 70, 1067-1074.

- Cloitre, M., Stovall-McClough, K.C., Miranda, R., Chemtob, C. M. (2004). Therapeutic Alliance, Negative Mood Regulation, and Treatment Outcome in Child Abuse-Related Posttraumatic Stress Disorder. *Journal of Consulting & Clinical Psychology*, 72(3), 411-416.
- Cochran, B., Pruitt, L., Fukuda, S., Zoellner, L. & Feeny, N. (2005). Reasons underlying treatment preference for PTSD. Manuscript in submission.
- Coyne, J. (2001). Enhancement to the randomized clinical trial. Presentation made to NIMH, New Developments in Clinical Interventions Research.
- Copper, N.A., & Clum, G.A. (1989). Imaginal flooding as a supplementary treatment for PTSD in combat veterans: A controlled trial. *Behavior Therapy*, 20,381-391.
- Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy*, 38, 219-345.
- Erickson, D.J., Wolfe, J., King, D.W., King, L.A., & Sharkansky, E.J. (2001). Posttraumatic stress disorder and depression symptomatology in a sample of gulf war veterans: A prospective analysis. *Journal of Consulting and Clinical Psychology*, 69(1), 41-49.
- Falsetti, S.A., Resnick, H.S., & Davis, J. (2005). Multiple channel exposure therapy: Combining cognitive-behavioral therapies for the treatment of posttraumatic stress disorder and panic attacks. *Behavior Modification*, 29(1), 70-94.
- Feeny, N.C., & Danielson, C.K. (2004). PTSD, dissociation, and treatment. In S. Taylor (Ed.), *Advances in the treatment of posttraumatic stress disorder: Cognitive-behavioral perspectives* (223-241). New York: Springer.
- Feeny, N.C., Hembree, E.A., & Zoellner, L.A. (2003). Myths regarding exposure therapy for PTSD. *Cognitive and Behavioral Practice*, 10, 85-90.
- Feeny, N.C., Zoellner, L.A., & Foa, E.B. (2002). Treatment outcome for chronic PTSD among female assault victims with borderline personality characteristics: a preliminary examination. *Journal of Personality Disorders*, 16, 30-40.
- Feeny, N. C. & Zoellner, L. A. (2005). The role of choice in the treatment of chronic PTSD: PE versus sertraline. Manuscript in preparation.
- Foa, E.B., Dancu, C.V., Hembree, E.A., Jaycox, L.H., Meadows, E.A., & Street, G.P. (1999). A comparison of exposure therapy, stress inoculation training, and their combination for reducing posttraumatic stress disorder in female assault victims. *Journal of Consulting and Clinical Psychology*, 67(2), 194-200.
- Foa, E.B., Hearst, D.E., Dancu, C.V., Hembree, E., & Jaycox, L.H. (1994). *Prolonged exposure (PE) manual*. Unpublished manuscript, Medical College of Pennsylvania, Eastern Pennsylvania Psychiatric Institute.
- Foa, E.B., Hembree, E.A., Cahill, S.P., Rauch, S.A.M., Riggs, D.S., Feeny, N.C., & Yadin, E. (2005). Randomized trial of prolonged exposure for posttraumatic stress disorder with and without cognitive restructuring: Outcome at academic and community clinics. *Journal of Consulting and Clinical Psychology*, 73(5), 953-964.

- Foa, E.B., Keane, T.M., & Friedman, M.J. (Eds.). (2000). *Effective treatments for PTSD: Practice guidelines from the International Society for Traumatic Stress Studies*. New York: Guilford Press.
- Foa, E. B., & Kozak, M. J. (1986). Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin*, 99, 20-35.
- Foa, E. B., Molnar, C., & Cashman, L. (1995). Change in rape narratives during exposure therapy for posttraumatic stress disorder. *Journal of Traumatic Stress*, 8, 675-690.
- Foa, E.B. & Rauch, S. (2004). Cognitive changes during prolonged exposure versus prolonged exposure plus cognitive restructuring in female assault survivors with posttraumatic stress disorder. *Journal of Consulting and Clinical Psychology*, 72, 879-884.
- Foa, E. B., & Riggs, D. S. (1993). Posttraumatic stress disorder in rape victims. In J. Oldham, M. B. Riba, & A. Tasman (Eds.) *American psychiatric press review of psychiatry, volume 12* (pp. 273-303). Washington, DC: American Psychiatric Press.
- Foa, E.B., & Rothbaum, B.O. (1998). *Treating the trauma of rape: Cognitive-behavioral therapy for PTSD*. New York: Guilford Press.
- Foa, E.B., Rothbaum, B.O., Riggs, D.S., & Murdock, T.B. (1991). Treatment of posttraumatic stress disorder in rape victims: A comparison between cognitive-behavioral procedures and counseling. *Journal of Consulting and Clinical Psychology*, 59, 715-723.
- Foa, E. B., Zoellner, L. A., Feeny, N. C., Hembree, E. A., & Alvarez-Conrad, J. (2002). Does imaginal exposure exacerbate PTSD symptoms? *Journal of Consulting and Clinical Psychology*, 70(4), 1022-1028.
- Foy, D.W., Kagan, B., McDermott, C., Leskin, G., Sippelle, R.C., & Paz, G. (1996). Practical parameters in the use of flooding for treating chronic PTSD. *Clinical Psychology and Psychotherapy*, 3(3), 169-175.
- Havik, O.D., & VandenBos, G.R. (1996). Limitations of manualized therapy for everyday clinical practice. *Clinical Psychology: Science & Practice*, 3, 264-267.
- Hazlett-Stevens, H., Craske, M. G; Roy-Byrne, P. P, Sherbourne, C.D, Stein, M. B., & Bystritsky, A (2002). Predictors of willingness to consider medication and psychosocial treatment for panic disorder in primary care patients. *General Hospital Psychiatry*, 24(5), 316-321.
- Hembree, E.A., Cahill, S.P., & Foa, E.B. (2004). Impact of personality disorders on treatment outcome for female assault survivors with chronic posttraumatic stress disorder. *Journal of Personality Disorders*, 18(1), 117-127.
- Hembree, E.A., Street, G.P., Riggs, D.S., & Foa, E.B. (2004). Do assault-related variables predict response to cognitive behavioral treatment for PTSD? *Journal of Consulting and Clinical Psychology*, 72 (3), 531-534.

- Ironson, G., Freund, B., Strauss, J.L., & Williams J. (2002). Comparison of two treatments for traumatic stress: A community-based study of EMDR and prolonged exposure. *Journal of Clinical Psychology, 58* (1), 114-128.
- Jaycox, L.H., & Foa, E.B. (1996). Obstacles in implementing exposure therapy for PTSD: Case discussions and practical solutions. *Clinical psychology and psychotherapy: 3*(3), 176-184.
- Keane, T.M., Fairbank, J.A., Caddell, J.M., & Zimering, R.T. (1989). Implosive (flooding) therapy reduces symptoms of PTSD in Vietnam combat veterans. *Behavior Therapy, 20*, 245-260.
- Kessler, R. C., Demler, O., Frank, R. G., Olfson, M., Pincus, H. A., Walters, E. E., Wang, P., Wells, K. B., Zaslavsky, A. M. (2005). Prevalence and Treatment of Mental Disorders, 1990 to 2003. *New England Journal of Medicine, 352*(24), 2515–2523.
- Kessler, R.C., Sonnega, A., Bromet, E., Hughes, M., & Nelson, C.B. (1995). Posttraumatic stress disorder in the National Comorbidity Survey. *Archives of General Psychiatry, 52*, 1048-1060.
- Levitt, J.T., & Cloitre, M. (2005). A clinician's guide to STAIR/MPE: Treatment for PTSD related to childhood abuse. *Cognitive and Behavioral Practice, 12*(1), 40-52.
- Lombardo, T.W., & Gray, M.J. (2005). Beyond exposure for posttraumatic stress disorder (PTSD) symptoms: Broad-spectrum PTSD treatment strategies. *Behavior Modification, 29*(1), 3-9.
- Marks, I., Lovell, K., Norshirvani, H., Livanuo, M., & Trasher, S. (1989). Treatment of posttraumatic stress disorder by exposure and/or cognitive restructuring. A controlled study. *Archives of General Psychiatry, 55*, 317-325.
- Marshall, R.D., Carcamo, J.H., Blanco, C., & Liebowitz, M. (2003). Trauma-focused psychotherapy after a trial of medication for chronic PTSD: Pilot observations. *American Journal of Psychotherapy, 57*, 374-383.
- McDonagh, A., Friedman, M., McHugo, G., Ford, J., Sengupta, A., Mueser, K., Demment, C.C., Fournier, D., Schnurr, P.P., & Descamps, M. (2005). Randomized trial of cognitive-behavioral therapy for chronic posttraumatic stress disorder in adult female survivors of childhood sexual abuse. *Journal of Consulting and Clinical Psychology, 73*(3), 515-524.
- Meichenbaum, D. (1974). *Cognitive-behavior modification*. Morristown, NJ: General Learning Press.
- Moore, S.A., Zoellner, L. A., & Bittinger, J. (2004). How do you combine cognitive restructuring with exposure? In S. Taylor (ed.), *Advances in the treatment of posttraumatic stress disorder: Cognitive behavioral perspectives*. NY: Springer.
- Nacasch, N. (November, 2005). Successful dissemination of prolonged exposure therapy (PE) in Israel: Process and Outcome. Paper presented at the International Society for Traumatic Stress Studies. Toronto, Canada.
- Neuner, F., Schauer, M., Klaschik, C., Karakara, U., & Elbert, T. (2004). A comparison of

- Narrative Exposure Therapy, Supportive Counseling, and Psychoeducation for treating posttraumatic stress disorder in an African refugee settlement. *Journal of Consulting and Clinical Psychology*, 72, 579-587.
- Otto, M.W., Hinton, D., Korbly, N.B., Chea, A., Ba, P., Gershuny, B.S., & Pollack, M.H. (2003). Treatment of pharmacotherapy-refractory posttraumatic stress disorder among Cambodian refugees: a pilot study of combination treatment with cognitive-behavior therapy vs sertraline alone. *Behaviour Research and Therapy*, 41(11), 1271-1276.
- Paunovic, N. & Öst, L. (2001). Cognitive-behavior therapy vs exposure therapy in the treatment of PTSD in refugees. *Behaviour Research and Therapy*, 39, 1183-1197.
- Rauch, S.A.M. & Cahill, S.P. (2003). Treatment and Prevention of Posttraumatic Stress Disorder. *Primary Psychiatry*, 10 (8), 60-65.
- Resick, PA., Nishith, P., Weaver, T.L., Astin, M.C., & Feuer, C.A. (2002). A comparison of cognitive-processing therapy with prolonged exposure and a waiting condition for the treatment of chronic posttraumatic stress disorder in female rape victims. *Journal of Consulting and Clinical Psychology*, 70, 867-879.
- Rothbaum, B.O. (in press). Prolonged Exposure vs. EMDR for PTSD Rape Victims. *Journal of Traumatic Stress*.
- Roy-Byrne, P. P., Berliner, L., Russo, J., Zatzick, D., & Pitman, R. K. (2003). Treatment preferences and determinants in victims of sexual and physical assault. *Journal of Nervous and Mental Disease*, 191(3), 161-165.
- Schnurr, P.P., Friedman, M.J., Foy D.W., Shea, M.T., Hsieh, F.Y., Lavori, P.W., Glynn, S.M., Wattenberg, M., & Bernardy, N.C. (2003). Randomized trial of trauma-focused group therapy for posttraumatic stress disorder. *Archives General Psychiatry*, 60, 481-489.
- Taylor, S., Thordarson, D., Maxfield, L., Fedoroff, I., Lovell, K., & Ogradniczuk, J. (2003). Comparative efficacy, speed, and adverse effects of three PTSD treatments. *Journal of Consulting and Clinical Psychology*, 71( 2), 330-338.
- Taylor, S., Federoff, I., Koch, W., Thordarson, D., Fecteau, G., & Nicki, R. (2001). Posttraumatic stress disorder arising after road traffic collisions: Patterns of response to cognitive-behavior therapy. *Journal of Consulting and Clinical Psychology*, 69( 3), 541-551.
- Wagner, A.W., Bystritsky, A., Russo, J. E., Craske, M.G., Sherbourne, C. D., Stein, M. B., & Roy-Byrne, P. P. (2005). Beliefs about psychotropic medication and psychotherapy among primary care patients with anxiety disorders. *Depression and Anxiety*, 21(3), 99-105.
- van Minnen, A., Arntz, A., & Keijsers, G.P.J. (2002). Prolonged exposure in patients with chronic PTSD: predictors of treatment outcome and dropout. *Behaviour Research and Therapy*, 40, 439-457.
- van Minnen, A., Wessel, I., Dijkstra, T., & Roelofs, K. (2002). Changes in PTSD patients' narratives during prolonged exposure therapy: A replication and extension. *Journal of Traumatic Stress*, 15, 255-258.

Zoellner, L.A. & Bittinger, J.N. (2004). On the uniqueness of trauma memories in PTSD. In Rosen, Gerald (Ed). *Posttraumatic stress disorder: Issues and controversies*, (pp. 147-162). New York, NY, US: John Wiley & Sons Ltd.

Zoellner, L.A. Feeny, N.C., Fitzgibbons, L.A., & Foa E.B. (1999). Response of African-American and Caucasian women to cognitive-behavioral treatment for PTSD. *Behavior Therapy*, 4, 581-595.

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## Inclusion and Challenging Behaviors: Greek General Educators' Perspectives

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### Abstract

Research evidence from several educational systems indicates that students with developmental disabilities who exhibit challenging behaviors are in the bottom of the agenda as candidates for inclusion. The present investigation of the perspectives of 85 Greek teachers in primary education indicates that they are in need of training that it will enable them to deal with the presence of a student with challenging behaviors in their classroom and that it will assist them to overcome their concerns about the impact of inclusion of students with challenging behaviors on their time and emotional well-being, the routine of the class, the peer acceptance and the educational progress of the student with challenging behaviors. The implications for training are briefly discussed.

Key words: inclusion, challenging behaviors, self-management.

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In the last decade the trend towards inclusion became vigorous on an international scale (Forlin, 1997; Yuen & Westwood, 2001). The implication of this is that more inexperienced and unprepared general education teachers are coming into contact with challenging behaviors (Hastings, Remington, & Hopper, 1995), which impede the flow of learning in the classroom and require considerable amount of teachers' time, while they have to focus on the achievement of good academic results (Daniels, 1998).

In many instances, inclusion has occurred without an adequate understanding of the implications for the general education teachers (Evans, & Lunt, 2002; Goodfellow, 1990), since the primary focus was on promoting the principles and the ideals related with inclusion (Evans & Lunt, 2002) and not on scrutinizing the teachers' concerns about the presence of students with challenging behaviors in their classrooms.

### *General teachers' attitudes*

It is widely accepted that the success of inclusion schemes depends on teachers' attitudes towards inclusion (e.g. Chow & Winzer, 1992; Hayes & Gunn, 1988; Hastings & Oakford, 2003; Minke, Baer, Deemer, & Griffin, 1996; Olson, Chalmers & Hoover, 1997; Williams & Algozine, 1977; Wood, 1995) and on the sophistication of their skills (Koegel, Harrower, & Koegel, 1999; Rock, Rosenberg & Carran, 1995; Wood, 1995).

Although teachers' attitudes towards inclusion are positive (e.g. European Agency for Development in Special Needs Education, 2001; Evans, & Lunt, 2002; Katz & Mirenda, 2001; Scruggs & Mastropieri, 1996; Yuen & Westwood, 2001) research evidence from Australia (Forlin, 1997), E. U. (European Agency for Development in Special Needs Education, 2001; Evans, & Lunt, 2002), Honk Kong (Yuen & Westwood, 2001) and US (Scruggs & Mastropieri, 1996; Semmel, Abernathy, Butera, & Lesar, 1991) indicates that teachers feel insecure and ill-equipped<sup>1</sup> (Kennedy,

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<sup>1</sup> The lack of relevant skills drives teachers to emotion focusing rather than to behavior focusing interventions. Characteristic are the statements of Australian teachers (Forlin, 1997) who report that in order to cope with the stress associated with challenging behaviors they try to maintain a sense of humour, develop other interests outside the school, and look on the bright side of the things.

Shukla & Fryxell, 1997; Scruggs & Mastropieri, 1996; Shinn, Powell-Smith, Good & Baker, 1997; Smith, 2000; Vaughn, Schumm, Jallard, Slusher, & Saumell, 1996) to cope with the prospect of having a student with challenging behaviors in their own classrooms.

Thus, students with special needs who are less demanding in terms of teachers' time and skills are generally viewed more positively as candidates for inclusion than students with challenging behaviors who are typically rated less positively by samples of teachers (e.g., Avramidis, Bayliss, & Burden, 2000; Evans & Lunt, 2002; Forlin, 1997; Soodak, Podell, & Lehman 1998; Yuen & Westwood, 2001) and student-teachers (Hastings & Oakford, 2003). This is understandable if it is taken into account that general teachers are under pressure for the delivery of good academic results.

Actually, the pressure for good academic results impedes the inclusive attempts because it poses such a strain on teachers' time that it leads to the exclusion of students with challenging behaviors from the inclusive settings. For example, in the UK the Education Reform Act of 1988 (Stillman, 1990), the Education Act of 1993 (Simkins, 1994) and the Code of Practice on the Identification and Assessment of Special Educational Needs (Department for Education, 1994) placed greater emphasis on inclusive education. However, the introduction of the National Curriculum in England and Wales, which increased emphasis on measuring success only in terms of academic performance (Vlachou & Barton, 1994), has had an inhibiting effect on moves towards increased inclusive practice because teachers had to focus increasingly on the students without special needs rather than to those with more specialised and individualised needs (Forlin, 1997). By consequence, in England, in parallel with the increase of the number of included students increased the number of students expelled from school due to their unacceptable behavior (Parsons, 2000). According to Hayden (2000) students with challenging behaviors are six times more likely to be expelled than their peers<sup>2</sup>. Similarly, in the U.S. students with challenging behaviors are at high risk of exclusion from general education settings (Crimmins & Berotti, 1996; National Centre for Educational Statistics, 1997; Riecher, 1990) due to the increase of discipline problems (Daniels, 1998).

Considering all that as well as the lack of relevant training it comes at no surprise that, as Evans & Lunt (2002) suggest, students with challenging behaviors are far away from the top of the agenda as candidates for inclusion.

On the base of that, it was decided to search the general teachers' perspectives in primary schools located in Northern Greece so that training relevant to their perspectives could be devised. For the purpose of the study it has been assumed that the teachers' preferences on categories of special needs and their views towards the impact of inclusion are good predictors of their attitudes towards the inclusion of students with challenging behaviors.

### *Method*

Data were gathered using a self-report questionnaire containing four sections. In the first section, participants were asked for demographic information about themselves, their teaching experience and qualifications and their experience with students with special needs. The second section included five categories of special needs (i.e. movement impairments, developmental disabilities, moderate learning disabilities, challenging behavior, limited self-help and social skills). Participants were asked to classify them in a descending order according to their difficulty for inclusion. The third section included two open questions, which were searching the participants'

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<sup>2</sup> It is worthy to note that all the sixty participants in the survey of Evans & Lunt (2002) unanimously agreed that students with challenging behaviors are the most difficult to include.

views about the major obstacles to inclusion of students with challenging behaviors and the area of special needs, which makes their job more difficult.

The fourth section was based on the Impact of Inclusion Questionnaire (IIQ). This questionnaire, which has been developed by Hastings & Oakford (2003) in order to test the student-teacher attitudes on challenging behavior, is an instrument designed to assess teachers' attitudes across a number of domains towards inclusion of students with challenging behaviours. Its items refer on the following potential impact domains: the Child with Challenging Behavior, Other Children in the classroom, the Teacher, and the School or Classroom Environment. The items in the Child with Challenging Behavior domain include the impact upon: acceptance/rejection by classmates, and their academic development. Items in the Other Children domain include the impact upon: contact time with the teacher, children's behavior problems, and their learning opportunities. Items in the Teacher domain include the impact upon: stress, tiredness, and workload. Finally, items in the School or Classroom Environment domain include the impact upon: classroom routines, parent and community perceptions of the school.

The Greek version was given to a lecturer in English literature, an experienced researcher in behavior analysis and an educational psychologist who concluded that the adaptations made in Greek were consistent with the original text in English.

In the original version of Hastings & Oakford (2003), which was given to student-teachers, each item is rated on a seven points agreement scale ranging from "very strongly agree" to "very strongly disagree". However, considering the pressure on teachers' time two versions were produced in Greek, one with the seven points agreement scale and one in which the range was reduced from seven choices to four (i.e. strongly disagree, disagree, agree, and strongly agree). Both versions were tested in a pilot scheme with a group of twenty teachers. Each version was given to a group of 10 teachers. Although the distribution of the results was the same the group which replied to the four choices version of the IQQ spent considerably less time than the group which replied to the seven choices version. Thus, it was decided to use the four choices agreement scale.

### *Sample*

One hundred questionnaires were given to teachers in 20 schools of primary education in the area of Northern Greece. There were returned 85 completed. All participants have been trained to work with children of 6-12 years of age while 14 participants have been trained at post-graduated level. Of the total sample, 55 participants were female and 30 were male. Eleven had less than five years of teaching experience, 36 between 6 and 15 years and 38 more than 15. Forty-nine participants had no previous experience of working with children with special needs, and 36 participants had social contact with individuals with special needs (i.e., family members, friends, contacts made through leisure pursuits).

### *Results*

Thirty-nine percent of participants consider that students with challenging behaviors are the most difficult to include. On the other hand 23% consider so the students with developmental disabilities, 19% the students with limited self-help skills and social skills, 15% the students with moderate learning disabilities and 4% the students with the movement impairments. To the open question, which was searching the participants' perception on categories of special needs that make their job more demanding, 52% reported the challenging behaviors, 33% the developmental disabilities and the remaining 15% the limited self-help skills. To the open question, which was searching the factors that impede inclusive attempts, 50% reported their limited interventional skills,

26% the lack of proper training in behavioral interventions, 18% the students' with challenging behaviors non-acceptance by peers and 6% the lack of cooperation with the parents of students with challenging behaviors.

With reference to participants' replies to the IIQ, relationships between demographic variables and IIQ scores were explored. The effects of gender, teaching experience, qualifications and experience with students with special needs were explored using t-tests. No significant differences were observed for any of the IIQ scores. One-sample Kolmogorov-Smirnov tests were used to compare the distributions of IIQ scores to a normal distribution. The results of these tests were non-significant, indicating that the data were reasonably normally distributed. Mean scores for participants, are displayed in Table 1.

**Table 1 - Mean scores on IIQ domains**

Strongly disagree (1), Disagree (2), Agree (3) Strongly Disagree (4).

	The behavior problem	Mean/SD		The behavior problem	Mean/SD		
Impact on teacher	Consumes a lot of my time for other students	3.03/.697	Impact on peers	Upsets and distracts The peers	2.76/.811		
	I feel helpless	2.87/1.009		Reduces their learning opportunities and their performance	2.50/.853		
	I do not feel that I am properly trained	2.85/1.036					
	Poses additional stress	2.85/.818					
	Makes me feel emotionally Exhausted	2.75/.911					
	Increases excessively the workload	2.67/.792					
	Impedes me from paying attention to other children	2.58/.82				Puts them in danger	2.4/.915
	Makes me feel physically exhausted	2.58/.806					
	Makes me feel nervous	2.28/.904					
	Makes me feel incompetent	2.10/.900					
Impact on school/class environment	Disturbs the routine of the class	2.92/.703	Impact on student	Impedes access to learning	2.89/.938		
	Disturbs the normal function of the school	2.30/.845		Leads to his/her rejection from peers	2.82/.847		
	Gives a negative impression for the school	1.80/.842		Gives a show to the audience, which reinforces behavior	2.65/.924		

As shown in Table 1, participants consider the impact of inclusion on time, their emotional well-being, the routine of the class and the availability of learning opportunities for the student with challenging behaviours and his/her acceptance by peers as the most serious problems they have to

face. On the other hand, elements that would show a negative attitude towards inclusion in general (e.g. the impact of inclusion on the community perception of their school) as serious problems.

### *Implications for training*

The evidence gained has important implications for the development of training, which would allow participants to overcome their concerns by enabling them to deal effectively with challenging behaviors. Several researchers (e.g. Koegel, et al., 1999; Pelham et al., 2000; Turnbull, Wilcox, Stowe & Turnbull 2001) suggest that as long as teachers are not assisted to implement appropriate behavioral interventions then the placement of students with challenging behaviors in full-inclusion classrooms will risk to fail. However, following the results of the present investigation, intervention should be as well relevant to the teachers' needs and not just appropriate. Participants need procedures, which are not time-consuming, do not impede the flow of learning in the classroom and on the meantime increase the skills and the social status of the student with challenging behaviors. As the following analysis indicates, self-management, which is an effective strategy of behavioral intervention towards challenging behaviors (Callahan & Rademacher, 1999; Hughes, Korinek, & Gorman, 1991; Koegel, et al., 1999; Todd, Horner, & Sugai, 1999; Todd, Tofflemoyer & Horner, 2003), satisfies these criteria.

### *Appropriateness of self-management*

In essence, self-management is independent use of appropriate skills across contexts, people, and materials (Todd et al., 2003). It teaches the students to recognize their own behavior and to identify, which behaviors to increase and decrease and recording and reinforcing their own behaviors (Koegel, Koegel & Parks, 1995). It includes self-monitoring, self-evaluation, self-delivered prompts and rewards as strategies for improving students' competence (Hughes et al., 1991; Hughes, 1992; Hughes, Harner, Killian, & Niharos, 1995; Hughes, Hugo, & Blatt, 1996; Mank & Horner, 1998) and applies to all areas such as completing a task, monitoring appropriate behavior, and recording events (Hughes et al., 1991; Kanfer & Karoly, 1982; Shimabukuro, Parker, Jenkins, & Edelen-Smith, 1999). It has been tested successfully in inclusive settings (e.g. Falk, Dunlap & Kern, 1996; Koegel, Koegel, Hurley & Frea, 1992; Maag, Rutherford, & DiGangi, 1992) as well as in home, and community settings (Callahan, Rademacher, & Hildreth, 1998; Christian & Poling, 1997) for the remediation of a variety of challenging behaviors like emotional disorders (Dunlap, et al., 1995; Shear & Shapiro, 1993), hyperactivity (Reiber & McLaughlin, 2004) disruptive behavior of autistic students (Barry & Singer, 2001), attention deficit hyperactivity disorder (Barry & Messer, 2003; Hinsaw & Melnick, 1992; Shapiro, DuPaul & Bradley-Klug, 1998; Shimabukuro, Parker, Jenkins, & Edelen-Smith, 1999; Slusarek, Velling, Bunk, & Eggers, 2001). There are no negative side effects reported and its' only limitation is that it seems applicable mainly to students with some level of communicative ability (Whitaker 2002).

### *Self-management and the participants' needs*

From the search of the relevant literature it emerges that self-management presents a promising response to the participants' needs for the following reasons: First, it poses minimal demands on teacher's time (Frith & Armstrong, 1986; Todd, et al., 2003) it does not interrupt the flow of learning in the classroom, it is relatively simple to implement, and it quickly reaches a point in which little supervision is required (Dunlap, Dunlap, Koegel, & Koegel, 1991). Second, by shifting behavior management responsibility from the teacher to the student enables the teacher to concentrate on the lesson (Dunlap, et al., 1991; King-Sears & Cummings, 1996; Reid, 1996).

Third, it improves peer interactions of students with challenging behaviors (Falk, Dunlap, &

Kern, 1996), and their social and play skills (e.g. Koegel, et al., 1992; Koegel & Frea, 1993; Stahmer & Schreibman, 1992). Finally, the performance of the self-managed behaviors increases desirable behaviors (Todd, et al., 1999) and promotes the self-determination and the academic independence of the student (Barry & Messer, 2003; Dunlap, et al., 1991; Frith & Armstrong, 1986; King-Sears & Cummings, 1996; Reid, 1996).

### Discussion

In harmony with previous research, which has been carried out in other countries, students with special needs who are less demanding in terms of teachers' time and skills are viewed more positively as candidates for inclusion than students with challenging behaviors.

Following the results of the present investigation this preference can be attributed to the participants' limited skills and to their concerns about the impact of inclusion on their emotional well-being and time, the flow of learning in the classroom and the restriction of opportunities for learning and peer acceptance for the student with challenging behaviors. Considering too, that participants are not concerned about the impact of inclusion of students with challenging behaviors on the community perception of their school it can be suggested that the promotion of inclusion is not a matter of prejudices but of the development of relevant interventional skills that would enable participants to deal effectively with the presence of a student with challenging behaviors in their classroom.

Furthermore search of the relevant literature indicated that self-management presents a promising response to the participants' needs. Thus, training in self-management should assist them both in overcoming their concerns and in becoming effective inclusionists of students with challenging behaviors. Follow-up research will show whether training in self-management decreased the participants' concerns and successfully promoted full inclusion of students with challenging behaviors.

### References

- Avramidis, E., Bayliss, P., & Burden, R. (2000). Student teachers' attitudes towards the inclusion of children with special educational needs in the ordinary school. *Teaching and Teacher Education, 16*, 277-293.
- Barry, L. M., & Messer, J. L. (2003). A practical application of self-management for students diagnosed with attention-deficit/hyperactivity disorder. *Journal of Positive Behavior Interventions, 5*, 4, 238-248.
- Barry, L. M., & Singer, G. H. S. (2001). A family in crisis. Replacing the aggressive behavior of a child with autism toward an infant sibling. *Journal of Positive Behavioral Interventions, 3*, 28-38.
- Callahan, K., Rademacher, J. A., & Hildreth, B. L. (1998). The effect of parent participation in strategies to increase the housework performance of students who are at-risk. *Remedial and Special Education, 19*, 131-141.
- Callahan, K., & Rademacher, J. A. (1999). Using self-management strategies to increase the on-task behavior of a student with autism. *Journal of Positive Behavior Interventions, 1*, 2, 117-122.
- Center, Y., & Ward, J. (1987). Teachers' attitudes towards the integration of disabled children into regular schools. *The Exceptional Child, 34*, 41-52.

- Chow, P., & Winzer, M. M. (1992). Reliability and validity of a scale measuring attitudes towards mainstreaming. *Educational and Psychological Measurement, 52*, 223-227.
- Christian, L., & Poling, A. (1997). Using self-management procedures to increase the productivity of adults with developmental disabilities in a competitive employment setting. *Journal of Applied Behavior Analysis, 30*, 169-172.
- Cook, B. G., Semmel, M. I., & Gerber, M. M. (1999). Attitudes of principals and special education teachers toward the inclusion of students with mild disabilities: Critical differences of opinion. *Remedial and Special Education, 20*, 199-208.
- Crimmins, D. B., & Berotti, D. (1996). Supporting increased self-determination for individuals with challenging behaviors. In D. H. Lehr & F. Brown (Eds.). *People with disabilities who challenge the system*. Baltimore: Brookes.
- Daniels, V. (1998). How to manage disruptive behavior in inclusive classrooms. *Teaching Exceptional Children, 30*, 4, 26-31.
- Dunlap, L. K., Dunlap, G., Koegel, L. K., & Koegel, R. L. (1991). Using self-monitoring to increase independence. *Teaching Exceptional Children, 23*, 3, 17-22.
- Dunlap, G., Clarke, S., Jackson, M., Wright, S., Ramos, E., & Brinson, S. (1995). Self-monitoring of classroom behavior with students exhibiting emotional and behavioral challenges. *School Psychology Quarterly, 10*, 165-177.
- Department for Education (1994). Code of Practice on the identification and assessment of special educational needs. London: DFE.
- European Agency for Development in Special Needs Education. Editors Meijer, C., and Watkins, A. (2001). *Special needs education: European perspectives*. Middelfart: European Agency for Development in Special Needs Education.
- Evans, J., & Lunt, I. (2002). Inclusive education: are there limits? *European Journal of Special Needs Education, 17*, 1, 1-14.
- Falk, G. D., Dunlap, G., & Kern, L. (1996). An analysis of self-evaluation and video-tape feedback for improving the peer interactions of students with externalizing and internalizing behavioral problems. *Behavioral Disorders, 21*, 261-276.
- Frith, G. H., & Armstrong, S. W. (1986). Self-monitoring for behavior disordered students. *Teaching Exceptional Children, 18*, 2, 144-148.
- Farrell P. (2000). 'The impact of research on developments in inclusive education'. *International Journal of Inclusive Education, 4*, 2, 153-162.
- Forlin, C. (1997). Teachers' perceptions of the stress associated with inclusive education and their methods of coping. Paper presented in the 21st National Conference of the Australian Association of Special Education. Brisbane, 25-28 September, 1997.
- Goodfellow, J. (1990). Personal preparation for successful integration of young children with special education needs - a case study. *Australian Journal of Early Childhood, 15*, 9-14.

- Hastings, R. P., Remington, B., & Hopper, G. M. (1995). Experienced and inexperienced health care workers' beliefs about challenging behaviours. *Journal of Intellectual Disability Research, 39*, 474-483.
- Hastings, R. P., & Oakford, S. (2003). Student teachers' attitudes towards the inclusion of children with special needs. *Educational Psychology, 23*, 87-94.
- Hayden, C. (2000). 'Exclusion from school in England: the generation and maintenance of social exclusion'. In: Walraven, G., Parsons, C., Van Veen, D. and Day, C. (Eds) *Combating Social Exclusion through Education*. Leuven: Garant.
- Hayes, K., & Gunn, P. (1988). Attitudes of parents and teachers toward mainstreaming. *The Exceptional Child, 35*, 31-39.
- Hinsaw, S. P., & Melnick, S. (1992). Self-management therapies and attention deficit hyperactivity disorder. *Behavior Modification, 16*, 253-273.
- Hughes, C. (1992). Teaching self-instruction utilizing multiple exemplars to produce generalized problem solving among individuals with severe mental retardation. *American Journal on Mental Retardation, 97*, 302-314.
- Hughes, C. A., Korinek, L., & Gorman, J. (1991). Self-management for students with mental retardation in public school settings: A research review. *Education and Training in Mental Retardation, 26*, 271-291.
- Hughes, C., Harner, M. L., Killian, D. J., & Niharos, F. (1995). The effects of multiple-exemplar self-instruction training on high school students' generalized conversational interactions. *Journal of Applied Behavior Analysis, 28*, 201-218.
- Hughes, C., Hugo, K., & Blatt, J. (1996). Self-instructional intervention for teaching generalized problem-solving within a functional task sequence. *American Journal on Mental Retardation, 100*, 565-579.
- Kanfer, F. M., & Karoly, P. (1982). The psychology of self-management methods: Abiding issues and tentative directions. In P. Karoly & F. M. Kanfer (Eds.). *Self-management and behavior change: From theory to practice* (pp. 571-599). Elmsford, N Y: Pergamon Press.
- Katz, J., & Mirenda, P. (2001). Including students with developmental disabilities in general education classrooms: Educational benefits. *International Journal of Special Education, 17*, 2, 14-23.
- Kennedy, C. H., Shukla, S., & Fryxell, D. (1997). Comparing the effects of educational placement on the social relationships of intermediate school students with severe disabilities. *Exceptional Children, 64*, 31-47.
- King-Sears, M. E., & Cummings, C. S. (1996). Inclusive practices of classroom teachers. *Remedial and Special Education, 17*, 217-225.

- Koegel, L. K., Koegel, R. L., Hurley, C., & Frea, W. D. (1992). Improving social skills and disruptive behavior in children with autism through self-management. *Journal of Applied Behavior Analysis, 25*, 341-353.
- Koegel, R. L., & Frea, W. D. (1993). Treatment of social behavior in autism through the modification of pivotal social skills. *Journal of Applied Behavior Analysis, 26*, 369-377.
- Koegel, R. L., Koegel, L. K., & Parks, D. R. (1995). *A guide to self-management: A training manual*. Santa Barbara: University of California.
- Koegel, L. K., Harrower, J. K., & Koegel, R. L. (1999). Support for children with developmental disabilities in full inclusion classrooms through self-management. *Journal of Positive Behavior Interventions, 1*, 26-33.
- Maag, J. W., Rutherford, R. B., & DiGangi, S. A. (1992). Effects of self-monitoring and contingent reinforcement on on-task behavior and academic productivity of learning-disabled students: A social validation study. *Psychology in the Schools, 29*, 157-172.
- Mank, D. M., & Horner, R. H. (1988). Instructional programming in vocational education. In R. Gaylord-Ross (Ed.). *Vocational education for persons with handicaps* (pp. 142-173). Palo Alto, CA: Mayfield.
- Minke, K. M., Baer, G. C., Deemer, S. A., & Griffin, S. M. (1996). Teachers' experiences with inclusive classrooms: Implications for special education reform. *The Journal of Special Education, 30*, 152-186.
- National Center for Educational Statistics, (1997). *The condition of education*. (NCES Publication No. 96-304 GPO No. 056-000-00871-8). Washington, DC: US Government Printing Office.
- Olson, M. R., Chalmers, L., & Hoover, J. H. (1997). Attitudes and attributes of general education teachers identified as effective inclusionists. *Remedial and Special Education, 18*, 28-35.
- Parsons, C. (2000). 'The third way to educational and social exclusion'. In: Walraven, G., Parsons, C., Van Veen, D. and Day, C. (Eds.). *Combating social exclusion through education*. Leuven: Garant.
- Pelham, W.E., Gnagy, E.M., Greiner, A.R., Hoza, B., Hinshaw, S.P., Swanson, J.M., et al. (2000). Behavioral versus behavioral and pharmacological treatment in ADHD children attending a summer treatment program. *Journal of Abnormal Child Psychology, 28*, 507.
- Reiber, C., & McLaughlin, T. F. (2004). Classrooms interventions: Methods to increase academic performance and classroom behavior for students with attention-deficit hyperactivity disorder. *International Journal of Special Education, 19*, 1, 1-14.
- Reid, R. (1996). Research in self-monitoring with students with learning disabilities: The present, the prospects the pitfalls. *Journal of Learning Disabilities, 29*, 317-331.
- Riecher, J. (1990). *National Working Conference on positive approaches to the management of excess behavior: Final report and recommendations*. Minneapolis: University of Minnesota. Institute on Community Integration.

- Rock, E. E., Rosenberg, M. S., & Carran, D. T. (1995). Variables affecting the reintegration rate of students with serious emotional disturbance. *Exceptional Children, 61*, 254-268.
- Rose, J. (1996). Anger management: A group treatment program for people with mental retardation. *Journal of Developmental and Physical Disabilities, 8*, 133-149.
- Scruggs, T. E., & Mastropieri, M. A. (1996). Teacher perceptions of mainstreaming/inclusion, 1958-1995: A research synthesis. *Exceptional Children, 63*, 59-74.
- Semmel, M. I., Abernathy, T. V., Butera, G., & Lesar, S. (1991). Teacher perceptions of the regular education initiative. *Exceptional Children, 58*, 9-24.
- Shapiro, E. S., DuPaul, G. L., & Bradley-Klug, K. L. (1998). Self-management as a strategy to improve the classroom behavior of adolescents with ADHD. *Journal of Learning Disabilities, 31*-545-555.
- Shear, S. M., & Shapiro, E. S. (1993). Effects of using self-recording and self-observation in reducing disruptive behavior. *Journal of School Psychology, 31*, 519-534.
- Shimabukuro, S. M., Parker, M. A., Jenkins, A., & Edelen-Smith, P. (1999). The effects of self-monitoring of academic performance on students with learning disabilities and ADD/ADHD. *Education and Treatment of Children, 22*(4), 397-414.
- Shinn, M. R., Powell-Smith, K. A., Good, R. H., & Baker, S. (1997). The effects of reintegration into general education reading instruction for students with mild disabilities. *Exceptional Children, 64*, 59-79.
- Simkins, T. (1994) Efficiency, effectiveness and the local management of schools. *Journal of Education Policy, 9*, 1, 15-33.
- Slusarek, M, Velling, S, Bunk,, D, & Eggers, C. (2001). Motivational effects on inhibitory control of children with ADHD. *Journal of the American Academy of Child and Abnormal Psychiatry, 40*, 355-368.
- Smith, M. G. (2000). Secondary teachers' perceptions toward inclusion of students with severe disabilities. *NASSP Bulletin, 84*, 613, 54 – 60.
- Smith, B., & Sugai, G. (2000). A self-management functional assessment–based behavior support plan for a middle school student with EBD. *Journal of Positive Behavior interventions, 2*, 208-217.
- Soodak, L. C., Podell, D. M., & Lehman, L. R. (1998). Teacher, student, and school attributes as predictors of teachers' responses to inclusion. *Journal of Special Education, 31*, 480-497.
- Stahmer, A. C., & Schreibman, R. (1992). Teaching children with autism appropriate play in unsupervised environments using a self-management treatment package. *Journal of Applied Behavior Analysis, 2, 5*, 447-459.
- Stillman, A. (1990) Legislation for choice. In M. Flude & M. Hammer (Eds.), *The Education Reform Act, 1988: Its origins and implications* (pp. 87-106). London: The Falmer Press.

- Todd, A. W., Horner, R. H., & Sugai, G. (1999). Self-monitoring and self-recruited praise: *Journal of Positive Behavior Interventions*, 122, 66-76.
- Todd, A. W., Tofflemoyer, S., & Horner, R. H. (2003). Use of functional assessment and a self-management system to increase academic engagement and work completion. *Journal of Positive Behavior Interventions*, 13, 144-149.
- Turnbull, H. R., Wilcox, B. L., Stowe, M., & Turnbull, A. P. (2001). IDEA requirements for use of PBS. Guidelines for responsible agencies. *Journal of Positive Behavior Interventions*, 3, 11-18.
- Vaughn, S., Schumm, J., Jallard, B., Slusher, J. & Saumell, L. (1996). Teachers' views of inclusion. *Learning Disabilities Research and Practice*, 11 (2): 96 – 106.
- Vlachou, A., & Barton, L. (1994). Inclusive education: Teachers and the changing culture of schooling. *British Journal of Special Education*, 21, 105-107.
- Whitaker, S. (2002). Maintaining reductions in challenging behaviours: A review of the literature. *The British Journal of Developmental Disabilities*, 48, 1, 94, 15-25.
- Williams, R. J., & Algozine, B. C. (1977). Differential attitudes toward mainstreaming: An investigation. *The Alberta Journal of Educational Research*, 23, 207-212.
- Wood, M. (1995). Parent-professional collaboration and the efficacy of the IEP process. In R. L. Koegel, & L. K. Koegel (Eds.). *Teaching children with autism: Strategies for initiating positive interactions and improving learning opportunities*. Baltimore: Brookes.
- Yuen, M., & Westwood, P. (2001). Integrating students with special needs in Honk Kong secondary schools: Teachers' attitudes and their possible relationship to guidance training. *International Journal of Special Education*, 16, 2, 69-84.

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## The Relationship Between Early Learning Rates and Treatment Outcome For Children With Autism Receiving Intensive Home-Based Applied Behavior Analysis

*Mary Jane Weiss and Lara Delmolino  
Rutgers, The State University of New Jersey*

The present study suggests that initial learning rates of young children with autism receiving early, intensive, home-based behavioral intervention are moderately correlated with outcome variables after four years of treatment. 20 children with autism who had Childhood Autism Rating Scale scores between 37.5 and 58 and Vineland Adaptive Behavior Scales scores between 38 and 63 at the beginning of treatment were re-evaluated after 4 years of treatment through the Rutgers Autism Program. School placement follow-up data were also available after 4 years. Treatment data reflecting rate of initial acquisition of skills was significantly correlated with school placement, severity of autism symptomatology, and adaptive behavior profiles four years into treatment, with those children having faster early skill acquisition showing greater gains in adaptive functioning, fewer or less severe symptoms of autism, and less restrictive educational placements after 4 years. The data are consistent with previous research showing the impact of intensive ABA intervention and variability in outcomes associated with such intervention, and also lend support to other published findings that early learning rates are correlated with outcome.

Key Words: Early Behavioral Intervention, Home based Programs, Outcome, Learning Rates, Autism

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The demonstration of the benefits of intensive applied behavior analytic programming for preschoolers with autism has been compelling (e.g., Anderson, Avery, DiPietro, Edward & Christian, 1987; Fenske, Zalenski, Krantz & McClannahan, 1987; Harris, Handleman, Gordon, Kristoff & Fuentes, 1991; Lovaas, 1987). Approximately 50% of children with autism participating in such programs have been shown to have significant increases in IQ and/or be placed in regular educational classrooms with little or no support. A number of researchers have documented that intensive behavioral intervention (i.e., 30-40 hours per week) begun before age 4 and lasting at least 2 years sometimes produces these dramatic effects, although studies vary in degrees of experimental control and treatment fidelity.

While some studies report that just under half of the children receiving 40 hours per week of 1:1 instruction achieved essentially normal educational and intellectual functioning (Lovaas, 1987; McEachin, Smith, & Lovaas, 1993; Perry, Cohen, & DeCarlo, 1995), slightly less dramatic improvements have been documented with less intensive (i.e., 20-25 hours per week) intervention (Birnbrauer & Leach, 1993, Andersen et al., 1987; Harris et al., 1991). It is important to note, however, that most of these children benefited from substantial gains in IQ scores, adaptive functioning, and language (Anderson et al., 1987; Harris et al., 1991). These early studies provide demonstrations of results achieved in both home programs (Lovaas, 1987, McEachin et al, 1993, Perry, Cohen & DeCarlo, 1995) and center-based programs (Birnbrauer & Leach, 1993, Andersen et al., 1987; Harris et al., 1991).

Following the initial reports of the success of ABA intervention, another model of service delivery emerged in which intensive ABA was provided in home settings with programs coordinated by parents. Previous studies utilizing a home-based model were coordinated and supervised by ABA professionals who, in addition to directing programming, hired staff and managed data. However, in the alternate home-based model, parents played a much more central coordination role: hiring staff, managing data and assisting in programming decisions with consultation from ABA professionals. Smith, Buch and Evslin-Gamby (2000) reported on the effectiveness of parent directed, intensive early intervention programs in the home. While 5 of 6 children rapidly acquired skills at the start of

treatment, only 2 improved on standardized tests at 2-3 year follow-up. These authors also noted that home instructors were less consistent than clinic employees in their implementation of teaching strategies. This study highlights some of the unique challenges to conducting intervention in a home-based setting and represents one of the few published reports of progress of children involved in home-based ABA directed by parents.

In addition to the impact of variables such as intensity, setting, or coordinator as described above, research indicates that there may be other factors that are significantly related to outcome. The age of initial intervention appears to be critically important, with a much higher likelihood of eventual enrollment in regular education classes if intervention begins prior to age 5 than at a later age (Fenske et al., 1985). Harris and Handleman (2000) found that both IQ at intake and age at intake were predictive of educational placement after discharge. Specifically, children who were 48 months or younger at intake were much more likely to be educationally placed in an inclusive setting after preschool.

Early learning rates have also been hypothesized to have predictive value in outcomes for young children with autism. Lovaas and Smith (1988) suggested that an Early Learning Measure would be more predictive of outcome than standardized instruments. Their Early Learning Measure is an instrument containing 40 instructions, divided evenly between receptive language, non-verbal imitation, verbal imitation, and expressive language. In their research, children's rate of acquisition of these items in the first four months of treatment was correlated with outcome (Lovaas & Smith, 1988). Specifically, verbal imitation and expressive labeling abilities were predictive of ultimate outcome. Similarly, Smith, Groen, and Wynn (2000) found that among other variables, initial acquisition of skills in basic curricular areas was related to outcome in an ABA program.

Weiss (1999) found that initial learning rates were predictive of changes in adaptive functioning, severity of autistic symptoms, and school placement two years into treatment within a home-based ABA model. The present study represents a follow-up assessment of those children who were involved in a home-based model of ABA instruction.

In the present study, early learning rates of young children with autism exposed to intensive home-based ABA treatment over a period of 4 years were compared to global indices of progress (i.e., in autistic symptoms and in functional skills). Though not a controlled investigation of predictors of treatment outcome, the current study presents descriptive clinical data regarding progress in young children with autism receiving intensive behavioral treatment. Relationship of progress to initial treatment learning rates is examined.

## Method

### *Participants*

Data from the entire caseload of the first author were examined. The caseload consisted of 19 boys and one girl with autism receiving intensive behavior analytic home-based intervention for 40 hours a week for approximately two years, with supplemental home-based instruction in years three and four. The 20 children all received services through the Rutgers Autism Program, a non-profit service agency directed by university faculty. The gender ratio in this sample was representative of the population of children served at the center (76 boys and 4 girls). The average age of children at the start of intervention was 41.5 months (range: 20 - 65 months). Thirteen of the 20 youngsters started intervention prior to age 4, and 19 of the 20 children began intervention before age 5. All parents of the children receiving services had contacted the Rutgers Autism and requested services.

All of the children had received the diagnosis of autism or PDD/NOS from independent qualified professionals (i.e., doctoral level psychologists, pediatric neurologists). In each instance, all

children were seen by at least two professionals who indicated that the child met DSM-IV criteria (American Psychiatric Association, 1994) for a pervasive developmental disorder of Autistic Disorder or PDD-NOS. Eighteen of the 20 children had independent diagnoses of autism, while the remaining two had diagnoses of PDD-NOS. None of these professionals were employees of Rutgers University or involved in the intervention in any way. In addition, an initial observational screening by the first author confirmed that each child met the DSM IV criteria (American Psychiatric Association, 1994) for Autistic Disorder or PDD-NOS. At the time of these diagnoses and at the onset of treatment, instruments such as the Autism Diagnostic Interview - Revised (ADI-R; Lord, Rutter & LeCouteur, 1994) or the Autism Diagnostic Observation Scale (ADOS; Lord, Rutter, DiLavore & Lisi, 2001) were not widely available or utilized.

### *Treatment*

*Intensity.* All treatment was delivered within a home-based ABA model, with each student receiving approximately 40 hours per week of individual sessions with an instructor, for the first two years. During this time, the children generally received 6 hours of instruction per day, seven days a week. The 6 hours of daily instruction were divided into two 3-hour sessions. During the work sessions, instructional demands were interspersed with periods of naturalistic play. Children generally worked for 5 to 20 trials, and then played for 1 to 3 minutes. This pattern was repeated throughout the session.

In years three and four, 1:1 home-based instruction was in addition to school-based treatment. During this time, home-based hours averaged approximately 20 hours per week, delivered in 3-hour sessions each day after school and one or two 3-hour session each weekend.

Data was not available on the precise number of hours of instruction each child received per week. All families were advised to provide 40 hours of instruction per week. All parents logged hours and all parents reported that the children received about 40 hours per week throughout the two-year period, and approximately 20 hours per week in the last two years.

*Programming and Curriculum.* Specific details of the Rutgers Autism Program intervention model are described in depth elsewhere (Weiss & Piccolo, 2001) and therefore not addressed here. Programming utilized ABA teaching strategies such as shaping, Discrete Trial Instruction and naturalistic teaching strategies, and involved individualized use of reinforcement. Basic initial curricular targets for young children included early expressive and receptive language programs, imitation and matching skills, and beginning social skills such as requesting. Progression through programming was determined by data regarding the child's progress and individualized to reflect each child's strengths and specific deficits. Programming was coordinated by the first author, a doctoral level clinical psychologist with extensive experience using applied behavior analytic methods with children with autism. In some cases, a behavior specialist employed by the Rutgers Autism Program assisted in monitoring programming and providing consultation.

*Instructors.* All of the instructors were hired by the families to provide direct instruction. The prior experience and knowledge levels of instructors were variable. Many instructors were college students or graduates specializing in psychology or special education. Typically, each instructor was paired with an experienced instructor for 18 hours of training before working individually.

*Training.* Instructors were all trained in an initial two-day workshop and received additional training every 4 to 6 weeks. Workshop training was primarily conducted by the first author, with some additional workshops co-led by an experienced behavior employed by the Rutgers Autism Program. Initial workshop topics included: definitions of ABA terminology, basics in the technique of discrete trial instruction, use of reinforcement, and prompting strategies. Role-play, demonstration, and a

checklist of instructional competence in discrete trial instruction were used to provide practice, feedback, and evaluate competency. The child was present for the workshop and was worked with directly for the majority of the time. Follow-up training (every 4 to 6 weeks) afforded opportunities to hone complex clinical ABA techniques such as shaping, prompt fading, and incidental teaching.

*Data.* In all cases, instructional staff in the home-based program recorded data. Mastery of each program and each item within a program was always determined through trial-by-trial data collection. Mastery reflected 90% performance (out of a minimum of 10 trials) across two instructors in two consecutive sessions. Instructors determined mastery. Mastery dates were recorded for first and second mastery of each item. First mastery was the first instance of 90% or better performance, while second mastery was the second instance of performance at this level with a different instructor and in a consecutive session. Full mastery could take place on one day if first and second mastery occurred on the same day.

*Procedures*

*Measures.* All children were assessed with the Childhood Autism Rating Scale (CARS) (Schopler, Reichler, DeVellis & Daly, 1988) and the Survey Form of the Vineland Adaptive Behavior Scale (Sparrow, Balla & Cicchetti, 1984) at the start of intervention and at approximately two years and four years into treatment. The CARS consists of 15 subscales based on specific behavior observation and has generally good inter-rater reliability and discriminant validity based on DSM-III-R criteria (Parks, 1983; Sevin, Matson, Coe, Fee & Sevin, 1991). The Vineland Adaptive Behavior Scales are widely used to assess developmental and self-help competencies in four domains: communication, socialization, daily living skills, and motor skills. Additionally, an adaptive behavior composite score provides a summary of comprehensive adaptive functioning (Harris, Delmolino & Glasberg, 1996). The first author administered these instruments. The Vineland and CARS for 12 of the children were re-administered independently by a master's level clinician at the Rutgers Autism Program. This clinician was not involved in the child's program and arranged for a separate interview within one week of the original interview. Both instruments are widely utilized in clinical settings to evaluate young children with autism and as measures of treatment outcome (e.g. Rogers & Lewis, 1989; Smith, Groen & Wynn, 2000).

Data regarding mastery of initial skills was obtained from archival records for each child. Data from seven initial programs were included in the analyses. These programs were selected because these were core components of initial programming for all children receiving intervention (see Table 1). The measure of initial skill acquisition used for each program was the average number of days to master each of the first five items.

Table 1. Initial Programs

1. **NVI (Non-Verbal Imitation) SD:** "Do this"  

<b>Sample items :</b>	stomp feet	bang table
	clap hands	raise arms
2. **OM (Object Manipulation) SD:** "Do this"  

<b>Sample items :</b>	peg in pegboard	move car on table
	block in bucket	place ring on stacker
3. **3D-3D Matching (Identical Object Matching) SD:** "Put with same"  

<b>Sample items :</b>	plates	cups
	bowls	spoons
4. **RC (Receptive Commands) SD:** "(Action)" (eg "clap hands")  

<b>Sample items :</b>	stomp feet	stand up
-----------------------	------------	----------

- |   |                   |            |
|---|-------------------|------------|
|   | clap hands        | raise arms |
| 5. <b>RL (Receptive Labels)</b>                 | SD: "Touch _____" |            |
| <b>Sample items:</b>                            | car               | hat        |
|   | book              | shoe       |
| 6. <b>VI (Verbal Imitation of sounds/words)</b> | SD: "Say _____"   |            |
| <b>Sample items:</b>                            | ah                | eee        |
|   | ooo               | mmm        |
| 7. <b>EL (Expressive Labels)</b>                | SD: "What is it?" |            |
| <b>Sample items:</b>                            | car               | hat        |
|   | book              | shoe       |

It is important to note that it was not possible to ascertain the specific number of trials per day for each skill, so trials to mastery could not be utilized in the analyses. Therefore, it is theoretically possible that a skill mastered in more days may have been implemented in fewer trials than a skill mastered in fewer days but with more trials per day. However, children receiving intervention with the Rutgers Autism Program model generally received instruction according to the following guidelines. Each program was implemented at least on time per session, with approximately 10 trials. Given that there were two sessions per day, it is estimated that each program had 20 trials per day as an average.

*School Placement*

Four years into treatment, information on school placement was obtained by parents and verified by school personnel. School placement was designated as regular education without individualized instruction in a typical classroom environment, or education requiring specialized and individualized instruction for some or all of the school day.

Results

*Autism Severity*

Prior to intervention, all 20 children scored in the severely autistic range on the CARS ( $M = 45.7$ , range 37.5 to 58,  $SD = 5.30$ ). Post-intervention scores on the CARS reflected improvement for all children, but were consistent with differential outcomes (see Table 2). Nine participants scored clearly in the non-autistic range (i.e., below 30). Nine youngsters were in the mild-moderate range of autism (30 to 36), and two scored in the severe range (37 to 60). The mean post-intervention CARS score was 26.6 (range 15.5 to 43,  $SD = 8.60$ ).

Table 2. CARS and Vineland Scores at the start of intervention and at 4-year follow-up.

Child	Original CARS	Current CARS	CARS change	Original Vineland	Current Vineland	Vineland change
1	43.5	31.5	-12	48	55	7
2	41	15.5	-25.5	52	113	61
3	41	15.5	-25.5	50	112	62
4	43	15.5	-27.5	50	160	110

5	53.5	33.5	-20	39	36	-3
6	37.5	30.5	-7	47	64	17
7	45.5	31.5	-14	39	68	29
8	43.5	25.5	-18	46	55	9
9	47.5	32.5	-15	48	46	-2
10	46.5	37.5	-9	45	34	-11
11	42	16.5	-25.5	55	115	60
12	47	19.5	-27.5	61	115	54
13	52	30.5	-21.5	63	51	-12
14	38.5	17	-21.5	63	103	40
15	58	43	-15	38	47	9
16	43	17	-26	49	108	59
17	41	21.5	-19.5	60	100	40
18	50	36	-14	43	39	-4
19	49	31.5	-17.5	57	51	-6
20	50.5	30	-20.5	44	49	5
Mean	45.68	26.58	-19.10	49.85	76.05	26.20
Standard Deviation	5.30	8.60	6.13	7.84	36.01	33.11

### *Adaptive Behavior*

As shown in Table 2, the range of adaptive behavior composite standard scores on the Vineland Adaptive Behavior Scales (Sparrow, Balla, Cicchetti, 1984) prior to intervention was 38 to 63 ( $M = 49.85$ ,  $SD = 7.84$ ). This mean falls well below an average score of 100. In fact, the whole range falls more than two standard deviations below an average score on this measure (Sparrow, Balla, & Cicchetti, 1984). Post-intervention scores were more variable ( $M = 76.05$ , range 34-160,  $SD = 36.01$ ). Eight children's scores were equal to or over 100. The remaining twelve children's scores break down as follows: two in the 60's, four in the 50's, three in the 40's, and three in the 30's.

### *School Placement*

Four years into treatment, the children had been placed in a variety of educational settings (see Table 3). Information on school placement was obtained by parents and verified by school personnel. Seven of the 20 participants were enrolled full-time in regular education without support. Three additional children were enrolled full-time in regular education with minimal support (i.e., had some related services or a part-time instructional assistant). None of these children received any individual instruction in their classroom settings and received minimal help from the instructional assistants. Thus, 10 participants were receiving regular education services, participating in group instruction, and reportedly acquiring skills within a typical classroom environment.

Table 3. Placement after 4 years of Treatment.

Setting	# Students	Group
Full-time Regular Education - no support	7	1
Full-time Regular Education - minimal support	3	1
Full-time Regular Education - with 1:1 discrete trial	7	2

instruction		
Full-time Special Education	3	2

Group 1 - Regular Education with no or minimal support  
 Group 2 – Receiving systematic ABA instruction

The remaining 10 participants still required some individualized instruction. Seven of these 10 children were placed full-time in regular education, but received 1:1 intensive instruction from aides for part of the school day. All of these children also required full-time aides to successfully participate in group activities. The remaining three participants were placed in special education, receiving a combination of 1:1 intensive instruction and small group instruction.

*Variability in Skill Acquisition*

Table 4 shows the average number of days needed to master each of the 1<sup>st</sup> 5 items in each program across all children. There was considerable variability across children. Acquisition rates for all programs were combined for each child to come up with a summary acquisition rate. The range for this summary score was 1 to 27 days ( $M = 5.7, SD = 6.8$ ), meaning that some children mastered each of the 1<sup>st</sup> five items in all seven programs in an average of 1 day each, with other children requiring as much as an average of 27 days to master each of the 1<sup>st</sup> five items across programs.

**Table 4, Next Page!**

*Table 4.* Average number of days to master each of the first 5 items

Child	Program						
	NVI	OM	RC	3D-3D	VI	RL	EL
1	1	1	2	2	3	3	2
2	1	1	2	1	1	1	1
3	1	1	1	1	1	1	1
4	1	1	1	1	2	1	2
5	3	2	2	3	4	3	4

6	1	2	2	1	2	1	2
7	1	1	1	1	1	1	1
8	4	2	4	2	5	3	2
9	3	2	5	2	3	2	2
10	2	1	1	1	1	2	1
11	4	2	4	2	2	2	1
12	8	4	14	5	2	10	3
13	5	2	3	2	4	3	2
14	25	13	24	7	51	10	13
15	30	17	31	6	50	27	
16	2	3	6	3	4	6	6
17	4	3	5	2	30	4	2
18	12	4	14	3	3	5	15
19	3	4	4	3	45	5	2
20	5	3	4	3	34	6	3

*Correlation of acquisition rates with outcome variables*

*Childhood Autism Rating Scale (CARS).* Correlation between skill acquisition measures and CARS scores are shown in Table 5. When averaged across all programs, the average rate for a child to learn each of the 1<sup>st</sup> five items was correlated with CARS scores at intake,  $r(18) = .49$ ,  $p \leq .025$  and 4 years into treatment,  $r(18) = .46$ ,  $p \leq .025$ . Overall learning rate was not related to the amount of change in CARS scores from time 1 to time 2. In other words, children with higher CARS scores at the beginning and four years into treatment took longer to master items across all programs. The amount of improvement in CARS scores was not related to the speed of skill acquisition; therefore, children with both faster and slower learning rates showed comparable degrees of improvement relative to their initial score.

The rate of learning each of the 1<sup>st</sup> five items for some, but not all, of the seven individual programs was significantly correlated with children's CARS scores at the beginning of treatment and at 4 years, supporting the finding that children with lower CARS scores in the beginning of treatment learned a number of their programs faster and had lower CARS scores 4 years later. Receptive Commands,  $r(18) = .42$ ,  $p \leq .05$ , 3D Matching,  $r(18) = .58$ ,  $p \leq .005$ , Verbal Imitation,  $r(18) = .49$ ,  $p \leq .025$ , and Receptive Labels,  $r(18) = .45$ ,  $p \leq .025$ , were significantly related to the post-intervention CARS scores, with 3D Matching showing the strongest relationship and was also the only learning variable that was significantly related to the amount of change in CARS scores,  $r(18) = .43$ ,  $p \leq .05$ . Children who mastered the 1<sup>st</sup> five items of 3D Matching more quickly showed lower CARS scores after treatment and greater degree of improvement than those children who took longer to master items in the same program. 3D Matching,  $r(18) = .44$ ,  $p \leq .025$ , Verbal Imitation,  $r(18) = .62$ ,  $p \leq .005$ , Receptive Labels,  $r(18) = .39$ ,  $p \leq .05$ , and Expressive Labels,  $r(18) = .38$ ,  $p \leq .05$ , were significantly related to CARS scores at the beginning of treatment, with Verbal Imitation having the strongest relationship. Children who took

longer to master Verbal Imitation items had higher CARS scores at the outset; however, learning rate on this program was not related to the amount of improvement in CARS scores.

*Vineland Adaptive Behavior Scale (VABS).* The overall average rate to master each of the 1<sup>st</sup> five items across all programs was not correlated with VABS scores at the beginning of treatment, but did show a significant relationship to follow-up VABS scores at 4 years,  $r(18) = -.48, p \leq .025$  (as shown in Table 6). Children who learned skills faster showed higher VABS scores post-treatment and showed more improvement in their VABS scores,  $r(18) = -.53, p \leq .025$ . Children who had slower learning rates did not improve as dramatically on the VABS.

Also shown in Table 6, rate of learning each of the 1<sup>st</sup> five items for all individual programs was related to the amount of change on the VABS and to the VABS scores at 4 years. Similarly to the CARS scores, 3D matching was the variable most strongly related to the amount of change,  $r(18) = -.62, p < .005$  and the follow-up scores on the VABS  $r(18) = -.59, p \leq .005$ . Therefore, children who learned programs more quickly (particularly 3D matching) tended to have higher VABS scores 4 years into treatment and showed greater improvement, even though they did not have higher VABS scores in the beginning.

*Placement.* Of the pre-treatment and learning rate variables, initial CARS scores were the most strongly related to educational placement at 4 years,  $r(18) = .76, p < .005$ . Those children with lower CARS scores at the beginning of treatment were more likely to be placed in the least restrictive educational settings with less support. The initial VABS was also related to placement at 4 years,  $r(18) = .48, p \leq .025$ , with children having higher initial VABS scores having less restrictive placements four years later. In addition, the children's rate of mastering each of the 1<sup>st</sup> five items of all programs overall and for each individual program was related to the placement information at 4 years (see Table 7).

Table 5. Pearson r correlation rate to master each of the 1<sup>st</sup> five items compared to CARS scores pre and post treatment.

<i>Program</i>	<i>CARS (4 years)</i>	<i>CARS (intake)</i>	<i>CARS Change</i>
All programs	.46*	.49*	ns
Receptive Commands	.42*	ns	ns
3D 3D Matching	.58****	.44**	.43*
Verbal Imitation	.49**	.62****	ns
Receptive Labels	.45**	.39*	ns
Nonverbal Imitation	ns	ns	ns
Object Manipulation	ns	ns	ns
Expressive Labels	ns	.38*	ns

\*  $p \leq .05$

\*\*  $p \leq .025$

\*\*\*\*  $p \leq .005$

Table 6. Pearson r correlation rate to master each of the 1<sup>st</sup> five items compared to Vineland scores pre and post treatment.

<i>Program</i>	<i>Vineland (4 years)</i>	<i>Vineland (intake)</i>	<i>Vineland Change</i>
All Programs	-.49**	ns	-.54***
Receptive Commands	-.48**	ns	-.55***

3D 3D Matching	-.59****	ns	-.62****
Verbal Imitation	-.49**	ns	-.47**
Receptive Labels	-.46**	ns	-.51**
Nonverbal Imitation	-.39*	ns	-.46**
Object Manipulation	-.41*	ns	-.47**
Expressive Labels	-.38*	ns	-.48**

\*  $p \leq .05$   
 \*\*  $p \leq .025$   
 \*\*\*  $p < .01$   
 \*\*\*\*  $p \leq .005$

Table 7. Pearson r correlation relationship between 4-year placement and pretreatment variables.

Intake CARS	.76****
Intake Vineland	-.48**
Receptive Commands	.58****
3D 3D Matching	.63****
Verbal Imitation	.57****
Receptive Labels	.51**
Nonverbal Imitation	.49**
Object Manipulation	.51**
Expressive Labels	.45**

\*  $p \leq .05$   
 \*\*  $p \leq .025$   
 \*\*\*\*  $p \leq .005$

*Reliability*

Inter-rater reliability data were available for the CARS and VABS for twelve of the twenty participants for the pre-treatment scores, and fourteen out of the twenty for post-treatment scores. The reliability data for the initial VABS and CARS scores are shown in Table 8. For the CARS, 4 out of the 12 pairs of total scores (33%) were identical. All 12 pairs of scores were within one point of each other. For the VABS, nearly all scores, 11 out of 12 (92%) were the same, and 12 pairs were within one point of each other.

Table 9 shows reliability data for scores on the follow-up administration of the CARS and scores on the follow-up administration of the VABS. For the CARS, 8 out of 14 pairs of total scores (57%) were equal to each other. All 14 pairs were within one point of each other. On the VABS scales, 7 out of 14 were exactly the same (50%), and 12 out of the 14 (86%) were within one point of each other. The remaining two pairs of scores were within two points of each other. The participants for whom reliability data were available were widely variable in characteristics and outcome (range of initial VABS scores of 38 to 60; range of follow-up VABS scores of 49 to 160). Four of the twelve participants scored equal to or above 100 on the second administration of the VABS.

The correlations for the reliability scores were all above .90. (Intake CARS,  $r(10) = .995, p = .0001$ ; 4-year CARS,  $r(12) = .999, p = .0001$ ; Intake VABS,  $r(10) = .999, p = .0001$ ; 4-year VABS,

$r(12) = .999, p = .0001$ ). In addition, the means and standard deviations for the reliability data were closely matched (see Tables 8 and 9).

Table 8. Reliability data for initial scores (CARS and Vineland)

Child	Original CARS	Original CARS reliability	Original Vineland	Original Vineland reliability
1	43.5	n/a	48	N/a
2	41	n/a	52	N/a
3	41	n/a	50	N/a
4	43	43	50	50
5	53.5	n/a	39	N/a
6	37.5	37.5	47	47
7	45.5	46.5	39	40
8	43.5	43.5	46	46
9	47.5	48.5	48	48
10	46.5	46	45	45
11	42	42.5	55	55
12	47	46.5	61	61
13	52	52	63	63
14	38.5	n/a	63	N/a
15	58	59	38	38
16	43	43	49	49
17	41	41.5	60	60
18	50	n/a	43	N/a
19	49	n/a	57	N/a
20	50.5	n/a	44	N/a
Mean	45.68	45.79	49.85	50.17
Standard Deviation	5.30	5.56	7.84	8.05

Table 9. Reliability for follow-up scores (CARS and Vineland Scores)

Child	CARS at 4 years	4 year CARS reliability	Vineland at 4 years	4 year Vineland reliability
1	n/a	n/a	n/a	N/a
2	15.5	15.5	113	113
3	15.5	15.5	112	111
4	15.5	15.5	160	160
5	n/a	n/a	n/a	N/a
6	30.5	30	64	65
7	31.5	31.5	68	68
8	25.5	25	55	53
9	32.5	33	46	46
10	37.5	37.5	34	35

11	n/a	n/a	n/a	N/a
12	n/a	n/a	n/a	N/a
13	n/a	n/a	n/a	N/a
14	17	17	103	103
15	43	42.5	47	48
16	n/a	n/a	n/a	N/a
17	21.5	21	100	100
18	36	36	39	37
19	31.5	32	51	51
20	30	30	29	48
Mean	27.36	27.29	72.93	74.14
Standard Deviation	9.06	9.06	38.48	37.12

### Discussion

The results of the present study indicate that the initial learning rates of children with autism were correlated with later learning and status after four years. Children who initially learned quickly continued to demonstrate rapid acquisition rates. Initial learning rates were also positively correlated with the child's scores on the CARS and VABS four years into treatment. This finding is consistent with the findings that initial skill acquisition in core curricular areas is related to outcome (Lovaas & Smith, 1988; Smith, Groen, & Wynn, 2000).

In addition to documenting the correlations between measures of initial learning and certain outcome measures, the results of the present study support the beneficial impact of intensive behavioral intervention for young children with autism (e.g., Anderson et al., 1987; Birnbrauer & Leach, 1993; Fenske et al., 1987; Harris et al., 1991; Lovaas, 1987; McEachin, Smith, & Lovaas, 1993; Maurice, 1993; Perry, Cohen, & DeCarlo, 1995). Our study lends support to the potential benefit of very intensive instruction, with every participant making substantial gains on standardized measures of outcome.

However, the present study showed highly variable outcomes for learners with autism exposed to intensive treatment. This is consistent with existing literature. While all children made extensive gains on measures of autism symptomatology, changes in adaptive behavior were more variable. While approximately half of the children were fully included in their educational placements, the remainder continued to require highly specialized instruction to learn skills.

The present study is limited in some critical ways. There was no control group or group receiving a different level of treatment. It therefore exists primarily as a clinical description of the effects of this model of intensive behavioral intervention.

Some important information regarding child and family characteristics was not collected. No information was gathered about family SES or the family environment. What can be said, however, is that this sample represents a self-selected group of families who specifically sought this form and intensity of intervention. In addition, the intervention model includes a significant parent training aspect, and promotes intensive parent involvement. The advocacy for ABA and level of involvement of the parents in this sample may be factors that are significantly related to the outcome for this group of children.

Also IQ data were absent. None of the children were tested by Rutgers Autism Program staff. In addition, IQ data from independent evaluations was not required. This is a serious omission, as a standardized measure of IQ would strengthen the study. Additionally, IQ may have demonstrated some prognostic value, as found by Harris and Handleman (2000).

A significant limitation is that there may be many other factors confounded with learning rate. For example, children varied widely in their responsiveness to selected rewards. Furthermore, it is impossible to capture the individualization of the programming efforts for each child, which may be of critical importance. A related possible source of impact is variability in the skill levels of teams. While training was equivalent, some teams were more enthusiastic, more acutely aware of nuances of instruction, or more thorough in their communication. This is a natural variable that was not possible to control, but which may have had an impact on the effectiveness of instruction.

An additional unanswered question is the extent to which early learning rates, in and of themselves, predict outcome. It is impossible to assess the unique predictive power of this variable in the present study, given the strong correlation with degree of autistic symptomatology. A future direction of research to address this issue would be to track the differential learning rates in a group of children with similar severity of autism as measured by instruments like the CARS or other diagnostic assessments.

Despite these limitations, none of the potential confounds can obscure the substantial link that we observed between initial performance and a child's status 4 years later. Further, the data are important as they add to the literature regarding the positive outcome of intensive behavioral intervention for young children with autism. All children made very significant gains over the course of the intervention period. However, a large number of children continued to need ongoing, specialized services. At times, the very substantial needs of this group are obscured by the focus on best outcome learners. As we continue to maximize the effectiveness of our instructional technology, we need to ensure that we address the needs of the entire spectrum of children with autism. We have a great deal to learn about how to best assist more impaired learners.

#### References

- American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.
- Anderson, S. R., Avery, D. L., DiPietro, E. K., Edward, G. L., & Christian, W. P. (1987). Intensive home-based early intervention with autistic children. *Education and Treatment of Children, 10*, 352-366.
- Birnbrauer, J. S., & Leach, D. J. (1993) The Murdock early intervention program after 2 years. *Behaviour Change, 10*, 63-74
- Fenske, E. C., Zalenski, S., Krantz, P. J. & McClannahan, L. E. (1985). Age at intervention and treatment outcome for autistic children in a comprehensive intervention program. *Analysis and Intervention in Developmental Disabilities, 5*, 49-58.
- Harris, S. L., Delmolino, L. & Glasberg, B. (1996). Psychological and behavioral assessment in mental retardation. *Child and Adolescent Psychiatric Clinics of North America, 5*, 797-807.
- Harris, S. L. & Handleman, J. S. (2000). Age and IQ at intake as predictors of treatment outcome. *Journal of Autism and Developmental Disorders, 30* (2), 137-142.

- Harris, S. L., & Handleman, J. S., Gordon, R., Kristoff, B. & Fuentes, F. (1991). Changes in cognitive and language functioning of preschool children with autism. *Journal of Autism and Developmental Disorders, 21*, 281-290.
- Lord, C., Rutter, M. & LeCouteur, A. (1994). Autism Diagnostic Interview – Revised: A revised version of a diagnostic interview for caregivers of individuals with possible pervasive developmental disorders. *Journal of Autism and Developmental Disorders, 24*(5), 659-685.
- Lord, A., Rutter, M., DiLavore, P. D. & Lisi, S. (2001). *Autism Diagnostic Observation Schedule*. Los Angeles: Western Psychological Services.
- Lovaas, O. I. (1987). Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology, 55*, 3-9.
- Lovaas, O. I. & Smith, T. (1988). Intensive behavioral treatment for young autistic children. In B. B. Lahey & A. E. Kazdin (Eds.), *Advances in Clinical Child Psychology*, (Vol. 11, pp. 285-324), New York: Plenum.
- McEachin, J. J., Smith, T., Lovaas, O. I. (1993). Long-term outcome for children with autism who received early intensive behavioral treatment. *American Journal on Mental Retardation, 4*, 359-372.
- Parks, S. (1983). The assessment of autistic children: A selective review of available instruments. *Journal of Autism and Developmental Disorders, 13*, 255-266.
- Perry, R., Cohen, I., DeCarlo, R. (1995). Case study: Deterioration, autism, and recovery in two siblings. *Journal of the American Academy of Child and Adolescent Psychiatry, 34*, 232-237.
- Rogers, S. J. & Lewis, H. (1989). An effective day treatment model for young children with pervasive developmental disorders. *Journal of the American Academy of Child and Adolescent Psychiatry, 28*, 207-214.
- Schopler, E., Reichler, R. J., DeVellis, R. F. & Daly, K. (1988). *The Childhood Autism Rating Scale*. Los Angeles, CA: Western Psychological Services.
- Sevin, J. A., Matson, J. L., Coe, D. A., Fee, V. E. & Sevin, B. M. (1991). A comparison and evaluation of three commonly used autism scales. *Journal of Autism and Developmental Disorders, 21*, 417-430.
- Smith, T., Buch, G. A., Evslin Gamby, T. (2000). Parent-directed, intensive early intervention for children with pervasive developmental disorder. *Research in Developmental Disabilities, 21*, 297-309.
- Smith, T., Groen, A., & Wynn, J. (2000). Randomized trial of intensive early intervention for children with pervasive developmental disorder. *American Journal on Mental Retardation, 105*(4), 269-285.
- Sparrow, S.S., Balla, D. A., & Cicchetti, D. V. (1984). *Vineland Adaptive Behavior Scales: Interview Edition*. Survey form manual. Circle Pines, MN: American Guidance Service.

Weiss, M. J. (1999). Differential Rates of Skill Acquisition and Outcomes of Early Intensive Behavioral Intervention for Autism. *Behavioral Interventions*, 14, 3-22.

Weiss, M. J. & Piccolo, E. (2001). Rutgers Autism Program. In J. S. Handleman & S. L. Harris (Eds.) *Preschool education programs for children with autism: Second Edition*. Austin, TX: Pro-Ed.

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## The Effects of a Motor Training Package on Minimally Assisted Standing Behavior in a Three-Month-Old Infant

*Halina Dziewolska, MS.Ed, St. Joseph's University and  
Joseph Cautilli, Ph.D., Children Crisis Treatment Center  
& St. Joseph's University*

### Abstract

Behavior analysts have spent relatively little time in designing interventions to enhance motor development in typically developing infants and children. This study examines the effect of a motor training package consisting of opportunity to respond and practice (standing the infant and letting her hold the fingers of the experimenter), conditioned leg kicks (using Fischer Price's Kick and Play) and buttocks and trunk lifts (stimulated by contingent imitation of the infants responses) on minimally assisted standing behavior in a three month old infant. Using an ABAB reversal design, we were able to dramatically increase the amount of time the infant stood and decrease the infant's rate of wobbling while standing. Future directions for this research are discussed.

Key words: Opportunity to respond, practice, standing, infant, cusp skills, and motor development

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Thelen and Fisher (1982) reignited interest in environmental variables that affect infants motor development. Behavioral theories of development tend to hold that development is the product of person-environment interactions (Novak & Pelaez, 2004) and that learning plays a central role in development (Gewirtz & Pelaez-Nogueras, 1994). While behavior analysts and behavioral educators have completed research on many areas of development including adaptive physical education with school aged children (Magill, 1993; Schmidt, 1991), infant motor development appears to have lagged behind.

One concept that holds considerable promise for infant motor development is opportunity to respond (Greenwood, Carta, Hart, Kamps, Terry, Arreaga-Mayer, Atwater, Walker, Risley, & Delquadri, 1992). Opportunity to respond has potential in facilitating children's language development (Hart & Risley, 1995) and has significant implications for cognitive development (Greenwood, Delquadri, & Hall, 1984; Greenwood, Hart, Walker, & Risley, 1994). However, a literature search on the term, using psycho-info, produced no results for the area of motor development.

We became interested in the subject matter of opportunity to respond, as well as sensory reinforcement for motor behavior, because it was: (1) simple enough to track; (2) susceptible to environmental influences; and (3) a fun series of activities for parents to do with typical infants. The current study represents an on going extension of our work on motor development.

### *Methods*

#### Participant

Participant: is a three-month-old female. She is typically developing. She is the same subject as previously described in Cautilli and Dziewolska (2005). At birth subject was 9lbs 15 ounces and 22 inches placing her in the 99%ile for weight and 98%ile for height. At the time of the study she was approximately 18lbs and 26 inches long.

## Procedure

### Intervention Package

The package consisted of a daily routine. This routine included:

- Two to three periods of approximately 20 minutes in the Fischer Price Kick and Play©. The Kick and Play uses visual and auditory reinforcement in the form of flashing lights and common children's tunes for kicking responses. The tunes are played on an intermittent schedule with brief segments of sound played for kicks that do not achieve full reinforcement of a song.
- 10-15 standing episodes. These episodes involve the infant grabbing on to the two index fingers of the experimenter. The infant is then lifted to the standing position. The fingers represent an assist to give the infant an opportunity to respond. While in the standing position, the experimenter would look very excited by raising eyes, making exaggerated facial expressions, and talking to the infant – praising her for standing.
- Two 15-minute episodes of contingent imitation for trunk and buttocks lifting. This procedure was identical to the procedure used in Cautilli & Dziewolska (2005). The infant would engage in approximately 10-25 trunk/buttocks lifts per session.

### Behavior targets defined

Minimally assisted standing is defined as lifting the infant to the upright position while infant holds to the experimenter's index fingers. In the standing position the infant is supporting her own body while on both feet with no other part of the body touching ground.

Wobbling behavior is defined as a rotation or movement of the hips.

### Probe procedure

The first standing session was taking place in the morning, approximately half an hour after the infant awoke and was breastfed. The probe data was graphed (See Graphs 1&2) and formed the basis for the results provided in this study Figures 1-5 are pictures of an actual probe session.

FIGURES 1-5, NEXT PAGE!



**Figure 1. Assisted Standing Sequence**



**Figure 2. Assisted Standing Sequence**



Figure 3, Assisted Standing Sequence



Figure 4. Assisted Standing Sequence



**Figure 5.** Stimulus Generalization of Minimally Assisted Standing

#### Inter-Observer Agreement

The experimenters calculated the inter-observer agreement on both wobbles and duration of standing. The experimenters counted the number of wobbles on three separate sessions. The total number of agreements was 28 and disagreements 4. IOA was calculated by the equation of agreements / agreements + non-agreements multiplied by 100. An 87.5% coding agreement occurred between the experimenters. Duration of standing was defined as the time from when the infant was assisted to standing until the time the infant sat. The experimenters measured duration using stopwatch. The time on the stopwatch was viewed by both experimenters, which allowed for an IOA score of 100%

#### Design

The primary purpose of experimental research is to examine relationships between independent and dependant variables (Connell & Thompson, 1986; Kearns, 1986; McReynolds & Thompson, 1986). Within subject-designs are flexible in that an experimenter can tailor the design to the phenomenon being studied (Connell & Thompson, 1986). This study used a reversal (A/B/A/B) design. The reversal design is the most straightforward illustration of experimental logic. The basic logic underlying single subject research is that the experimenter controls for extraneous variables by comparing the individual's performance under intervention to the performance on the baseline (McReynolds & Thompson, 1986). In this study, the reversal design offered a procedure for investigating the effects of the motor training package on infant's standing behavior.

The experimenters compared the behavior of the subject during the baseline condition, to the intervention condition. The experimenters assumed that the subject's performance during baseline 1 & 2 condition would predict future performance if no intervention occurs (see

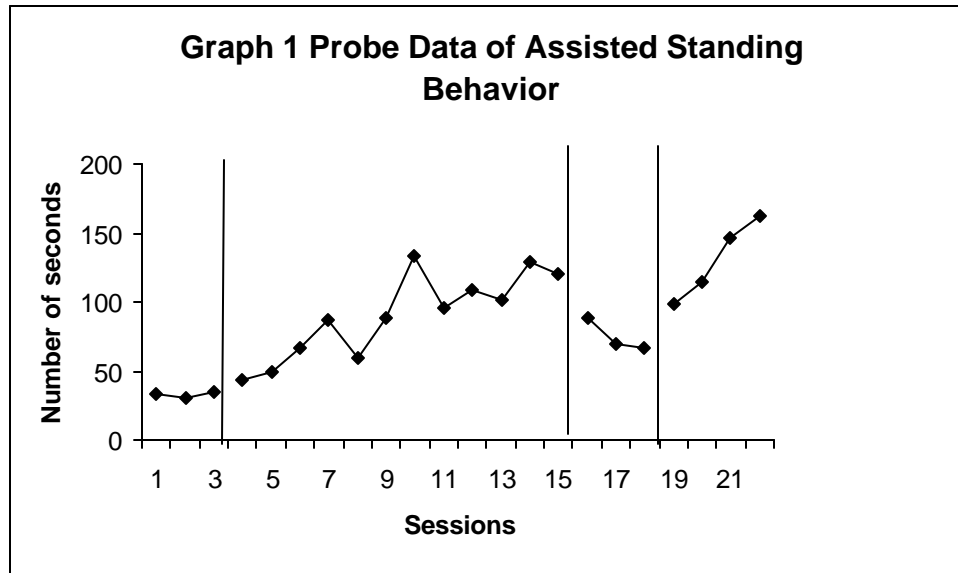
McReynolds & Thompson, 1986). After an initial baseline, in which the child was probed daily the experimenters introduced the intervention package. The AB phase shows if an effect exists; however, the simple AB phase does not allow the experimenters to demonstrate internal validity.

An internally valid design is one in which the researcher presents evidence that any differences in performance are not due to extraneous conditions (McReynolds et al. 1986). While the variables impinging on the subject during baseline are at least similar to those during intervention, the experimenter must demonstrate they are the same. It is always possible that some third variable unknown to the experimenter is actually responsible for the change (Kearn, 1986). In this study, the author observed for extraneous variables that might better explain the results and none were found; however, it is the reversal condition, which allows the experiment to have internal validity.

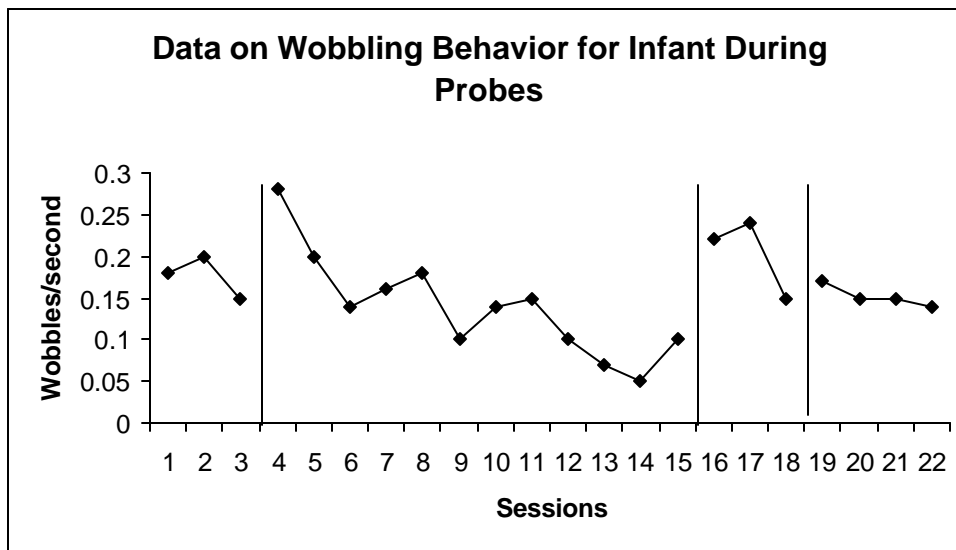
After the initial treatment package phase, the experimenter initiated the withdrawal phase. In this phase, the infant was only lifted for the probes. She was not placed on the Fischer Price Kick and Play © and was not engaged in the contingent imitation for trunk lifts. This lasted for three days. After this condition, the experimenter reinstated the motor intervention package. In this within subject study, the experimenter considered extraneous influences equally present during the baseline and intervention phases (see Kearns, 1986). Clearly, a possible role for maturation was considered but did not materialize.

When the experimenter initiates the within-subject replication, it allows the researcher to make a statement of a functional relationship (Alberto & Troutman, 1999; Bergan & Kratochwill, 1990). Thus, in a reversal design, the experimenter first achieves a stable baseline. When this occurs, then intervention phases begin. If the change in the behavior is in the predicted direction, then the experimenter has confirmed the effect. This is followed by a return to baseline phase in which the intervention is withdrawn. The prediction is that without the intervention the rates of the behavior would decline and return near the original baseline. If this occurs, it verifies the original baseline. In the final phase, the experimenter restores the intervention and this verifies the initial experimental effects. Thus, the sequence was baseline, prediction + verification (intervention 1), return to baseline (prediction + verification), and finally intervention (prediction + verification of prediction).

Graphs 1&2, Next Page!



Graph 1: Probe data graph, Assisted Standing Behavior



Graph 2: Probe data graph, Wobbling Behavior

*Results*

In the initial baseline phase, the mean length of standing was 32.7 seconds. The average rate of infant wobbles/second during baseline was .18. In the initial phase of introducing the motor package the mean length of assisted standing during the probes was 90.2 seconds. The average rate of wobbles/second during the probes was .14. In the withdrawal (return to baseline phase), the mean length of standing during the probe session was 74.3 seconds. The average rate of wobbles/second was .20. In the reinstatement of the training package, the mean during the probe increased to 130.8 seconds. The average rate of wobbles/second was .15.

### Discussion

Growing evidences exists to support learning as having a major role in the behavioral development of children (Gewirtz & Pelaez-Nogueras, 1994). In this case, it is clear that the package facilitated minimally assisted standing behavior in this infant. In addition, we were surprised not to find any evidence of maturation during the return to baseline phase. The latter concerns us because it brings up questions as to how durable the effect will be.

The number of subjects in the study limits the generality of these results. Thus, the study awaits replication. We are continuing the current level of intervention to determine if it will eventually facilitates unassisted standing and possibly walking behavior.

While motor development in a typical infant probably is not a major concern for most parents, standing and walking could be considered critical cusp skills (Rosales & Baer, 1994). As a behavioral cusp, this skill could hold the key to prevention of problems from developing or to ameliorate the impact of problems (Bosch & Hixson, 2004). One area that could profit from this type of intervention package could be for children with Down syndrome.

On average, infants with Down syndrome walk about 1 year later than typically developing infants. Currently, only one evidenced based practice exists for facilitating motor development with Down syndrome children and this involves the infant stepping response. The infant stepping response is well established (Peiper, 1929, 1969). Ulrich, Ulrich, Angulo-Kinzler, and Yun, (2001) found that using a tread mill, which provides the opportunity to respond and to practice the stepping reflex, the experimental group learned to walk with help and to walk independently at a significantly faster rate (73.8 days and 101 days, respectively) than the control group. This produced, statistically, a large effectsize for the group differences. Since infant walking is clearly a cusp skill, this may have some benefit on cognitive and social development in these children. The latter remains to be assessed.

### References

- Bergan, J.R.& Kratochwill, T.R.(1990). *Behavioral consultation and therapy*. Plenum Press.
- Bosch, S. & Hixson, M.D. (2004). The final piece to a complete science of behavior: Behavior development and behavioral cusps. *The Behavior Analyst Today*, 5(3), Page 244-252.
- Cautilli, J.D. & Dziewolska, H. (2005). Brief Report: Can contingent imitation reinforce trunk lifting in a three-month-old infant? *The Behavior Analyst Today*, 6, 250-262.
- Connell, P.J. & Thompson, C.K. (1986). Flexibility of single-subject experimental designs. Part III: Using flexibility to design or modify experiments. *Journal of Speech and Hearing Disorders*, 51, 214-225.

- Gewirtz, J.L. & Pelaez-Nogueras, M. (1994). In the context of gross environmental and organismic changes, learning provides the main basis for behavioral development. In S. Bijou & Ribes, I. (Eds.) *New Directions in Behavioral Development*. Context Press. Reno: NV
- Greenwood, C. R., Carta, J. J., Hart, B., Kamps, D., Terry, B., Arreaga-Mayer, C., Atwater, J., Walker, D., Risley, T., & Delquadri, J. (1992). Out of the laboratory and into the community: 26 years of applied behavior analysis at the Juniper Gardens Children's Project. *American Psychologist*, 47, 1464-1474
- Greenwood, C. R., Delquadri, J., & Hall, R. V. (1984). Opportunity to respond and student academic performance. In W. Heward, T. Heron, D. Hill, & J. Trap-Porter (Eds.), *Behavior analysis in education* (pp. 58-88). Columbus, OH: Merrill.
- Greenwood, C. R., Hart, B., Walker, D., & Risley, T. R. (1994). The opportunity to respond revisited: A behavioral theory of developmental retardation and its prevention. In R. Gardner III, D. M. Sainato, J. O. Cooper, T. E. Heron, W. L. Heward, J. W. Eshleman, & T. A. Grossi (Eds.), *Behavior analysis in education: Focus on measurably superior instruction* (pp. 213-223). Pacific Grove, CA: Brooks/Cole.
- Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore: Brooks.
- Kearns, K. (1986). Flexibility of single subject experimental designs. Part II: Design selection and arrangement of experimental phases. *Journal of Speech and Hearing Disorders*, 51, 204-213.
- Magill, R. A. (1993). *Motor learning: Concepts and applications*. (4<sup>th</sup> ed.). Madison, WI, Brown and Benchmark.
- McReynolds, L.V. & Thompson, C.K. (1986). Flexibility of single-subject experimental designs. Part I: Review of the basics of single participant designs. *Journal of Speech and Hearing Disorders*, 51, 194-203.
- Novak, G. & Pelaez, M. (2004). *Child and adolescent development: A behavioral systems approach*. SAGE Publications: Thousand Oaks: London.
- Peiper, A. (1929). Die schreitbewegungen der neugeborenen. *Monatsschrift fur Kinderheilkunde* 45, 444.
- Peiper, A. (1961). *Cerebral Function in Infancy and Childhood*. Consultants Bureau, New York.
- Rosales-Ruiz, J & Baer, D.M. (1994). A behavior-analytic view of development. In S. Bijou & I. Ribes (Eds.). *New Directions in Behavioral Development*. Context Press: Reno: Nevada.
- Schmidt, R. A. (1991). *Motor learning & performance: From principles to practice*. Champaign, IL: Human Kinetics.
- Thelen, E., & Fisher, D. M. (1982) Newborn stepping: An explanation for a "disappearing

reflex". *Developmental Psychology*, 18, 760- 775

Ulrich, D.A., Ulrich, B.D., Angulo-Kinzler, R.M., and Yun, J. (Nov, 2001). Treadmill training of infants with Down syndrome: Evidence-Based developmental outcomes. *Pediatrics*, 108 (5), p. e84-e88 <http://pediatrics.aappublications.org/cgi/content/full/108/5/e84>

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## Contextual Control of Infant Retention

Carolyn Rovee-Collier & Kimberly Cuevas  
Rutgers University

This article reviews the role of the environmental context in the expression and retention of operantly conditioned responding by human infants. Whether it was explicitly associated with reinforcement or not, the context controls learned responding throughout the first postnatal year, although explicitly associating different contexts with reinforcement and nonreinforcement sharpens discrimination. Throughout the first year, the training context also facilitates retention after relatively long delays. These findings have theoretical implications for both infantile amnesia and the functional maturation of the neural mechanisms that mediate the encoding of place information, as well as practical implications for the elimination of undesirable behaviors.

Keywords: Context, memory development, renewal effect, human infants, operant conditioning, long-term retention, stimulus control.

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For many years, the role of ambient environmental stimuli was largely ignored in research on stimulus control. Today, the facilitating and impairing effects of the environmental context occupy a central role in theory and research on learning and memory (e.g., Bouton, 1993, 1994; Pearce & Hall, 1980; Rescorla & Wagner, 1972; Wagner, 1981). Whereas considerable attention has focused on the role of context in studies with animal and human adults, scant attention has been paid to the role of context in studies with infants. This neglect has largely been due to the widely held assumption that infants' brains are too immature to store information about the environmental surround in which learning occurs. Nadel, Willner, and Kurz (1985), for example, asserted that "Virtually all learning during infancy is . . . independent of context" (p. 398). Despite mounting evidence to the contrary, many neuroscientists continue to cling to this long-held belief (e.g., McKee & Squire, 1993; Nadel & Zola-Morgan, 1984; Nelson, 1995; Squire, 1992). In this article, we review some of the major findings of our conditioning research on the contextual stimulus control of retention in infants and its implications.

### *Distinction between cues and contexts*

A cue is defined as that aspect of a situation which the experimenter manipulates, and the context is defined as the relatively invariant aspects of the setting (e.g., its location) in which the response occurs that do not affect the characteristics or demands of the task (Riccio, Richardson, & Ebner, 1984; Thomas, 1985). Even when responding to a given cue is explicitly reinforced, however, seemingly irrelevant contextual cues often exert a profound influence on test behavior. Riccio, Urda, and Thomas (1966), for example, found that pigeons key pecked for grain more frequently when the tilt of the cage floor during training and testing was more similar. Likewise, Winocur and Kinsbourne (1978) found that training Korsakoff patients in a highly distinctive room significantly increased the duration for which they remembered the training event when they were tested in the same room. In fact, one of the few principles upon which most memory theorists agree is that retention is best when the conditions of training (encoding) and testing most closely match. This principle is known as the *encoding specificity principle* (Tulving & Thomson, 1973).

Baddeley (1982) distinguished two types of context. The *intrinsic or interactive context* determines the form in which a target item is encoded, so that changing the context during testing essentially requires that subjects recognize something very different from what they originally encoded. An example of the intrinsic context is the sentence in which a target word is embedded that gives the word a particular meaning or the scene in which a target object appears. The *extrinsic or independent context* does not influence how a target item is encoded. It includes aspects of the background, such as where or when the item was learned, the age, sex, or attitude of the experimenter, the subject's internal state, and so forth. In studies with infants, we have manipulated the extrinsic context.

*Basic Research Paradigms*

Because infants lack a verbal response to tell us what they remember, we teach them a motoric one that they can use instead. Later, we test their retention by showing them the training cue in either the original training context or a different one and "asking" them if they recognize the cue. If infants kick or lever press at a rate greater than operant level, then we infer that they recognize the cue; if they do not respond above operant level, then we infer that they do not recognize it.

All infants are trained and tested in their homes at a time they are likely to be playful. Infants between 2-6 months are operantly trained to kick to move an overhead mobile via a ribbon that is strung from one ankle to the mobile suspension hook (see Figures 1a & 1b), and infants between 6-18 months



*Figure 1(a):* A 3-month-old during a reinforcement phase (acquisition) in its crib.



*Figure 1(b):* A 6-month-old during acquisition in the playpen. Note the distinctive context draped over the sides of the crib and playpen.

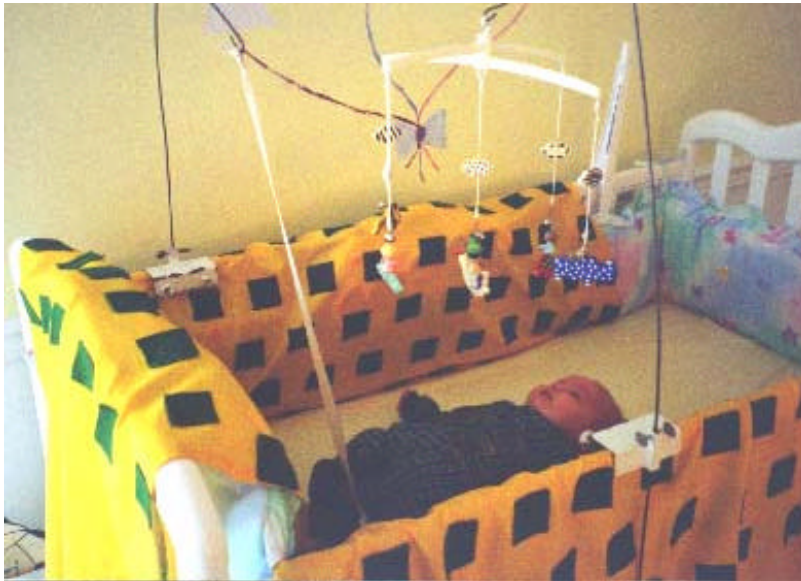
are operantly trained to lever press to move a miniature train around a circular track (see Figure 2).



**Figure 2.** A 6-month-old performing the operant train task.

Because memory performance is identical in the mobile and train tasks, we use the train task as an “upward extension” of the mobile task without concern that age differences in retention might reflect task differences. The *context* is either a distinctively colored-and-patterned cloth that is draped over the sides of the crib or playpen or a particular room in the home. Other researchers using the mobile task have also manipulated the auditory context (Fagen, Prigot, Carroll, Pioli, Stein, et al., 1997) and olfactory context (Rubin, Fagen, & Carroll, 1998).

Immediately before and after training, the ankle ribbon is briefly connected to an empty hook or the response lever is deactivated so that infants can see the mobile or train, but responding does not move it (see Figure 3a). Before training, this is the baseline period when we measure the infant’s operant level;



**Figure 3 (a)** A 3-month-old during a nonreinforcement phase (baseline, the immediate retention test, the long term retention test).

after training, this period is when we measure the final level of conditioning and retention after zero delay. After training is over and a specified amount of time (usually days to weeks) has elapsed, we administer a long-term retention test under identical circumstances so that the measure of retention reflects only what infants actually bring into the test session and not new learning or savings at the time of testing. Because we test infants only once, all forgetting functions reflect the data of independent groups. The duration for which infants remember the task increases linearly over the first year-and-a-half of life, from 1-2 days at 2 months of age to 13 weeks at 18 months of age (Hartshorn, Rovee-Collier, Gerhardstein, Bhatt, Wondoloski, et al., 1998b).

After delays so long that infants have forgotten the task (i.e., they fail to respond above operant level on the long-term test), we can use a *reactivation procedure* to alleviate their forgetting. During the reactivation treatment, we briefly expose infants to a fractional component of the original training event, such as the original mobile or train (alone or in the training context; see Figure 3b) or the distinctive cloth

Figure 3(b), Next Page!



**Figure 3(b)** A 3-month-old during a reactivation treatment in the training context. Note that the end of the ribbon is not attached to the ankle but is held by the experimenter, who tugs it to move the mobile at the same rate that a given infant had kicked during the final 3 min of acquisition.

context (no mobile present), as a memory prime or reminder. The efficacy of the prime is subsequently assessed in a standard long-term retention test. One day after priming, infants respond at the same rate that they had responded 1 day after training; thereafter, they forget the reactivated memory at the same rate that they had forgotten the original one (Hildreth & Rovee-Collier, 2002; Hsu & Rovee-Collier, in press).

#### *Developmental Changes in Contextual Specificity*

In everyday life, the likelihood that the conditions of encoding and retrieval will remain the same decreases as the retention interval becomes longer. In addition, infants are often asked to retrieve information from memory in circumstances that are substantially different from those of original encoding. An important developmental question, then, is how the similarity between the conditions of encoding and retrieval affects long-term memory over the infancy period.

Our lab has studied the effect of changing the retrieval context on retention over the first year of life (Hartshorn, Rovee-Collier, Gerhardstein, Bhatt, Klein et al., 1998a). Although the absolute delay after which a context change impairs retention increases over this period, so too does the maximum duration of infants' retention (see above). At 3 months of age, for example, when infants remember the operant mobile task for only 5 days, testing in a novel context 1 day after training is over does not affect retention, but testing in a novel context 3 days afterward does (Butler & Rovee-Collier, 1989). At 9 months, however, when infants remember the operant train task for 6 weeks, testing in a novel context 3 days after training is over does not affect retention, but testing 42 days afterward does (Hartshorn et al., 1998a). In order to compare contextual specificity at similar relative points along the forgetting functions of differently aged infants, therefore, we anchored the forgetting functions of 3-, 6-, 9-, and 12-month-olds at their beginning and end points (Hartshorn et al., 1998b) and then compared retention at the first,

middle, and last points on the forgetting functions. (These points correspond, respectively, to absolute retention intervals of 1, 3, and 5 days at 3 months; 1, 7, and 14 days at 6 months; 1, 28, and 42 days at 9 months; and 1, 28, and 56 days at 12 months.)

We found that changing the context at the time of testing impaired retention only after delays near the end of the forgetting function at all ages except 6 months (Borovsky & Rovee-Collier, 1990), when it impaired recognition only after a relatively short delay. We interpreted the former result as evidence that when infants' memory for the training cue gets "fuzzy," the context provides additional cues that disambiguate the focal cue and facilitate its recognition (Bouton & Bolles, 1985). Apparently, when the memory is weak, the additional information about the context facilitates its retrieval. We interpreted the unique result at 6 months as a functional adaptation in anticipation of the onset of independent locomotion at 7 months of age. Having previously learned what objects are located in what places during the first half-year of life (for review, see Rovee-Collier, 1996), independent locomotion permits infants to navigate from one of these places to another. After delays so long that the memory has been forgotten, however, if the memory has been reactivated in the original context, then 24 hr later, infants can recognize the original cue in a different context by 9 months of age. By 12 months of age, the forgotten memory can even be reactivated in a different context (DeFrancisco, 2003). Thus, reactivated memories become less context-dependent with age. Parents, educators, and public policy experts should be comforted to know that infants can transfer what they learn in one place (e.g., the daycare center or nursery school) to another place (e.g., home) if given an opportunity to do so before too much time has elapsed or if subsequently given a reminder.

Although context changes are a major source of memory deficits in animals, they may cause less of a problem for older children or adults. Crowder (1985), for example, argued that context effects in human adults result only from "sledge-hammer" manipulations, such as learning a word list underwater and recalling it on land (Godden & Baddeley, 1975). Our data from infants also suggest that less radical interventions have failed to affect retention in older children and adults because their retention tests have usually been administered after relatively short delays, and context effects rarely appear until later on the forgetting function.

#### *A Case of Context-Dependent Learning and Retention: The Renewal Effect*

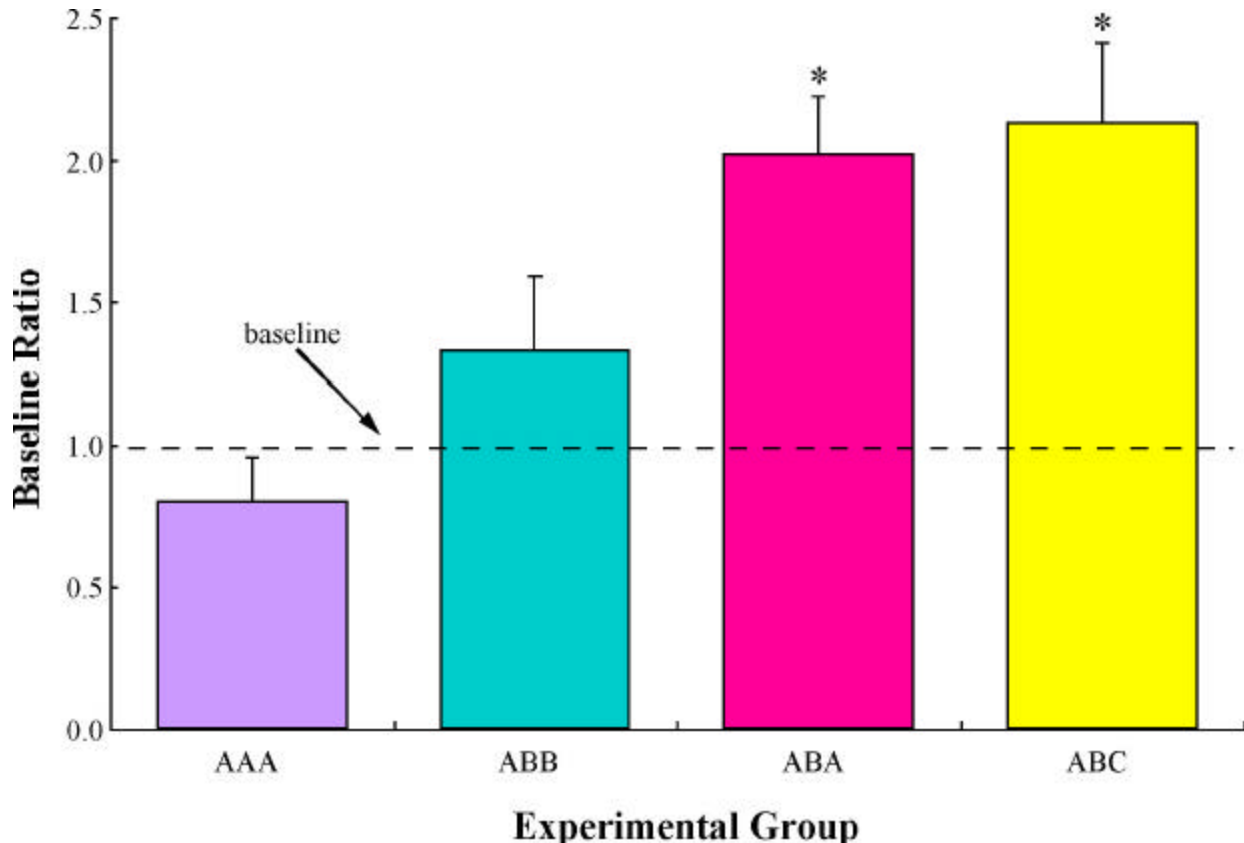
Thus far, we have only discussed the role of the context as the incidental setting in which a target event occurs. However, the context can also be explicitly associated with the experimental contingencies, in which case it functions like a set of environmental "instructions" that tell the subject what to do. The renewal effect is a prime example of context-dependent learning (Bouton, 1993, 1994).

The *renewal effect*, originally described by Bouton and Bolles (1979), occurs after a response has been extinguished in a context that differs from the context in which that response was originally acquired. It is manifested as the recovery (*renewal*) of acquisition performance when the context that was present during extinction is changed, and subjects are returned to the acquisition context or are shifted to a completely "neutral" (e.g., novel) context (Bouton & Ricker, 1994). The latter result reveals that the renewal effect is not due to encountering the retrieval cues that had been associated with the excitatory context in which the response was acquired but is a *retrieval failure* that occurs when the retrieval cues associated with extinction are removed, thereby disrupting subjects' retention of extinction.

The renewal effect has primarily been studied with adult animals. Recently, however, we have found that 3-month-old infants also exhibit the renewal effect (Cuevas, Learmonth, & Rovee-Collier, 2005). Here, the particular colored-and patterned cloth panel that was draped over the crib rails during the experimental session defined the context. At the outset of session 1, infants' operant levels were initially assessed for 2 min each in either contexts A and B or contexts A and C, depending on infants'

assigned test condition. Next, kicks were reinforced by mobile movement in context A for 9 min in session 1 and, 24 hr later, 9 min in session 2. Immediately after acquisition was over in session 2, context A was replaced with context B, the extinction context, for 9 min. At this time, infants' kicks were no longer reinforced (i.e., did not move the mobile). One day later, all infants received a long-term retention test (a 2-min nonreinforcement phase) with the original mobile in either context A (the acquisition context), context B (the extinction context), or context C (a neutral context).

As expected, infants who were tested in context B responded at operant level, indicating 24-hr retention of extinction. Infants who were tested in either context A or context C, however, responded significantly above operant level (see Figure 4), indicating that the original learning was still intact.



**Figure 4.** The renewal effect in 3-month-olds. The retention measure was the baseline ratio (LRT/BASE), which expresses the extent to which an infant's response rate during the long-term retention test (LRT) exceeds that same infant's operant level or baseline rate (BASE). All statistical comparisons were made against a theoretical baseline ratio of 1.0 (*dashed line*). A group mean baseline ratio significantly > 1.0 indicated significant retention. In the group labels, the first letter designates the training context, the second letter designates the extinction context, and the third letter designates the test context. Groups AAA (*purple column*) and ABB (*green column*), which were tested in the extinction context, exhibited no retention during the long-term test. Group ABA (*pink column*), which was tested in the acquisition context, and Group ABC (*yellow column*), which was tested in a novel context, exhibited significant retention during the long-term test. Asterisks indicate significant retention ( $M$  baseline ratio significantly > 1.00); vertical bars indicate +1 SE.

These results confirm that original learning is permanent, as Pavlov (1927) had originally argued. They further reveal that the elimination of infant behavior via an extinction procedure is context-specific: In contexts other than the extinction context, infants will resume the behavior that was previously been reinforced. The finding that the context "instructs" subjects about which experimental contingencies are

in effect has a number of practical implications for caregivers and clinicians who seek to eliminate undesirable behaviors such as temper tantrums and excessive crying, addictions (e.g., to alcohol and drugs), and phobias.

### *Overriding Context-Dependent Retention*

Although extinction in a specific context does not eliminate behavior that infants had acquired in another context, their context-dependent retention can be overridden by initially training them in two or more contexts. Thereafter, learned responding generalizes to new contexts that the infants had not encountered before (Amabile & Rovee-Collier, 1991; Rovee-Collier & DuFault, 1991). Conceivably, this manipulation was also responsible for the generalization of responding to context C that we described in the preceding section, although we have not explicitly tested this possibility, and 3-month-olds do not exhibit a retention deficit in a novel context 1 day after training (Butler & Rovee-Collier, 1989). Contextual generalization is also achieved by merely exposing infants to the training cue in a novel context shortly after training in a single context is over (Boller & Rovee-Collier, 1992; Boller, Rovee-Collier, Gulya, & Prete, 1996; Rossi-George & Rovee-Collier, 1999).

### *Implications for Infantile Amnesia*

Few adults can remember events that occurred before the age of 3 or 4 (White & Pillemer, 1979)—a phenomenon known as *infantile amnesia*. For many years, this phenomenon was attributed to the poor memory ability of immature organisms, but evidence that infants' memories are quite enduring (Hartshorn et al., 1998b) and that 4-year-olds can recall events that occurred before the age of 2-1/2 (Fivush & Hamond, 1990) necessitates another explanation. A more satisfactory account reflects what our studies with infants have revealed about the retention of contextual information, namely, its fragility over repeated retrievals and the temporal constraints on reactivating forgotten memories.

First, evidence of remembering a particular episode requires that an individual be able to specify the time and place that the event had occurred, which is contextual information. The memory for contextual information is relatively fragile, however, and contextual information is simply "lost" if the memory has been reactivated before (Campanella & Rovee-Collier, 2005; Galluccio & Rovee-Collier, 2005; Hitchcock & Rovee-Collier, 1996). Moreover, if an event occurred in more than one context, then its memory is context free (Amabile & Rovee-Collier, 1991; Rovee-Collier & DuFault, 1991). It should come as no surprise, therefore, that verbally proficient individuals usually cannot pinpoint the time or place that an early memory originated. Second, most memories that originated early in life have probably been modified or updated, perhaps many times (Boller et al., 1996; Rovee-Collier, Adler, & Borza, 1994). In addition, even if the memory has not been reactivated before, it is susceptible to modification if its *initial* reactivation occurs after a long delay--and the longer the delay, the stronger the effect (Galluccio & Rovee-Collier, 2005). If the infant encounters a different context immediately after the memory has been reactivated (and the context is likely to be different as the delay becomes increasingly long), then the new context is substituted for (displaces) the old one in the memory (Galluccio & Rovee-Collier, 2005). When the contextual information in the memory has been updated in this way, the original context in which the memory was encoded can no longer be identified by individuals of any age.

Third, once a memory has been encoded and forgotten, it cannot be reactivated indefinitely. Rather, there is a ceiling or upper limit to the point after an event has occurred when its forgotten memory can be reactivated (Hildreth & Hill, 2003). Throughout the first and second years of life, this upper limit is four times longer than an infant originally remembered the event (Hsu & Rovee-Collier, in press). Since the duration of original retention determines the upper limit of reactivation, it must be obvious that the forgotten memory of infants who were younger when the event originally occurred cannot be reactivated after an absolute delay as long as that of older individuals, who remember longer in the first

place. Conversely, if the same constant relative upper limit of reactivation were to persist into early childhood and beyond, then at some point, a memory could be reactivated years after it was encoded! Finally, because the match between the encoding and retrieval contexts facilitates memory retrieval after very long delays in infancy and probably does so in early childhood, both natural and perceived changes in context over time make the probability of retrieving a unique memory that was acquired early in life minimal at best.

### Conclusions

The environmental context controls the expression and retention of learned behavior of very young infants. This behavioral control is seen whether the context has been explicitly associated with particular reinforcing contingencies or not, although explicit, context-dependent learning sharpens discrimination. Younger infants do not spontaneously exhibit learned responding in a context that differs from the context in which they were trained except after relatively short intervals (e.g., 1 day). As infants age, however, the contextual constraints on their retention begin to loosen, and by the second year of life, they readily generalize learned responding from one context to another except after very long retention intervals. The findings described in this article have theoretical implications for the developmental timetable of the brain mechanisms that are putatively responsible for processing information about the place where an event occurs, the role of contextual cues in retention, and the likely basis of infantile amnesia. They also have a number of applied implications, including implications for the elimination of undesirable behaviors and the means by which to facilitate the transfer of learning from one context to another.

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### References

- Amabile, T.A., & Rovee-Collier, C. (1991). Contextual variation and memory retrieval at six months. *Child Development, 62*, 1155-1166.
- Baddeley, A.D. (1982). Domains of recollection. *Psychological Review, 89*, 708-729.
- Boller, K., & Rovee-Collier, C. (1992). Contextual coding and recoding of infant memory. *Journal of Experimental Child Psychology, 52*, 1-23.
- Boller, K., Rovee-Collier, C., Gulya, M., & Prete, K. (1996). Infants' memory for context: Timing effects of postevent information. *Journal of Experimental Child Psychology, 63*, 583-602.
- Borovsky, D., & Rovee-Collier, C. (1990). Contextual constraints on memory retrieval at 6 months. *Child Development, 61*, 1569-1583.
- Bouton, M.E. (1993). Context, time, and memory retrieval in the interference paradigms of Pavlovian learning. *Psychological Bulletin, 114*, 80-99.
- Bouton, M.E. (1994). Conditioning, remembering, and forgetting. *Journal of Experimental Psychology: Animal Behavior Processes, 3*, 219-231.
- Bouton, M.E., & Bolles, R.C. (1979). Contextual control of the extinction of conditioned fear. *Learning*

- and Motivation*, 10, 445–466.
- Bouton, M.E., & Bolles, R.C. (1985). Contexts, event-memories, and extinction. In P.D. Balsam & A. Tomie (Eds.), *Context and learning* (pp. 133-166). Hillsdale, NJ: Erlbaum.
- Bouton, M.E., & Ricker, S.T. (1994). Renewal of extinguished responding in a second context. *Animal Learning & Behavior*, 22, 317-324.
- Butler, J., & Rovee-Collier, C. (1989). Contextual gating of memory retrieval. *Developmental Psychobiology*, 22, 533-552.
- Campanella, J.L., & Rovee-Collier, C. (2005). Latent learning and deferred imitation at 3 months. *Infancy*, 7, 243–262.
- Crowder, R.G. (1985). Basic theoretical concepts in human learning and cognition. In L.-G. Nilsson & T. Archer (Eds.), *Perspectives on learning and memory* (pp. 19-37). Hillsdale, NJ: Erlbaum.
- Cuevas, K., Learmonth, A.E., & Rovee-Collier, C. (2005, March). *Contextual determinants of infant learning: The renewal effect*. Paper presented at the meeting of the Eastern Psychological Association, Boston, MA.
- DeFrancisco, B.S. (2003). *The effects of cue and context changes on reactivation in the first year of life*. Unpublished Doctoral dissertation, Rutgers University, New Brunswick, NJ.
- Fagen, J.W., Prigot, J., Carroll, M., Pioli, L., Stein, A., & Franco, A. (1997). Auditory context and memory retrieval in young infants. *Child Development*, 68, 1057-1066.
- Fivush, R., & Hamond, N.R. (1990). Autobiographical memory across the preschool years: Toward reconceptualizing childhood amnesia. In R. Fivush & J.A. Hudson (Eds.), *Knowing and remembering in young children* (pp. 223-248). Cambridge: Cambridge University Press.
- Galluccio, L., & Rovee-Collier, C. (2005). Updating reactivated memories in infancy. II. Time passage and repetition effects. *Developmental Psychobiology*, 47, 18-30.
- Godden, D.R., & Baddeley, A.D. (1975). Context-dependent memory in two natural environments: On land and underwater. *British Journal of Psychology*, 66, 325-331.
- Hartshorn, K., Rovee-Collier, C., Gerhardstein, P., Bhatt, R.S., Klein, P.J., Aaron, F., Wondoloski, T.L., & Wurtzel, N. (1998a). Developmental changes in the specificity of memory over the first year of life. *Developmental Psychobiology*, 33, 61-78.
- Hartshorn, K., Rovee-Collier, C., Gerhardstein, P., Bhatt, R.S., Wondoloski, T.L., Klein, P.J., Gilch, J., Wurtzel, N., & Campos-de-Carvalho, M. (1998b). The ontogeny of long-term memory over the first year-and-a-half of life. *Developmental Psychobiology*, 32, 69-89.
- Hildreth, K., & Hill, D. (2003). Retrieval difficulty and retention of reactivated memories over the first year of life. *Developmental Psychobiology*, 43, 216-229.
- Hildreth, K., & Rovee-Collier, C. (2002). Forgetting functions of reactivated memories over the first year of life. *Developmental Psychobiology*, 41, 277-288.

- Hitchcock, D.F.A., & Rovee-Collier, C. (1996). The effect of repeated reactivations on memory specificity in infants. *Journal of Experimental Child Psychology*, 62, 378-400.
- Hsu, V.C., & Rovee-Collier, C. (in press). Memory reactivation in the second year of life. *Infant Behavior and Development*, 28 (1).
- McKee, R.D., & Squire, L.R. (1993). On the development of declarative memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 19, 397-404.
- Nadel, L., Willner, J., & Kurz, E.M. (1985). Cognitive maps and environmental context. In P.D. Balsam & A. Tomie (Eds.), *Context and learning* (pp. 385-406). Hillsdale, NJ: Erlbaum.
- Nadel, L., & Zola-Morgan, S. (1984). Infantile amnesia: A neurobiological perspective. In M. Moscovitch (Ed.), *Advances in the study of communication and affect: Vol. 9. Infant memory* (pp. 145-172). New York: Plenum.
- Nelson, C.A. (1995). The ontogeny of human memory: A cognitive neuroscience perspective. *Developmental Psychology*, 31, 723-738.
- Pavlov, I.P. (1927). *Conditioned reflexes*. London: Oxford University Press.
- Pearce, J.M., & Hall, G. (1980). A model for Pavlovian learning: Variations in the effectiveness of conditioned but not of unconditioned stimuli. *Psychological Review*, 87, 532-552.
- Rescorla, R.A., & Wagner, A.R. (1972). A theory of Pavlovian conditioning: Variations in the effectiveness of reinforcement and nonreinforcement. In A.H. Black & W.F. Prokasy (Eds.), *Classical conditioning II: Current research and theory* (pp. 64-99). New York: Appleton-Century-Crofts.
- Riccio, D.C., Richardson, R., & Ebner, D.L. (1984). Memory retrieval deficits based upon altered contextual cues: A paradox. *Psychological Bulletin*, 96, 152-165.
- Riccio, D.C., Urda, M., & Thomas, D.R. (1966). Stimulus control in pigeons based on proprioceptive stimuli from floor inclination. *Science*, 153, 434-436.
- Rossi-George, A., & Rovee-Collier, C. (1999). Retroactive interference in 3-month-old infants. *Developmental Psychobiology*, 35, 167-177.
- Rovee-Collier, C. (1996). Shifting the focus from What to Why. *Infant Behavior and Development*, 19, 385-400.
- Rovee-Collier, C., Adler, S.A., & Borza, M.A. (1994). Substituting new details for old? Effects of delaying postevent information on infant memory. *Memory & Cognition*, 22, 644-656.
- Rovee-Collier, C., & DuFault, D. (1991). Multiple contexts and memory retrieval at three months. *Developmental Psychobiology*, 24, 39-49.
- Rubin, G.B., Fagen, J.W., & Carroll, M. (1998). Olfactory context and memory retrieval in 3-month-old infants. *Infant Behavior and Development*, 21, 641-658.

- Squire, L.R. (1992). Memory and the hippocampus: A synthesis from findings with rats, monkeys, and humans. *Psychological Review*, 99, 195-231.
- Thomas, D.R. (1985). Contextual stimulus control of operant responding in pigeons. In P.D. Balsam & A. Tomie (Eds.), *Context and learning* (pp. 295-321). Hillsdale, NJ: Erlbaum.
- Tulving, E., & Thomson, D.M. (1973). Encoding specificity and retrieval processes in episodic memory. *Psychological Review*, 80, 352-373.
- Wagner, A.R. (1981). SOP: A model of automatic memory processing in animal behavior. In N.E. Spear & R.R. Miller (Eds.), *Information processing in animals: Memory mechanisms* (pp. 5-47). Hillsdale, NJ: Erlbaum.
- White, S.H., & Pillemer, D.B. (1979). Childhood amnesia and the development of a socially accessible memory system. In J.F. Kihlstrom & F.J. Evans (Eds.), *Functional disorders of memory* (pp. 29-74). Hillsdale, NJ: Erlbaum.
- Winocur, G., & Kinsbourne, M. (1978). Contextual cueing as an aid to Korsakoff amnesics. *Neuropsychologia*, 16, 671-682.

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## Using Experimental Analysis to Identify Reading Fluency Interventions: Connecting the Dots

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### Abstract

This article reviews the conceptualization, measurement, and design of brief experimental analysis for oral reading fluency problems. It presents examples from the literature of how brief experimental analysis results have been used to generate effective treatments for a variety of different applications (e.g., parent tutoring, small group, self-managed interventions). It also describes three different approaches investigators have taken to conducting brief experimental analyses. Finally, the article describes a method for conducting a single trial brief experimental analysis that will allow practitioners to quickly and efficiently identify potential interventions designed to address skill and performance based oral reading fluency deficits. Limitations and areas where future research is needed are discussed.

Keywords: Academic performance, curriculum-based measurement, experimental analysis, oral reading fluency, stimulus control.

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Behavior Analysts frequently have legitimate reason to bemoan how their work is characterized by others. Their contributions are often marginalized and criticized in mainstream educational circles by individuals who may prioritize paradigm preferences and philosophical biases over the quality of results produced by differing educational methods. Yet, from time to time a remark from outside of behavior analytic circles rings true and, if we are not too quick to dismiss it, may provide us with fresh insight into the nature of our work. In this case, the comment came several years ago from a then 4-year old daughter of a doctoral student in school psychology. When she saw her mother's graphs of data, the daughter exclaimed, "Oh! It's connect-the-dots!" (Christine Bonfiglio, personal communication, 2002). Lest this commentary be dismissed as merely a cute reflection of an innocent who knew nothing about behavior analytic practices, we wish to point out that this little girl's point reveals a profound truth about our work. Her understanding may be greater than we are willing to give her credit for, even if she understood nothing about principles of reinforcement or stimulus control.

To this little girl, the activity of connecting the dots was sure to produce a picture out of an otherwise incomprehensible jumble of markings on the page. To the behavior analyst, the markings (dots) represent snapshots of behavior at various points in time and under various conditions. And just as the little girl confidently assumed that someone created an order to the dots for her to discover if she persisted with the task, behavior analysts confidently assume that there are predictable functional relationships that will allow them to put meaning and order to the picture in spite of the myriad of variables that may be operating to distract or overwhelm their attention. It is our intention in this paper to provide guidance in how to bring order to the dots associated with oral reading fluency problems. When analyses are appropriately structured, the "connections" between the dots provide valuable stimuli that can be used to occasion more effective teaching methods.

The remainder of this paper will be devoted to unfolding more completely what exactly it is that we are or should be assessing for reading fluency problems and how to fit direct measures of student reading performance into experimental analyses that can inform intervention selection in classrooms and schools. To this end, after conceptualizing the task, we review the literature on experimental analyses whose chief purpose has been to facilitate intervention selection (as opposed to a broader or more comprehensive review of experimental analyses of academic performance). Finally, we outline some ways in which these methods can be used efficiently by educational personnel to resolve reading fluency problems.

*Word Reading and Its Measurement*

In order for the dots to represent a meaningful educational picture, we must first ask what the conditions are that generate the dots in the first place. The dots are the product of a measured interaction between the student and pre-planned environmental stimuli, which would be an academic task of some type in the case of academic performance. The task and structured assessment conditions rely on an appropriate conceptualization of what the dots are supposed to mean in order to be interpretable. The task itself which is chosen as the source of stimulus materials during assessment obviously has a significant influence on the value of the dot in the overall picture. It should contain the most critical features of the curriculum if the results are to reflect an educationally relevant outcome. For instance, the assessor may choose to assess reading in fourth grade reading materials because the student is in fourth grade. There is more to working out the conceptualization of the dot, however. To complete the analysis, we must turn to the response.

For academic skills, each dot represents the degree to which the task exerts stimulus control over the appropriate response. For example, textual stimuli occasion a reading response of some type. If we ask a student to read aloud when we present him or her with a text, we expect to hear words that correspond exactly to the printed stimuli. For each word, there is one and only one response that is correct, and, therefore, the text should always occasion the same response. The measurement then is an indication of the presence or absence of stimulus control. However, responses within a response class vary in a number of ways across opportunities. The assessment conditions also are presumed to capture some quantifiable *dimension* of responding that is important and which is expected to change over time if response strength is initially weak or even inexistent. For instance, a measurement system in reading might reflect the number of correct responses (frequency) or it might reflect the speed of correct responses (rate or fluency). With effective teaching, response strength should increase over time and across different dimensions. A useful measure will accurately indicate the degree to which this is occurring, giving meaning to the dots on the page.

*Measuring oral reading fluency.* Fluency is a particularly useful dimension of behavior to measure. Reflecting a combination of accuracy and speed, fluency has proven to be a valid and sensitive indicator of instructional outcomes (Binder, 1996). Indeed, because of its critical role in reading acquisition, *oral reading fluency* has been established as a legitimate instructional target in its own right (National Reading Panel, 2000; Snow, Burns, & Griffin, 1998). Research supports the relationship between reading fluency and overall reading ability, including comprehension (Cunningham & Stanovich, 1998; Meyer & Felton, 1999). Oral reading fluency is a prerequisite to independent comprehension. When children laboriously decipher words in text, their decoding competes with comprehension efforts and impairs their ability later to give a verbal report of what they read.

Oral reading fluency has been operationalized into standardized procedures for creating interpretable dots, referred to in the literature as curriculum-based measurement (CBM; Shinn, 1989). Scored as correctly read words per minute (CRW per min), CBM involves repeated measurement of student proficiency in basic academic skills over time using standardized directions and brief fluency timings (Hintze, Daly, & Shapiro, 1998). CBM was developed as a general outcome measure and provides a reliable, valid, sensitive, and efficient procedure for obtaining performance data that may be used to evaluate instruction (Fuchs & Fuchs, 1999). CBM has a wide variety of applications. For instance, it can be used to model growth longitudinally (Fuchs, Fuchs, Hamlett, Walz, & Germann, 1993), develop and maintain appropriate student goals (Fuchs, Fuchs, & Hamlett, 1989; Fuchs & Shinn, 1989), and provide information about how to modify instruction (Deno, Fuchs, Marston, & Jongho, 2001; Fuchs, Fuchs, Hamlett, & Allinder, 1991).

*Measuring generalization of word reading.* Measuring response fluency alone is not sufficient for producing meaningful assessment results. An even more important question is the generality of the behavior (Stokes & Baer, 1977). If a student is able to reliably and quickly read a word in a single text, but cannot read the word when it appears in other texts, the response is of limited utility to the student. If the generality of word reading is not measured, then it is unlikely that educators will take steps to program for it (Stokes & Baer, 1977). Generalization of word reading can be seen as occurring in two forms. In the first case, a student who learns to read a word in one text may then be able to read it in other texts. Change in word order across texts serves as perhaps the most critical change in stimulus conditions that allows us to conclude that generalization occurred. (Although, maintenance of the response across time is another important dimension of behavior as well and is confounded with changes in word order in the example.) Generalization can also occur when a student reads a word he or she never read before in part as a function of having learned to read other words. For instance, if a student learns to read a phonetically regular word (e.g., “box”) and responds correctly in the presence of an untrained word (e.g., “mop”), he or she is said to have generalized. This same form of generalization also can be seen in words that do not share stimulus properties, as phonetically similar words do. Surely, teachers do not teach all possible stimulus-response relationships, but there are plenty of students who somehow come to learn them (Alessi, 1987). For example, a second grade student may show a generalized increase in word reading fluency across curriculum items before the teacher even teaches many of the words.

Oral reading fluency assessments can provide a more complete account of behavior if they systematically address the degree of generalization being sampled as dots are generated. According to Alessi (1987), assessment of instructed stimulus-response relationships provides information about student mastery and assessment of uninstructed stimulus-response relationships provides information about generalization. In other words, when responding is measured in directly taught material, the results indicate mastery of what was taught. When responding is measured either for untaught but functionally equivalent responses or for taught responses under different stimulus conditions, the results indicate generalization of responding. Fuchs and Deno (1991) refer to the former practice as *specific subskill mastery measurement* and to the latter as *general outcome measurement*. General outcome measurement is the stronger measurement model for the generalized outcomes that teachers and other educators desire for students, and should therefore serve as the ultimate criterion of instructional effectiveness.

General outcome measurement with untaught stimulus-response relationships (e.g., many untaught words from the curriculum) will be the hardest level of generalization to achieve with students, especially those referred for reading problems. Improvements are likely to show up on graphs more slowly, if at all. Yet, there may be other important types of generalization occurring, and general outcome measurement may actually underestimate a student’s responsiveness to instruction. One way in which reading fluency assessments have been structured to provide an index of generalization is to manipulate word overlap between passages used for instruction and those used to assess the effects of instruction (Daly, Martens, Kilmer, & Massie, 1996). Word overlap refers to the amount of word commonality across texts (expressed as a percentage of the same words that appear in both an instructional text and a text used to assess instruction). Passages are created in which many of the same words appear, but which are written as different stories. Stimulus conditions are varied (i.e., sequences of words and therefore meaning) while actual words appearing in both texts remain highly similar. Therefore, assuring high word overlap (e.g., greater amount of identical words between instructional and assessment passages) is one method for estimating the ability of instruction to produce generalized increases.

Use of high word overlap passages is perhaps an intermediate form of generalization which may be more sensitive to instructional effects than traditional general outcome measurement practices like formative evaluation in non-curricular materials that have low word overlap with what is taught. Measuring generalized performance increases within experimental analyses may improve the ability of experimental analyses to identify potentially useful interventions that can be applied in natural settings.

Without careful planning for evaluating generalization of effects, successful treatment of academic difficulties may fail to be relevant to the needs of children experiencing academic difficulties.

### *Establishing Functional Relationships for Oral Reading Fluency*

Our inquiry thus far has been into what the dot means from a behavior analytic perspective. But, we have looked at only part of the picture. When we inquire about the conditions that yield dots, we must also ask what happens *between* the dots to fully interpret their meaning. Between each dot, there will be variations in the stimuli (even if only as a function of time and previous exposure to the stimuli). When the dots increase steadily but the conditions of assessment do not change functionally across sessions, we infer that stimulus control is growing stronger. Joe Witt once said, “The goal of academic intervention is to get the dots to go to the top of the page” (Joseph Witt, personal communication, 1997). The connections between dots inform our interpretation of functional relationships. There are some situations in which we might want to purposefully exploit the direction of the dots by introducing variations in stimulus conditions between sessions. These intentional variations in stimulus conditions should influence the direction of the dots both up and down across assessment sessions. Planned variations in stimuli lie at the heart of the essence of experimental analysis. Variables are directly manipulated to determine the degree of stimulus control achieved across conditions. The results are used as a basis for deciding how to change instruction in the classroom, bringing a picture to the forefront that can help educators prioritize instructional variables for subsequent classroom intervention. In other words, experimental analysis contributes to the overall goal of making the dots reach the top of the page by directly controlling when they go up or down (as a function of instructional conditions and control conditions), allowing the clinician to draw an individualized picture for each case.

In any discussion of establishing functional relationships through experimental analysis, it is essential to relate all of the variables back to the natural environment, which is where those relationships must gain a foothold in order for the student to be successful in the curriculum. With this in mind, we point out that the teacher should have at least three objectives for the classroom for academic subjects like reading, all of which influence the teacher to change academic stimuli in very important ways so that stimulus generalization can be achieved. In promoting student learning, the teacher first aims to reduce and eventually eliminate response prompts necessary to help students make correct responses. Unless this is done, student responding will never fully come under the control of the target academic stimuli. Stimulus control is a prerequisite to stimulus generalization (Shahan & Chase, 2002). Second, the teacher progressively increases task difficulty level and complexity to meet the objectives of the sequential curriculum, which requires stimulus generalization for repertoires taught earlier in the curriculum. Finally (and related to the second objective), the teacher programs instructional activities to progressively approximate “real world” applications outlined as the outcomes of the curriculum. To be successful students must persist in responding correctly (i.e., according to the response demands and critical features of the academic stimuli) to all these stimulus changes. Ultimately, teachers are preparing students to display sophisticated behavioral repertoires in future environments (e.g., college, work settings, personal lives) for which the contingencies may not be altogether clear for any given student. In this process, careful attention is given to the development of stimulus control and then stimulus generalization (so that students’ behavioral repertoires are robust in the post-education environment), and any experimental analyses of student performance should be aligned accordingly if the results are to be generalizable to the classroom.

*Skill versus performance deficits.* It is when a student fails to get the right answer in spite of instructional efforts that an experimental analysis may be called for. An experimental analysis is carried out to establish the variables that will bring about stimulus control and stimulus generalization. Stimulus control itself comes about through differential reinforcement (Catania, 1998). Therefore, when there is a student problem the contingencies are not supporting the occurrence of the desired academic response.

There are two probable reasons why this is happening. In the first case, the consequences for responding are not effective reinforcers for the appearance of the behavior (even though the response repertoire exists). In other words, the student would give a correct response if stronger or more desirable consequences for behavior existed. In the second case, the consequences may be potentially effective (strong enough or desirable enough), but the response repertoire is not of sufficient strength for it to appear in the presence of those consequences. In this situation, antecedent stimuli that are naturally present do not serve as effective prompts for the response either. The former scenario is a performance deficit and the latter scenario is a skill deficit (Lentz, 1988).

Identifying the type of problem is helpful for resolving it. For instance, manipulation of consequences should be sufficient to resolve a performance deficit. In the case of a skill deficit, additional antecedent stimuli in the form of response prompts will be necessary to occasion responding in the presence of natural stimuli (e.g., words in a text) so that it can be reinforced. Corrective feedback will also play a critical role in the formation of appropriate discriminations as well. The types of instructional response prompts and consequences necessary can be differentiated according to a heuristic referred to as the Instructional Hierarchy (IH; Daly, Lentz, & Boyer, 1996; Haring, Lovitt, Eaton, & Hansen, 1978). The IH guides how to increase response frequency for behavioral deficits. Modeling and error correction (involving consequent modeling and contingent response repetition) are used to facilitate the initial appearances of accurate responses. When responding is consistently accurate, practice (i.e., frequent and repeated opportunities to respond) promotes response fluency. Performance feedback for rate of responding is also likely to improve fluency.

Several studies have demonstrated the utility of these distinctions by finding individual differences in students' responsiveness to performance-based (i.e., programmed reinforcement) or skill-based (i.e., use of instruction) interventions (Duhon et al., 2004; Eckert, Ardoin, Daisey, & Scarola, 2000; Eckert, Ardoin, Daly, & Martens, 2002; Noell et al., 1998). For example, Duhon et al. (2004) used brief assessment procedures to generate hypotheses about skill versus performance deficits in the areas of math and writing. Skill deficits were displayed by two students and performance deficits were displayed by two students. The hypotheses were confirmed through extended classroom applications of both types of interventions for all four students. In all cases, the results validated the original hypotheses which were formulated based on student assessments.

#### *Establishing functional relationships for generalized word reading.*

Experimental analyses that have explicitly targeted generalization of word reading by manipulating word overlap have been few in number. Many studies have measured outcomes directly in training materials, testing for mastery but not for generalization. One exception is a study by Daly, Martens, et al. (1996), who found an interaction between word overlap and difficulty level. The greatest effects were achieved when there was high word overlap between instructional and assessment conditions and difficulty level was better matched to students' instructional level (i.e., the materials were not too hard). Since that time, several studies have incorporated high word overlap passages into the experimental analyses, many of which will be reviewed in a later section. Here, we wish to focus on the results of a study that examined the effects of a combination of instructional and motivational variables on generalization to high word overlap passages. Daly, Bonfiglio, Mattson, Persampieri, and Yates (in press) found that a combination of antecedent instructional variables (in an instructional passage) and reinforcement for generalized responding (in high word overlap passages) produced greater generalization than a reinforcement-only condition, suggesting that it may be necessary to combine instructional and reinforcement components to produce generalized word reading in some cases. Generalization of responding was directly reinforced (across stories with different word order) and the instructional antecedents to generalization appear to have increased the probability of correct responding during the assessment of generalization. It is possible that the contingency which was explained at the beginning of

the session may have increased motivation to attend to the discriminations being taught (i.e., word reading fluency) during instruction. Interestingly, there was an interaction effect with difficulty level, with two participants displaying higher relative increases in easier passages and one participant displaying higher relative increases in harder passages. Individual differences in student responding to instructional and/or motivational components signals a need to test intervention components prior to instructional intervention if maximum impact is sought.

The interventions that lead to stimulus control and stimulus generalization are obviously important. Individual differences between students and the necessity of efficient interventions that are not costly in terms of time and effort in schools speak to the need to identify which intervention components may be necessary for a particular student. A number of strategies are available to the practitioner. Strategies used in the experimental analyses described in this paper appear in Table 1. These are the intervention components that we have found to be particularly useful for establishing stimulus control and generalization. They have been used together as a single treatment package and in various combinations to establish stimulus control and stimulus generalization for word reading (as will be reviewed in the next section).

Table 1. *Reading Fluency Intervention Components*

<u>Component</u>	<u>Rationale</u>	<u>Procedural Steps</u>
Reward (R)	Used to identify performance deficits (Daly, Murdoch, Lillenstein, Webber, & Lentz, 2002)	The practitioner tells the student that a tangible item (e.g., bouncy balls, pencils, stickers, candy, etc.) or access to a privilege (e.g., 10 min of playing a game) is available to the student contingent upon meeting a predetermined individualized performance goal. The performance goal is based on a 30% increase in correct words per minute, with fewer than 4 errors, derived from the student's previous performance on the passage. Prior to instruction and assessment, the student chooses one reward to earn for meeting the goal. The reward is delivered after the assessment if the student met or exceeded the goal. This condition can be used to reward generalization of responding if prior instruction is carried out in an instructional passage that has high word overlap.
Listening Passage Preview (LPP)	Provides modeling to increase the student's reading accuracy and fluency (Daly & Martens, 1994).	The examiner reads the instructional passage to the student at a comfortable pace while simultaneously monitoring the student to ensure that he or

		she is correctly following along with his or her finger.
Repeated Readings with Performance Feedback (RR)	Designed to provide a student with multiple opportunities to respond by having the student re-read a passage repeatedly and provide feedback on fluency (Eckert et al., 2002)	The examiner has the student re-read a passage three times. Each time, the examiner tells the student how quickly he or she read the passage and how many errors were made.
Phrase Drill (PD)	Designed to provide corrective feedback and accurate practice to increase correct responding (O'Shea, Munson, & O'Shea, 1984)	As the student reads the passage the first time, the practitioner highlights or underlines the student's errors. After the student finishes reading the passage, the practitioner points to and reads the first error word to the student. The student reads the error word correctly to the practitioner, and then reads the phrase or sentence containing the error word three times. This process is repeated for each error word.
Syllable Segmentation (SS)	Designed to increase accuracy by providing the students with further corrective feedback and practice blending the syllables of error words together (Daly et al., in press).	After the student has read the passage a second time, the practitioner corrects errors by using an index card to cover each error word and uncovering and modeling the correct pronunciation of one syllable at a time. The student repeats the correct pronunciation of each syllable as the practitioner uncovers them. The student then independently reads each syllable and blends the syllables together to pronounce the word. If the student makes any mistakes during this process, the practitioner repeats the previous step.

### *Identifying Oral Reading Fluency Interventions Through Brief Experimental Analysis*

Experimental analysis has a long, honorable, and fruitful tradition as the analytic framework within which empirical validation has occurred in the field of applied behavior analysis (Johnston & Pennypacker, 1990; Sidman, 1960). Unfortunately, the field has been slow to expand experimental analysis beyond social behaviors (Ervin et al., 2001). Recently, however, experimental analysis has begun to be used as a methodology for identifying effective treatment conditions, much as functional analysis was developed to facilitate treatment selection for behavioral excesses (Daly, Witt, Martens, & Dool, 1997). At least three characteristics of brief experimental analysis for academic behaviors differentiate it from traditional functional analyses. First, the analyses are conducted with behavioral deficits (i.e., not enough academic responding) rather than with behavioral excesses (e.g., self-injurious behavior). Second,

treatments are applied directly as a part of the experimental analysis (and not inferred based on analyses of maintaining variables). Third, data series and conditions are often abridged to make the process more time efficient (Martens, Eckert, Bradley, & Ardoin, 1999). It is for this last reason that the methods and procedures have inherited the name “brief experimental analysis,” or BEA, for short.

*Applications of BEA.* BEA has been used to generate effective reading interventions for parent tutoring (Daly, Shroder, & Robinson, 2001; Gortmaker, Daly, McCurdy, Persampieri, & Hergenrader, 2005; Persampieri, Gortmaker, Daly, & Sheridan, in press; Valleley, Evans, & Allen, 2002), small reading groups (Bonfiglio, Daly, Persampieri, & Andersen, 2005), and self-managed interventions (Daly, Persampieri, McCurdy, & Gortmaker, 2005). When used to develop parent tutoring interventions, it has potential for maximizing treatment integrity when it identifies the intervention that yields the best results yet requires the least amount of effort (Valleley et al., 2002). When the parent conducts an instructional trial as a part of the BEA, he or she not only gets to “try out” the intervention, but also receives supervision and training from the one supervising the BEA (Persampieri et al., in press). Results can be compared to those obtained by the clinician. The same is true for applications to small reading groups when the teacher uses the indicated treatment as a last step before classroom application (Bonfiglio et al., 2005). Finally, many of the instructional components used as a part of BEA can be tailored to individualized, self-managed components that require a minimum of adult supervision when the classroom teacher is unable or unwilling to modify typical reading instruction (Daly et al., in 2005). There are other potential applications of BEA derived interventions that have not yet been explored in the literature (e.g., peer tutoring). However, these examples illustrate that application of BEA results can be accomplished in a variety of ways.

*Three methods for conducting BEAs.* Since its development, three approaches to designing BEAs for reading fluency problems have been taken. Early on, intervention components were evaluated singly (Daly, Martens, Dool, & Hintze, 1998; Jones & Wickstrom, 2002; Valleley et al., 2002). For example, Daly et al. applied intervention components individually until a visible increase in reading fluency was found. Once this increase was obtained, the investigators added an additional baseline and then re-introduced the effective intervention component for experimental control purposes. Replication of baseline and the effective condition strengthened the case for the selected intervention. By only introducing an additional baseline condition when the intervention was identified as effective, Daly et al. reduced the overall number of sessions needed. However, the evaluation can still take a number of sessions to identify a single instructional component that produces a strong effect.

Although combining treatment components may create more complex treatments, effects would probably be stronger and may more closely resemble actual classroom instruction. Teachers would rarely (if ever) use a single instructional technique only. Therefore, BEAs in which intervention components were added sequentially began to emerge (Daly, Martens, Hamler, Dool, & Eckert, 1999; Daly, Murdoch, Lillenstein, Webber, & Lentz, 2002; VanAuken, Chafouleas, Bradley, & Martens, 2002). For example, Daly et al. (2002) systematically evaluated combinations of repeated readings, listening passage preview, phrase drill error correction, sequential modification (a generalization strategy), text difficulty, word list training, and rewards to identify effective interventions for five second grade students. Following a baseline condition, intervention began with a single component (repeated readings) and proceeded sequentially by including an additional treatment component in each subsequent condition. Individual differences were obtained in students’ responsiveness to the treatment combinations, with some students requiring simpler and some more complex treatments.

The third approach that has been taken to conduct BEAs is to use a strong treatment package initially and dismantle the package until the simplest intervention that still produces reasonable increases in performance is identified. For example, Daly et al. (2005) conducted brief experimental analyses in three phases. The first phase included a treatment package consisting of both skill- and performance-based strategies at two difficulty levels (i.e., easier and harder) and control conditions. Then, the package was dismantled by separating skill-based and performance-based instructional components. Finally, the indicated treatment (reinforcement-only for one student and the treatment package for the other) was compared once again to control and another treatment for validation purposes. Intervention components

were implemented by the students with the assistance of the experimenter in extended analyses and led to substantial increases in reading performance for both students. The advantage to the dismantling approach is that the complete treatment package can serve as a benchmark against which leaner treatments can be compared. If a simpler intervention produces the same result as the treatment package, then the simpler intervention is recommended for adoption as the intervention of choice.

#### *Conducting a Single Instructional Trial BEA*

In this section, guidelines for conducting a BEA are presented. These procedures can be used to identify an intervention in a single instructional trial. They are based on methods used in the studies described earlier, but have been simplified to reduce the amount of time and number of sessions necessary to identify an appropriate intervention. Student performance is measured immediately after the instructional trial in three different passages, allowing the examiner to determine whether generalization gains have been made as a function of either a treatment package (containing both instructional and reward components) and/or a reward-only condition relative to a control condition. An initial screening is conducted that should take not more than about 15 minutes. The instructional and assessment session can be conducted in about 20 minutes. The steps are presented in Table 2. After explaining how to prepare for a BEA, an explanation of each step is given.

Table 2

#### *Steps for Conducting a Single Instructional Trial BEA*

Steps
1. Screen to identify at least three equal difficulty level assessment passages.
2. Randomly assign one passage to the treatment package, one to the reward-only condition, and one to the control condition.
3. Deliver the treatment package using the corresponding instructional passage for the assessment passage assigned to the treatment package condition.
4. Assess student performance in all three passages immediately after treatment. Order of passages should be randomized.
5. Reward is delivered contingent on meeting pre-specified criteria for performance in one of the two reward passages (reward-only and treatment package). The passage chosen for reward is determined randomly between the two options after the student has read all three passages.

*Materials preparation.* Two types of reading passages are used in a BEA: assessment and instructional passages. All passages should consist of short (i.e., approximately 150 words) stories at the level at which the student is currently being instructed. Each assessment passage should have a corresponding high word overlap instructional passage. Assessment passages are rewritten as a different story with a high percentage of the same words to create instructional passages. Passages used in our research and practice have generally had about 80 to 95% word overlap. The percentage of word overlap can be calculated by dividing the number of words contained in both passages by the total number of words in the assessment passage. Each assessment passage is used twice in the BEA—first during screening to identify equal difficulty level passages, and then again after the student has received the instructional trial in an instructional passage.

Although each assessment passage has a corresponding high word overlap instructional passage, only one of the instructional passages will be used during the analysis (the one randomly chosen for the treatment package following screening). Therefore, one assessment passage will have high word overlap with the instructional passage: this is the treatment package passage. Two assessment passages will have low word overlap with the instructional passage: these are the control and reward passages. We recommend having at least a dozen assessment passages on hand for the screening to increase the likelihood of finding three equal difficulty level passages during the screening. You will also need two flashcards, one with an “A” marked on one side and the other with a “B” marked on one side. (Be sure that the marking is not visible from the other side.) These flashcards will be used to determine to which passage the reward criterion will be applied.

*Pre-experimental screening.* The purpose of the pre-experimental screening is to identify equal difficulty level passages that will serve as the basis for comparing conditions. Equating difficulty level controls for variance in reading performance due to fluctuations in passage difficulty from one passage to another. (Our experience has led us to find that readability formulas do a poor job of reflecting difficulty level of a passage for a given student and that the best way to determine difficulty level is to measure the student's oral reading fluency performance in the passage.) Once the materials are gathered, administer all of the high word overlap *assessment* passages to the student for 1 minute each in random order to collect the baseline oral reading fluency for each passage (CRW per min and errors per min according to standard CBM administration procedures; Shinn, 1989).

*Pre-session preparation.* Once all of the baseline fluency scores for the passages are collected, sort them from highest to lowest based on CRW per min. For example, if a student reads 46, 48, 33, 31, 37, 34 and 35 CRW per min on a series of passages, sort the scores as 48, 46, 37, 35, 34, 33 and 31 CRW per min. Next, choose the three passages that are closest in difficulty level (i.e., the passages for which the student read 35, 34, and 33 CRW per min in the example). Randomly assign one passage to the treatment package condition, one to the control condition, and one to the reward condition. Student copies of the two passages in which the student can earn a reward should be indicated in some way (e.g., with "REWARD" written across the top). The criterion for meeting the reward should be indicated on the examiner copies for these two passages. We recommend a criterion of a 30% increase in performance over the screening results for the passage with 3 or fewer errors (Daly et al., 2005). For example, for the passage in which the student read 34 CRW per min during screening, a 30% improvement would be 44 CRW per min. The criterion is determined individually for each passage. We also suggest that you put a bracket after the last word in the examiner copies of the two passages that must be met for the student to earn a reward (but not in the student copy). Differentiate the passages from one another by marking one passage as "REWARD A" and the other as "REWARD B" or some such other designation.

#### *Conducting the instructional trial.*

The high word overlap instructional passage that is associated with the assessment passage assigned to the full treatment package is selected for the instructional trial. All of the treatment components except the reward condition (see Table 1) are administered to the student in this passage. However, before beginning the instructional trial, the examiner allows the student to choose a reward (e.g., a tangible, access to a privilege, an edible) toward which he or she will be able to work during the assessment passages. Student motivation may be increased if the examiner explains that the instructional passage has a lot of the words as one of the assessment passages and that practicing in the instructional passage may help him or her to do well in the assessment passage. The steps for conducting the instructional trial are outlined in Table 3.

Table 3. Protocol for the Instructional Trial

Steps
1. Explain the reward contingency that will be applied to the two reward/assessment passages. Explain to the student that practicing in the instructional passage may help him or her do better in the reward passages.
2. Taking the instructional passage, read the passage aloud to the student at a comfortable reading rate while he or she follows along with a finger.
3. Have the student read the passage for 2 minutes while you mark errors. When the student is done, tell him or her how fast he or she read the passage (CRW per min) and how many errors he or she made.
4. Read each error word to the student and have him or her read the sentence containing the error word three times. Model correct responding if the student continues to make errors.
5. Have the student read the passage a second time for 2 minutes while you mark errors. When the

student is done, tell him or her how fast he or she read the passage (CRW per min) and how many errors he or she made.

6. For words that were read incorrectly a second time (i.e., were read incorrectly during both steps 3 & 5), break each word into syllables for the student. Next, have the student break the words into syllables (repeating what you just did) and also blend the syllables together to form the correct word. Model correct responding if the student continues to make errors.
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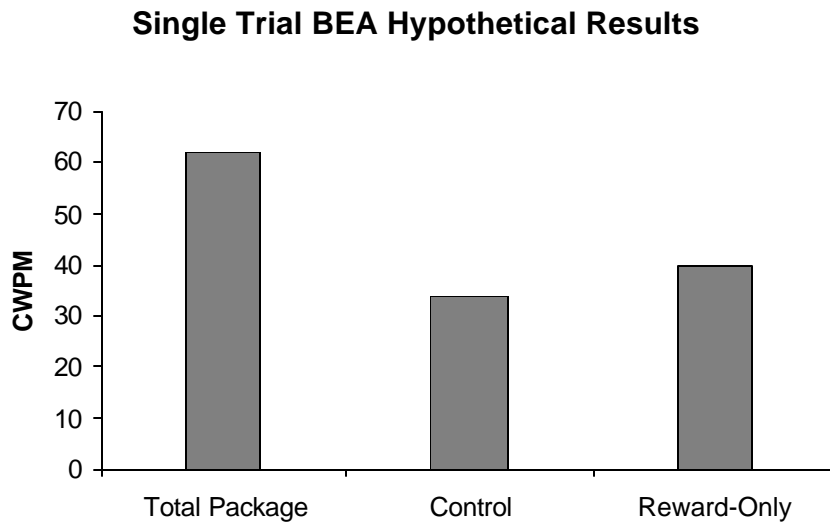
*Assessing performance and giving feedback about reward.* Before assessment begins, the examiner explains to the student that he or she can earn a reward for beating his or her last score on one of the two passages marked with “REWARD” at the top, and that the examiner will tell the student whether he or she met the goal after all three passages have been administered. The three assessment passages are administered to the student for 1 minute each in random order while the examiner scores student performance for CRW per min and errors in each passage. We suggest that you signal to the student each time a reward passage is presented (e.g., “You can see that this is one of the reward passages.”).

At the end of the session, set the passages aside and explain to the student that you will determine together which passage is the reward passage. Use the following procedure to randomly choose the passage to which the contingency will be applied. Shuffle the two index cards and present them with the blank sides facing the student so that he or she cannot see which card is which. Have the student choose a card without knowing whether it is “A” or “B.” Then, determine whether the student met the goal in the passage indicated by the flashcard (e.g., passage “A”). If the student met the criterion for performance (in terms of number of CRW per min and errors), offer access to the reward.

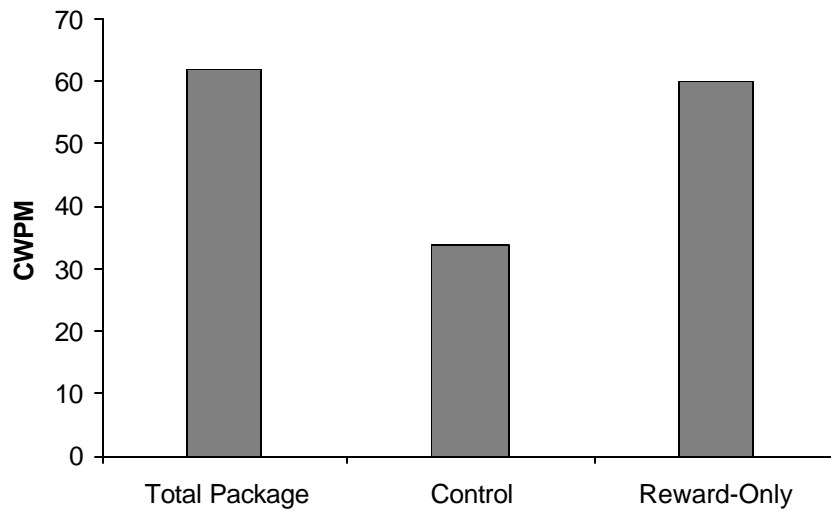
*Interpretation of results.* Results should be plotted on a graph. Figure 1 depicts three possible outcomes of the BEA. If the treatment package results exceed the other conditions (top graph in the Figure), then the evaluator can decide either to move on to treatment implementation or attempt to dismantle the treatment further (see next section). If reward meets or exceeds results of the treatment package and both exceed the control passage (middle graph in the Figure), then the student has a performance deficit which can be managed through rewards for performance gains. If the student fails to increase in either of the two conditions relative to the control condition (bottom graph in the Figure), the practitioner should consider either moving down to easier materials (VanAuken et al., 2002) or applying instructional components to the assessment passages as well (sequential modification; Daly et al., 1999). In either case, the student has a significant generalization problem and will need a very intensive intervention. (See Daly et al., 2002, for other instructional components that can be tried.)

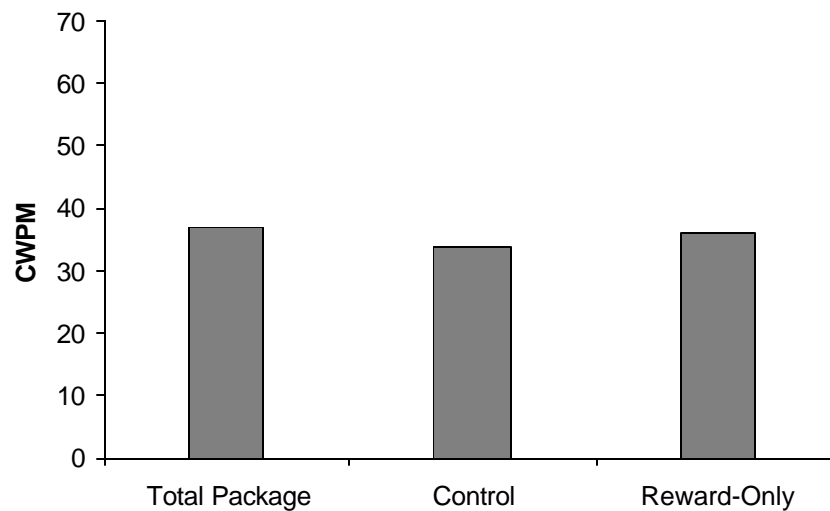
FIGURE 1, NEXT PAGE!

Figure 1. Hypothetical results for a single trial brief experimental



analysis.





*Optional steps for further dismantling the instructional condition.*

Upon visual inspection of the results of the first instructional trial, if the student performs notably higher in the treatment package passage than the reward-only and control passages, the student probably has a skill deficit. The evaluator can do one of two things at this point. Either, the assessment can be terminated because a treatment has been identified (i.e., the treatment package that includes both instructional and motivational components). Alternately, the instructional package can be dismantled further by sequentially withdrawing instructional components until the most effective, yet simplest instructional package is identified. This step can be taken if the evaluator is concerned that the person responsible for implementing the intervention (e.g., a parent, teacher, peer tutor) may not be able to follow all of the steps of the instructional protocol consistently.

If the decision is made to dismantle the instruction package further, further screening will need to be conducted to identify more passages for the analysis. As many as six additional, equal difficulty level assessment passages may be needed. The examiner should then proceed with the following conditions until there is a clear drop in performance. Each of these instructional conditions is carried out in the instructional passage for one assessment passage. Assessment should be carried out in random order in the assessment passage and an equal difficulty level control passage for each session. First, the examiner should administer the full instructional treatment without the reward. If performance matches or exceeds previous performance, the examiner should then withdraw the error correction components (phrase drill & syllable segmenting, leaving listening passage preview and repeated readings) in the next session (and set of passages) because they provide the fewest opportunities to respond (Gortmaker et al., 2005). If performance does not drop, withdraw the LPP component and administer the RR component in the next session (and assigned instructional passage). If performance does not drop, one concludes that the student will probably benefit from the RR intervention. A drop in performance in any of these conditions indicates that the previous instructional trial contained critical instructional or motivational components that are necessary for improving student performance.

*Limitations to BEA*

With the rapid alternation of multiple treatments implemented in brief conditions, the risk of multiple treatment interference naturally arises as a threat to the internal validity of an analysis. This

threat is minimized with the use of a control passage in each condition and replication of the chosen intervention during the BEA. Furthermore, investigations integrating extended analyses provide support for the effectiveness of interventions derived from BEA (Daly et al., 2005; Daly et al., 2001; Gortmaker et al., 2005; Jones & Wickstrom, 2002; Persampieri et al., in press; Valleley et al., 2002).

Research to date on the BEA of academic performance has largely focused on reading fluency. The procedures described in this article are applicable mostly to students who are able to read with some degree of fluency in text and are less appropriate for non-readers. Although this form of analysis has been applied to reading comprehension, spelling, math, and writing (Daly et al., 1998; Duhon et al., 2004; Hendrickson, Gable, Novak, & Peck, 1996; Jones & Wickstrom, 2002; McComas et al., 1996; Noell et al., 1998; VanAuken et al., 2002), more research is needed on its application to these and other early literacy skills like phoneme blending and segmenting.

### Conclusion

It was noted earlier in this paper that general outcome measurement (formative evaluation) is the strongest measurement model available to educators. Although BEA may help educators to identify an intervention in an efficient manner, it does not eliminate the need to monitor student progress over time and make instructional adjustments accordingly. Educators should use materials like those available as a part of Dynamic Indicators of Basic Early Literacy Skills assessments (DIBELS; Good & Kaminski, 2002) or through Aimsweb<sup>®</sup> reading series (Edformation, 2005) for the purpose of monitoring students' generalization to materials that have not been directly taught in the classroom. These are the types of generalized improvements in basic skills like oral reading fluency that will make it easier for students to move on to harder parts of the curriculum (Binder, 1996). We propose BEA merely as an intermediary form of connecting the dots.

### References

- Alessi, G. (1987). Generative strategies and teaching for generalization. *The Analysis of Verbal Behavior*, 5, 15-27.
- Binder, C. (1996). Behavioral fluency: Evolution of a new paradigm. *The Behavior Analyst*, 19, 163-197.
- Bonfiglio, C. M., Daly, E. J., III, Persampieri, M., Andersen, M. N. (2005). An experimental analysis of the effects of reading interventions in a small group reading instruction context. Submitted for publication, *Journal of Behavioral Education*.
- Catania, A. C. (1998). *Learning* (4th ed.). Upper Saddle River, NJ: Prentice Hall.
- Cunningham, A., Stanovich, K. (1998). The impact of print exposure on word recognition. In J. L. Metsala & L. C. Ehri (Eds.), *Word recognition in beginning literacy* (pp. 235-262). Mahwah, NJ: Lawrence Erlbaum Associates.
- Daly, E. J., III, Bonfiglio, C. M., Hauger, T., Persampieri, M., & Yates, K. (in press). Refining the experimental analysis of academic skill deficits, Part II: An Investigation of the use of brief experimental analysis for identifying reading fluency interventions. *Journal of Applied Behavior Analysis*.
- Daly, E. J., III, Lentz, F. E., & Boyer, J. (1996). The instructional hierarchy: A conceptual model for understanding the effective components of reading interventions. *School Psychology Quarterly*, 11, 369-386.

- Daly, E. J., III, & Martens, B. K. (1994). A comparison of three interventions for increasing oral reading performance: Application of the instructional hierarchy. *Journal of Applied Behavior Analysis*, 27, 459-469.
- Daly, E. J., III, Martens, B. K., Dool, E. J., & Hintze, J. M. (1998). Using brief functional analysis to select interventions for oral reading. *Journal of Behavioral Education*, 8, 203-218.
- Daly, E. J., III, Martens, B. K., Hamler, K., R., Dool, E. J., & Eckert, T. L. (1999). A brief experimental analysis for identifying instructional components needed to improve oral reading fluency. *Journal of Applied Behavior Analysis*, 32, 83-94.
- Daly, E. J., III, Martens, B. K., Kilmer, A., & Massie, D. (1996). The effects of instructional match and content overlap on generalized reading performance. *Journal of Applied Behavior Analysis*, 29, 507-518.
- Daly, E. J., III, Murdoch, A., Lillenstein, L., Webber, L., & Lentz, F. E. (2002). An examination of methods for testing treatments: Conducting experimental analyses of the effects of instructional components on oral reading fluency. *Education and Treatment of Children*, 25, 288-316.
- Daly, E. J., III, Persampieri, M., McCurdy, M., & Gortmaker, V. (2005) Generating reading interventions through experimental analysis of academic skills: Demonstration and empirical evaluation. *School Psychology Review*, 34, 395-414.
- Daly, E. J., III, Shroder, J., & Robinson, A. (2001). Testing treatments for oral reading fluency problems: Two case studies. *Proven Practice: Prevention and Remediation Solutions for Schools*, 4, 2-10.
- Daly, E. J., III, Witt, J. C., Martens, B. K., & Dool, E. J. (1997). A model for conducting a functional analysis of academic performance problems. *School Psychology Review*, 26, 554-574.
- Deno, S. L., Fuchs, L. S., Marston, D., & Jongho, S. (2001). Using curriculum-based measurements to establish growth standards for students with learning disabilities. *School Psychology Review*, 30, 507-524.
- Duhon, G. J., Noell, G. H., Witt, J. C. Freeland, J. T., Dufrene, B. A., & Gilbertson, D. N. (2004). Identifying academic skills and performance deficits: The experimental analysis of brief assessments of academic skills. *School Psychology Review*, 33, 429-443.
- Eckert, T. L., Ardoin, S. P., Daisey, D. M., & Scarola, M. D. (2000). Empirically evaluating the effectiveness of reading interventions: The use of brief experimental analysis and single-case designs. *Psychology in the Schools*, 37, 463-474.
- Eckert, T. L., Ardoin, S. P., Daly, E. J., III, & Martens, B. K. (2002). Improving oral reading fluency: An examination of the efficacy of combining skill-based and performance-based interventions. *Journal of Applied Behavior Analysis*, 35, 271-281.
- Edformation. (2005). *Aimsweb: Charting the path to literacy*. (Available on-line at <http://www.aimsweb.com/>)

- Ervin, R. A., Radford, P. M., Bertsch, K., Piper, A. L., Ehrhardt, K. E., & Poling, A. (2001). A descriptive analysis and critique of the empirical literature on school-based functional assessment. *School Psychology Review, 30*, 193-210
- Fuchs, L. S., & Fuchs, D. (1999). Monitoring student progress toward the development of reading competence: A review of three forms of classroom-based assessment. *School Psychology Review, 28*, 659-671.
- Fuchs, L. S., & Deno, S. L. (1991). Paradigmatic distinctions between instructionally relevant measurement models. *Exceptional Children, 57*, 488-500.
- Fuchs, L. S., Fuchs, D., & Hamlett, C. L. (1989). Effects of instructional use of curriculum-based measurement to enhance instructional programs. *Remedial and Special Education, 10*, 43-52.
- Fuchs, L. S., Fuchs, D., Hamlett, C. L., & Allinder, R. M. (1991). Effects of expert system advice within curriculum-based measurement on teacher planning and student achievement in spelling. *School Psychology Review, 20*, 49-66.
- Fuchs, L. S., Fuchs, D., Hamlett, C. L., Walz, L., & Germann, G. (1993). Formative evaluation of academic progress: How much growth can we expect? *School Psychology Review, 22*, 27-48.
- Fuchs, L., Shinn, M. (1989). Writing CBM IEP objectives. In M Shinn (Ed.) *Curriculum-based measurement: Assessing special children* (pp. 130-152). New York: Guilford Press.
- Good, R. H., III, & Kaminski, R. A. (2002). *DIBELS oral reading fluency passages for first through third grades*. (Technical Report No. 10), Eugene, OR: University of Oregon.
- Gortmaker, V. J., Daly, E. J., III, McCurdy, M., Persampieri, M. J., & Hergenrader, M. (2005). *Improving reading outcomes for children with learning disabilities: Using brief experimental analysis to develop parent tutoring interventions*. Manuscript submitted for publication.
- Haring, N. G., Lovitt, T. C., Eaton, M. D., & Hansen, C. L. (1978). *The fourth R: Research in the classroom*. Columbus, OH: Merrill.
- Hendrickson, J. M., Gable, R. A., Novak, C., & Peck, S. (1996). Functional assessment as strategy assessment for teaching academics. *Education and Treatment of Children, 19*, 257-271.
- Hintze, J. M., Daly, E. J., III, & Shapiro, E. S. (1998). An investigation of the effects of passage difficulty level on outcomes of oral reading fluency progress monitoring. *School Psychology Review, 27*, 433-445.
- Johnston, J. M., & Pennypacker, H. S. (1993). *Strategies and tactics of behavioral research* (2nd ed.). Hillsdale, NJ: Erlbaum.
- Jones, K. M., & Wickstrom, K. F. (2002). Done in sixty seconds: Further analysis of the brief assessment model for academic problems. *School Psychology Review, 31*, 554-568.
- Lentz, F. E., Jr. (1988). Effective reading interventions in the regular classroom. In J. L. Graden, J. E. Zins, & M L. Curtis (Eds.) *Alternative educational delivery systems: Enhancing instructional options for all students* (pp. 351-370). Washington, DC: National Association of School Psychologists.

- Martens, B. K., Eckert, T. L., Bradley, T. A., & Ardoin, S. P. (1999). Identifying effective treatments from a brief experimental analysis: Using single-case design elements to aid decision making. *School Psychology Quarterly, 14*, 163-181.
- McComas, J. J., Wacker, D. P., Cooper, L. J., Asmus, J. M., Richman, D., & Stoner, B. (1996). Brief experimental analysis of stimulus prompts for accurate responding on academic tasks in an outpatient clinic. *Journal of Applied Behavior Analysis, 29*, 397-401.
- Meyer, M., Felton, R. (1999). Repeated reading to enhance fluency: Old approaches and new directions. *Annals of Dyslexia, 49*, 283-306.
- National Reading Panel (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction* Available on-line: <http://www.nichd.nih.gov/publications/nrp/smallbook.htm>
- Noell, G. H., Gansle, K. A., Witt, J. D., Whitmarsh, E. L., Freeland, J. T., LaFleur, L. H., Gilbertson, D. N., & Northup, J. (1998). Effects of contingent reward and instruction on oral reading performance at differing levels of passage difficulty. *Journal of Applied Behavior Analysis, 31*, 659-664.
- O'Shea, L. J., Munson, S. M., & O'Shea, D. J. (1984). Error correction in oral reading: Evaluating the effectiveness of three procedures. *Education and Treatment of Children, 7*, 203-214.
- Persampieri, M., Gortmaker, V., Daly, E.J., III, Sheridan, S. M., McCurdy, M. (in press). Promoting parent use of empirically supported reading interventions: Two experimental investigations of child outcomes. *Behavioral Interventions*.
- Shahan, T. A., & Chase, P. N. (2002). Novelty, stimulus control, and operant variability. *The Behavior Analyst, 25*, 175-190.
- Shinn, M. R. (1989). *Curriculum-based measurement: Assessing special children*. New York: Guilford Press.
- Shinn, M. R. (1995). Best practices in curriculum-based measurement and its use in a problem-solving model. In A. Thomas & J. Grimes (Eds.), *Best practices in school psychology-III* (pp. 547-567). Washington, DC: National Association of School Psychologists.
- Sidman, M. (1960). *Tactics of scientific research: Evaluating experimental data in psychology*. New York: Basic Books.
- Snow, C., Burns, S., & Griffin, P. (1998). *Preventing reading difficulties in young children*. Washington, DC: The National Research Council.
- Stokes, T. F., & Baer, D. M. (1977). An implicit technology of generalization. *Journal of Applied Behavior Analysis, 10*, 349-367.

Valleley, R. J., Evans, J. H., & Allen, K. D. (2002). Parent implementation of an oral reading intervention: A case study. *Child & Family Behavior Therapy*, 24, 39-50.

VanAuken, T., Chafouleas, S.M., Bradley, T.A., & Martens, B.K. (2002). Using brief experimental analysis to select oral reading interventions: An investigation of treatment utility. *Journal of Behavioral Education*, 11, 165-181.

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## Behavioral Activation Treatment for Major Depressive Disorder: A Pilot Investigation

*Jenifer M. Cullen, C. Richard Spates, Sherry Pagoto, Neal Doran*

### Abstract

Behavioral activation (BA) has emerged as an effective intervention for major depressive disorder. Previous research has indicated that it is as effective as the full cognitive behavioral treatment package (CBT). Conceptualized to consume fewer participant sessions, BA may be more efficient and cost-effective than CBT. With depression among the most common diagnoses in practice settings, NIMH's recent vision statement calls for continued research devoted to cost- and time-effective targeted treatment alternatives, including "behavioral activation as a more simply behavioral form of CBT" (NIMH, 2005, p. 92). The present investigation piloted a 10-week individual intervention model of BA with medicated and unmedicated participants in a clinical research setting. This follows our earlier report (Porter, Spates, & Smitham, 2004) of an efficacious group-administered BA intervention. In comparison to the group intervention, end state functioning of participants in the present investigation revealed more robust symptom reductions to within the fully recovered range of functioning. Keywords: depression, behavioral activation, behavior therapy, cognitive behavioral therapy.

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Major depressive disorder (MDD) is the most prevalent psychological disorder (Kimerling, Ouimette, Cronkite, & Moos, 1999) and is now the 4<sup>th</sup> leading cause of disability across the lifespan and the 2<sup>nd</sup> leading cause of disability among people aged 15-44 (World Health Organization, 2005). According to a National Comorbidity Survey Replication (NCS-R) the lifetime prevalence rate of MDD is 16% (Kessler et al., 2003). The prevalence of MDD is expected to rise such that by the year 2020, MDD will be second only to heart disease in terms of global burden of disease (World Health Organization, 2005). Although high, prevalence rates may be underestimated given that only about 70% of individuals with depression seek treatment (Angst, 1998). The effective treatment and prevention of MDD are of paramount importance and rank high among both mental health research and clinical objectives. A number of psychological interventions have been identified as holding at least partial efficacy towards this end. Among them are cognitive behavior therapy (CBT), cognitive therapy (CT), behavior therapy (BT), and interpersonal therapy (IT).

Both behavioral and cognitive theories of depression are supported with substantial clinical and empirical evidence (Beck, Rush, Shaw, & Emery, 1979; Dobson, 1989; McLean, Ogston, & Grauer, 1973; Steinbrueck, Maxwell, & Howard, 1983), and distinct treatment modalities have emerged from each perspective. A behavioral conceptualization of depression first emerged in the 1970s, and suggested that depression is a result of a reduction in positively reinforcing behavior either via reduced availability of reinforcing alternatives, lack of skill to obtain reinforcing alternatives, or increased punishment (Lewinsohn, 1974). The treatment emanating from behavior theory is referred to as behavioral activation (BA). In BA, restoring an adequate schedule of reinforcement by having the patient increase activity levels is instrumental in decreasing depressive symptoms (Lewinsohn, Biglan, & Zeiss, 1976). BA has been reconceptualized since its original introduction. According to Martell and colleagues (Martell, Addis, & Jacobson, 2001), BA no longer aims to replenish a broad class of positive reinforcing activities but rather to replenish positive reinforcing activities that specifically move the patient toward personal goals while blocking avoidance patterns that prevent the patient from reaching

those goals. The approach is both functional analytic and idiographic, in which contingencies that maintain behavior for each patient are identified via self-monitoring. Avoidance patterns are changed by integrating new behaviors into a daily routine, observing the outcome, and assessing whether the behavior serves to approach or avoid personal goals.

Early treatment studies provided support for behavioral activation for depression (Brown & Lewinsohn, 1984; Lewinsohn & Atwood, 1969; Zeiss, Lewinsohn, & Munoz, 1979), but as discussed by Hopko and colleagues (Hopko, Lejuez, LePage, Hopko, & McNeil, 2003), a paradigm shift toward more cognitive explanations of psychological phenomena led to criticisms that behavioral approaches to depression were inadequate by failing to directly address depressive schemas and cognitive structures. The cognitive theory of depression, developed by Beck and colleagues (Beck et al., 1979), is based on the premise that dysfunctional cognitions and core beliefs are at the root of depression, causing both negative moods and avoidance behavior (Beck, 1970). CT seeks to change the participant's misinterpretations, self-defeating cognitions, and dysfunctional attitudes, by identifying them and recognizing the crucial link between such thoughts and the subsequent negative feelings and dysfunctional behavior that follow (Kovacs & Beck, 1978). With the help of the cognitive therapist, the CT patient self-monitors, challenges, and modifies depressive schemas and cognitive structures. Cognitive behavioral therapy, a merging of both cognitive and behavioral treatment modalities, resulted from this movement and has since been defined as a well-established treatment for MDD by the Task Force on the Identification and Dissemination of Efficacious Treatments (Chambless & Ollendick, 2001).

While the clinical effectiveness of CBT has been well-documented (Chambless & Ollendick, 2001; Dobson, 1989; Kendall, 1998; Roth & Fonagy, 1996; Williams, 1992), whether the mechanism of action is attributable to the cognitive, behavioral, or nonspecific factors of therapy has received less attention. Some research has suggested that the greatest therapeutic gains in CBT are achieved in early sessions, when BA is administered (Hollon, Shelton, & Davis, 1993; Otto, Pava, & Sprich-Buckminster, 1996). In a dismantling study, Jacobson and colleagues (Jacobson et al., 1996) found that after 16 weeks of the separately identified components of CBT (i.e., behavioral activation, automatic thoughts remediation, and the full CBT regimen), all participants showed significant reductions in depressive symptoms and no significant differences in reported depression levels were observed between the three groups. The results held at 6-month, 1- and 2-year post-treatment (Gortner, Gollan, Dobson, & Jacobson, 1998). Contrary to the investigators' *a priori* hypotheses, the BA condition was equally capable of producing clinically significant antidepressant effects and altering negative thinking and attributional styles compared to the cognitive therapy and "full" CBT conditions. This study called into question the assumption that dysfunctional thinking and maladaptive schemas must be directly targeted during treatment of depressed individuals (Hammen, 1997). More recently, BA has been applied to comorbid anxiety and depression (Hopko, Lejuez, & Hopko, 2004), to psychiatric inpatients with depression (Hopko et al., 2003), and via a group modality for depressed patients (Porter et al., 2004) with promising results.

In the context of evidence-based practice, treatments that are both maximally efficacious and cost-effective have the greatest potential to impact public health. BA is a more parsimonious, efficient, and cost-effective therapy than the full CBT treatment package

(Jacobson & Gortner, 2000; Robinson, Wischman, & DelVento, 1996). Behavioral approaches to depression have been characterized as easier to master by both the clinician and patient than more complex cognitive interventions (Martell et al., 2001). As such, BA might be more easily and efficiently disseminated to therapists with diverse training backgrounds (Chambless & Hollon, 1998) and to patients with varying skill bases and cognitive functioning. The next step needed in research on BA is to determine its effectiveness when applied under conditions in which 'real world' clients present for treatment.

The present investigation sought to examine the effectiveness of BA with a sample that represents a closer approximation to patients presenting for treatment in applied settings. Unlike most depression treatment studies, participants were not excluded based on their medication status. Positive treatment outcome would not only cross validate Jacobson and colleagues' (Jacobson et al., 1996) findings with unmedicated clients, but lend support to the generalizability of BA to a medicated but still depressed patient population. Further, it would extend our recent findings of the efficacy of a behavioral activation intervention for severely depressed individuals, applied in a group modality (Porter et al., 2004),

## Method

### Sample

Adult participants (N =25) seeking mental health services for MDD were recruited through public service announcements, newspaper advertisement, solicitations from community professionals, and other healthcare agencies. All participants met DSM-IV criteria for MDD based on the Structured Clinical Interview for Diagnosis of DSM-IV-Non Patient (SCID-NP) (First, Spitzer, Gibbon, & Williams, 1997). Participants scored at least 20 on the Beck Depression Inventory-II (BDI-II) (Beck, Steer, & Brown, 1996), and 14 or greater on the Revised-Hamilton Rating Scale for Depression (R-HRSD) (Warren, 1996).

Exclusion criteria included current bipolar (n=2) or psychotic disorders (n=1), panic disorder (n=0), current alcohol or other substance abuse (n=0), organic brain syndrome (n=0), obsessive compulsive disorder (n=0) and mental retardation (n=0). Suicide risk was regularly evaluated via responses to the suicide items on the BDI-II, the R-HRSD, and at the start of the investigation by the SCID-NP, as well as throughout the study by monitoring any verbalizations of suicidal ideations made by the patient.

### Setting, Assessors and Therapists

All assessment and treatment sessions were conducted in the outpatient service of a psychology training clinic that was associated with an APA-approved clinical psychology doctoral program. Doctoral graduate students in clinical or counseling psychology conducted all assessment interviews. Therapists had previous training in the cognitive-behavioral treatment of depression, and for purposes of the present investigation, received an additional 12 hours of training in the use of BA therapy.

### Experimental Design

A pre-test post-test wait list control group design was used. As this study was an early attempt at cross-validating Individual BA this type of control arrangement is appropriate instead of a comparative treatment design which assumes prior evidence of efficacy of two or more treatments. Additionally Human Subjects concerns mitigated use of a purely "no treatment" control group design. All participants were randomly assigned to either the immediate treatment (IT) or waitlist condition (WL). All participants were evaluated before treatment, at the termination of treatment, and at 3 months follow-up on principal dependent measures. Waitlist participants were additionally assessed before receiving treatment after the post wait period. Depressive symptomatology was also assessed bi-weekly using the BDI-II during the waitlist phase and weekly during the treatment phase.

### Measures

Depressive symptomatology was measured in three ways. First, the SCID-NP (First et al., 1997) was administered during the screening and post-test visit to assess if diagnostic criteria were met for major depressive disorder at pretest, posttest and 3-month follow-up. The SCID-NP is a broad-based structured clinical interview that covers 50 major DSM-IV disorders. Reliability was established by comparing the independent evaluation by two or more raters across a group of participants (Spitzer, Williams, Gibbon, & First, 1992). The BDI-II (Beck et al., 1996) was used to assess depressive symptomatology at screening, every second week during the 6-week waitlist period, at every treatment session, and at 3 months follow-up. The R-HRSD (Warren, 1996) was also used to assess depressive symptomatology at pretest, posttest, and 3-month follow-up.

### Treatment Integrity

Protocol outlines were supplied to each therapist for each session after initial training. The treatment fidelity measure used in this study was a modified version of the National Institute of Mental Health Collaborative Study Psychotherapy Rating Scale (CSPRS) (Hollon, Evans, Elkin, & Lowery, 1984). The CSPRS included the procedural steps in BA, along with a checklist of prescribed BA techniques. Also included was a list of proscribed cognitive therapy techniques. Trained observers then viewed a random sample of the video taped treatment sessions (11%), checking off the presence of each step in the outline, along with the specific treatment interventions used in that session. Inter-rater reliability checks were then performed on this same sample of videotapes and was found to be 88%, indicating that the raters agreed 88% of the time that therapists were delivering BA according to the protocol described in the treatment manual. Weekly research team meetings with a licensed clinical psychologist (the second author) were conducted to discuss cases and reduce therapist drift.

### Procedure

Adult participants seeking mental health services for major depression were recruited for this study via advertisements, public service announcements, public postings, and solicitations

from community professionals and health care agencies. Interested individuals phoned and underwent an initial telephone screening. During this screening, the nature of the study was explained and potential participants were assessed for depressive symptomatology. Potential participants were also asked if they were currently using any psychotropic medication or in psychotherapy. Those who were not experiencing symptoms of depression, who had been taking prescription medication for their depression for less than six weeks, and/or who were currently in other psychological treatments were deemed ineligible for participation. Appropriate referrals for mental health services were offered to all ineligible callers.

Eligible individuals were scheduled to participate in an in-person screening interview. During the screening interview, participants provided informed consent and were assessed for eligibility. Eligible participants ( $n=25$ ) were randomly assigned to either WL or IT conditions. Participants in the IT condition were scheduled for their initial treatment appointment. WL participants were told they would first participate in an “assessment phase” for which information about their depression would be gathered in advance to starting therapy. WL participants then visited the clinic every other week, for a total of three visits, while on the 6-week waitlist.

### Treatment Protocol

BA treatment utilized in the present investigation followed closely the model used in the Jacobson et al. (Jacobson et al., 1996) investigation. Thus the purpose of BA is to activate participants so that they can break a passive approach to life and maximize their opportunity to make contact with natural, positive reinforcers in their environment (Martell et al., 2001). The emphasis of BA is on “focused activation,” as opposed to simple activity at random. This includes not only finding behaviors and activities that will be positively reinforcing, but paying close attention to the activities with which one is participating (e.g., noticing colors, noises, and smells associated with the activity). This attention to the experience is very similar to the mindfulness training found in Morita therapy (LeVine, 1998) and dialectical behavior therapy (Jacobson, Martell, & Dimidjian, 2001; Linehan, 1993).

The goals of BA are to (1) determine the life circumstances that precipitated the depression, (2) determine the coping patterns that maintained and exacerbated the depression (e.g., chronic negativity, social withdrawal), and (3) develop a treatment plan for improving the coping patterns and provide access to more reinforcing life circumstances (Martell et al., 2001). The therapy is delivered in a directive manner, but the participant and therapist choose the direction in concert. The therapist coaches the participant to learn a core set of BA skills, but because the skill form varies from participant to participant, the BA therapist is required to be flexible, proficient, and able to coach a wide range of unique participants.

Each BA treatment session involves a distinctive beginning, middle, and end. The beginning of each session includes greeting the participant and administering the BDI-II. Issues to be covered throughout the rest of the session are then placed on an agenda as the therapist and participant work collaboratively to determine the most important topics for that week. Next, the completed BDI-II is reviewed, paying close attention to the specific questions that target suicidal

behavior and weekly activity levels. Any homework assignments the participant completed between sessions are also discussed.

The middle segment of the session involves working jointly on the previously set agenda items. The therapist typically does not stray from the prescribed agenda unless an emergent issue arises (e.g., suicidality). Reviewing self-monitoring records, identifying avoidance patterns, and brainstorming behavioral alternatives are activities that often occur in this part of session. As the session closes, the therapist briefly reviews topics covered and assigns homework. As treatment progresses, the participant begins to assume responsibility for reviewing the session and assigning homework to him or herself at the end of sessions.

#### End of Treatment and Follow-Up Assessment

One week following the end of treatment, each participant returned to the clinic for posttest assessment. Each participant met with a clinical assessor who administered the BDI-II and the SCID-NP. Finally, the assessor independently completed the R-HSRD. The same routine was completed at the 3-month follow-up session.

#### Analytic Plan

The analytic plan involved two approaches. The first was a ‘completer’ approach including only those participants (n=17) who attended a minimum of six sessions of BA. The second model was an intention to treat (ITT) approach, including all randomized participants (n=25). Finally, analyses of the clinical significance of outcome were conducted.

*Completer approach.* To determine the degree to which depressive symptoms were affected by treatment in each group, separate repeated measures analyses of variances (ANOVAs) were conducted on BDI-II and R-HSRD scores for each group with time entered as the within subjects factor (pre-treatment, post-treatment, 3-month follow-up). To evaluate change due to the time passage only, using a mixed model ANOVA, BDI-II scores of WL participants during the WL period were compared to BDI-II scores of IT participants during the same period of time. Group was entered as a between-subjects factor and time (week 1, 3, and 5) was entered as the within-subjects factor.

*Intention to treat approach.* ITT analyses, where all randomized cases are included in analyses, are required in standardized reporting guidelines. (Moher, Schulz, & Altman, 2001) In the ITT approach, the same analyses above were performed, but including all 22 randomized subjects. To include drop-outs, the last available BDI-II or R-HSRD score was used as the score for all time points following their last visit (i.e., last value carried forward). The intent to treat sample was also used to explore whether participants varied in their responses to the intervention depending on their medication status. Two repeated measures ANOVAs were conducted with Medication Status as a between-subjects independent variable and Time as a within-subjects independent variable. R-HSRD and BDI-II were the dependent variables in the models.

*Clinical Significance Testing.* In recent years a movement in the psychotherapy literature has occurred towards the addition of clinical significance tests to more traditional null hypothesis

significance tests (e.g., Jacobson, Follette, & Revenstorff, 1984; Jacobson, Roberts, Berns, & McGlinchey, 1999; Jacobson & Truax, 1991; Kendall, Marrs-Garcia, Nath, & Sheldrick, 1999). The purpose of clinical significance tests is to differentiate treatment effects that are meaningful in the real world from those that merely have a low  $p$ -value. Consequently, we also conducted analyses of clinical significance. As recommended by Jacobson et al. (1999), we compared end-of-treatment means to published norms for both depressed and non-depressed samples.

### Participant Characteristics

Demographic information for the entire sample is displayed in Table 1. Of the 25 participants, 32% were female. Participants were largely Caucasian (88%) and on average 38 years of age. Almost one-third of participants (32%) reported taking psychotropic medication to treat their depression. Four participants reported taking fluoxetine (Prozac), two were being treated with citalopram hydrobromide (Celexa), one reported taking paroxetine hydrochloride (Paxil), and another did not disclose the antidepressant medication he/she was taking. All medicated participants must have been taking the drug for a period of at least 6 weeks to be included in the study. No participants reported current participation in other psychotherapy.

Table 1: Baseline Characteristics of Wait List, Immediate Treatment and Total Sample

Variable	WL (n=12)	IT (n=13)	Total Sample (N=25)
Gender			
Female	33%	31%	32%
Age	41.75 (13.05)	35.46 (12.07)	38.48 (12.69)
Ethnicity			
Caucasian	92%	85%	88%
African American	8%	0%	4%
Hispanic	0%	8%	4%
Asian	0%	7%	4%
Medication Status	25%	39%	32%
Baseline BDI-II	29.91 (5.71)	31.92 (6.14)	30.96 (5.90)
Baseline R-HSRD	19.90 (3.44)	18.07 (3.37)	18.96 (3.46)
Completer	67%	69%	68%

Participants who dropped out did not differ from those who completed the study in terms of gender, ethnicity, age, education, income, whether they had been in psychotherapy in the past, whether they were currently receiving antidepressant pharmacotherapy, or whether they had ever received antidepressant pharmacotherapy.

Of the 17 completers, 13 participants entered the study with an Axis I diagnosis of MDD, Recurrent/Moderate, while 2 participants were diagnosed with MDD, Recurrent/Severe without psychotic features (see Table 2). One participant suffered from MDD, Recurrent/Mild and one from MDD, Single Episode/Mild. The SCID-NP identified 3 participants with dysthymic disorder, yielding a formal diagnosis of “double depression.” No participants obtained a formal Axis II diagnosis. Finally, Axis V Global Assessment of Functioning (GAF) scores ranged from 51-68, with a mean GAF of 60.

### Completer Analyses

No significant differences between IT and WL participants were observed at time of initial intake on either the BDI-II,  $t(15) = 1.04$ ,  $p = ns$ , or the RHRSD,  $t(15) = .94$ ,  $p = ns$ . IT and WL participants started treatment at comparable levels of symptom severity. The repeated measures ANOVA for the BDI revealed a significant reduction in symptoms from pre to post testing,  $F(2, 14) = 15.82$ ,  $p < .01$ . There was no significant group by time interaction. The repeated measures ANOVA for the R-HSRD also revealed significant symptom reductions from pre to post treatment,  $F(2, 14) = 9.47$ ,  $p < .01$ , and likewise no significant group by time interaction. On both dependent measures, depression scores declined over time (see Figures 1 and 2). In light of the stability of these measures for Waitlist participants from the pretest to post wait period, these data suggest that symptom reductions were attributable to the intervention and not due to time alone.

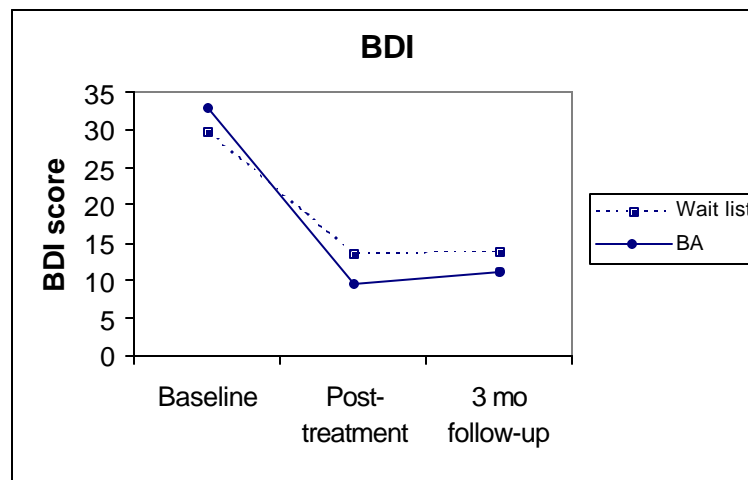


Figure 1. Mean Beck Depression Inventory (BDI) scores at baseline, post-treatment and 3-month follow-up.

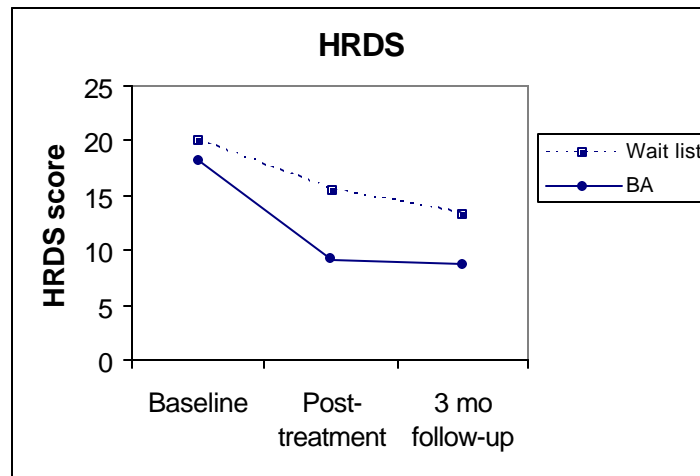


Figure 2. Mean Hamilton Rating Depression Scale scores at baseline, post-treatment and 3-month follow-up.

#### Intent to Treat Analysis

Intent to treat analyses were consistent with completer analyses. Both repeated measures ANOVA models for BDI,  $F(2, 22) = 27.89$ ,  $p < .01$ , and HRSD,  $F(2,22) = 6.96$ ,  $p < .01$ , revealed significant symptom reductions, but no significant interactions of time and group. Like the completer analyses, these analyses showed that depression scores declined significantly from pretest to posttest.

Additional post-hoc analyses were conducted to determine whether the changes in BDI scores could be a function of time rather than a function of treatment. As already indicated scores for subjects in the Immediate and Waitlist conditions were comparable at the pretesting. Additional comparisons of WL and IT at 6 weeks indicated that the IT participants showed significant changes BDI scores compared to WL participants. Results indicated that IT participants' BDI scores at week 6 were already significantly lower than those of WL participants at week 1 [ $F(1, 20) = 4.26$ ,  $p = .05$ ]. Thus, reductions in BDI scores reported by IT participants at week 6 appeared to be a function of treatment rather than time. These data, coupled with the significant reduction in symptoms noted when WL participants were subsequently assigned to treatment, clearly indicates the symptom reductions were due to Behavioral Activation intervention.

*BDI Classification.* Beck, Steer, and Brown (Beck et al., 1996) recommended the following classification scheme for BDI scores: 0 – 13, minimal depression; 14 – 19, mild depression; 20 – 28, moderate depression; 29 – 63, severe depression. According to this scheme, at week 1 of treatment, 11 participants in the current sample were classified as severely depressed, 6 as moderately depressed, 5 as mildly depressed, and 0 as minimally depressed. At week 10, 3 participants were classified as severely depressed, 5 as moderately depressed, 1 as mildly depressed, and 13 as minimally depressed.

*Effect of Medication Status.* Exploratory analyses were conducted to determine whether participants on medication improved to a greater extent than those who were unmedicated. For BDI-II, a significant main effect of Time was revealed,  $F(2, 22) = 24.27, p < .001$ , but no significant Time by Medication Status interaction,  $F(2, 22) = .98, p = .39$ . Results for the R-HSRD were similar. A significant main effect of Time,  $F(2, 22) = 6.02, p < .01$  and no significant Time by Medication Status interaction,  $F(2, 22) = .02, p = .97$ . Therefore, it can be concluded that there was no evidence for a differential response to the intervention by medication status.

### Clinical Significance

As recommended by Jacobson et al. (1999), we compared post-treatment BDI scores to norms for both depressed and non-depressed samples. Across treatment groups, at the first treatment visit, the current sample reported a mean BDI of 27.73 ( $sd = 8.29$ ). This was not significantly different from the mean of 28.64 ( $sd = 11.75$ ) that Steer, Ball, Ranieri, and Beck (1999) reported among a group of 210 depressed outpatients [ $t(230) = 0.47, p = ns$ ]. It was significantly different from the mean of 12.55 ( $sd = 9.93$ ) among non-depressed undergraduates reported by Beck et al. (1996) [ $t(140) = 7.64, p < .01$ ] and the 11.86 ( $sd = 8.06$ ) reported by Steer and Clark (1997) [ $t(180) = 8.45, p < .01$ ].

Across groups, mean post-treatment BDI in the present sample was 14.00 ( $sd = 10.66$ ). This was not significantly different from the norms for non-depressed undergraduates reported by Beck et al (1996) [ $t(140) = 0.59, p = ns$ ] and by Steer and Clark (1997) [ $t = 0.91, p = ns$ ]. However, it was significantly different from the norms for depressed outpatients reported by Steer et al. (1999) [ $t(230) = 6.07, p < .01$ ]. In sum, prior to treatment, the current sample was not statistically different from a sample of depressed outpatients, but was significantly more depressed than those reported by two groups of non-depressed undergraduates. Following treatment the converse pattern was evident. The current sample reported significantly lower BDI scores than the same sample of depressed outpatients and were not significantly different from either of the two samples of non-depressed undergraduates. These data indicate that the present sample met criteria for "caseness" before treatment and showed clinical significant improvement following treatment. Earlier analyses further indicated this improvement to be attributable to treatment rather than the passage of time.

### Treatment Fidelity

On 100% of the observed occasions, raters responded "yes" to the checklist item, "therapist implemented behavioral activation interventions." Furthermore, on 100% of the observed occasions, raters responded "no" to the item, "therapist did use cognitive interventions," indicating cognitive therapy was not implemented at any point throughout treatment in the observed sessions. Rater data revealed that therapists did not use cognitive interventions during BA treatment.

## Discussion

The purpose of this study was to examine the effectiveness of BA as a treatment for MDD in a sample of medicated and unmedicated participants. Results revealed that BA led to significantly reduced self-ratings of depression, independent assessor ratings of depression, and formal diagnoses of MDD from pretesting to 3-month follow-up. Additionally, neither the use of psychotropic medications nor participants' status as IM or WL explained the findings. The end-state functioning of participants in this study achieved clinically significant results in 6 - 10 treatment sessions. The full CBT treatment regimen typically includes approximately 20 treatment sessions.

Results are consistent with previous studies (e.g., Hopko et al., 2004; Hopko et al., 2003; Jacobson et al., 1996; Porter et al., 2004) that have demonstrated efficacy of BA among depressed patients. The results extend Jacobson et al's (1996) original demonstration of the efficacy of BA by supporting the efficacy of BA in a sample that was heterogenous in terms of medication status. Because patients seeking psychotherapy for depression are often medicated prior to therapy, it is important to determine whether behavioral treatments produce a benefit for this population. Our previous investigation (Porter et al., 2004) demonstrated efficacy of group-administered BA in medicated and unmedicated patients. The current investigation builds on the evidence of the efficacy of BA in both medicated (but still depressed) and unmedicated patients.

As in all research, this investigation has some limitations. The dropout rate was 32%, not unlike dropout rates seen in psychiatric community outpatient clinics, which typically range from 20-60% (Simons, Levine, Lustman, & Murphy, 1984), and better than other effectiveness studies that report dropout rates between 40-60% (Chambless & Ollendick, 2001).

Continued research with larger sample sizes is needed to further validate the effectiveness and generalizability of BA in real world settings and with patient samples with fewer exclusionary criteria. One direction for future BA research may include broadening the range of patients and settings in which BA appears to be effective. For instance, a next step might include testing the effectiveness of BA in other "real-world" and naturalistic settings (e.g., private and public mental health practice, instead of an academic clinical research setting), with still less stringent inclusion criteria (e.g., include those exhibiting suicidal behaviors and/or other comorbid Axis I and II disorders). This would provide an increment of "real world-ness" beyond the addition of medicated clients in the present study. Another future investigation might entail examination of the limitations of Individual BA with more severe patient samples, i.e. those with co-morbid conditions and severity levels. The severity and chronic nature of this disorder have widespread community implications, as both have been correlated with a higher financial burden to the community (Lecrubier, 2001). Finally, Individual BA should be compared to another efficacious treatment for MDD, i.e. CBT, medications or Interpersonal Therapy.

The results of this investigation affirm that BA shows great promise as an effective treatment strategy for both medicated and unmedicated individuals suffering from MDD. This study supports the notion of BA as a sufficient and cost-effective therapeutic tool. As in CBT, however, finding both statistically and clinically significant improvements in depression via BA does not imply that all components of BA are necessary to achieve that improvement or that it is

equally efficacious will all patient samples. Future research that aims to uncover the specific mechanisms of action of BA may further our understanding of the process of change and how to develop a still more parsimonious treatment.

### References

- Angst, J. (1998). The prevalence of depression. In M. Briley & S. Montgomery (Eds.), *Antidepressant therapy in the dawn of the third millennium* (1st ed., pp. 191-212). St Louis: Mosby.
- Beck, A. T. (1970). Cognitive therapy: Nature and relation to behavior therapy. *Behavior Therapy, 1*, 184-200.
- Beck, A. T., Rush, A. J., Shaw, B. F., & Emery, G. (1979). *Cognitive therapy of depression*. New York: Guilford Press.
- Beck, A. T., Steer, R. A., & Brown, G. K. (1996). *Manual for the Beck Depression Inventory-II*. San Antonio, TX: The Psychological Corporation.
- Brown, R. A., & Lewinsohn, P. M. (1984). A psychoeducational approach to the treatment of depression: Comparison of group, individual, and minimal contact procedures. *Journal of Consulting and Clinical Psychology, 52*, 774-783.
- Chambless, D. L., & Hollon, S. D. (1998). Defining empirically supported therapies. *Journal of Consulting and Clinical Psychology, 66*, 7-18.
- Chambless, D. L., & Ollendick, T. H. (2001). Empirically supported psychological interventions: Controversies and evidence. *Annual Review of Psychology, 52*, 685-716.
- Dobson, K. S. (1989). A meta-analysis of the efficacy of cognitive therapy for depression. *Journal of Consulting and Clinical Psychology, 57*, 414-419.
- First, M. B., Spitzer, R. L., Gibbon, M., & Williams, J. B. W. (1997). *Structured clinical interview for DSM-IV axis I disorders-clinical version (SCID-CV)*. Washington, DC: American Psychiatric Press.
- Gortner, E. T., Gollan, J. K., Dobson, K. S., & Jacobson, N. S. (1998). Cognitive-behavioral treatment for depression: Relapse prevention. *Journal of Consulting and Clinical Psychology, 66*, 377-384.
- Hammen, C. (1997). *Depression*. East Sussex, UK: Psychology Press Ltd.
- Hollon, S. D., Evans, M. D., Elkin, I., & Lowery, A. (1984). *System for rating therapies for depression*. Paper presented at the 92nd Annual Convention of the American Psychological Association, Toronto, Ontario, Canada.

- Hollon, S. D., Shelton, R. C., & Davis, D. D. (1993). Cognitive therapy for depression: Conceptual issues and clinical efficacy. *Journal of Consulting and Clinical Psychology, 61*, 270-275.
- Hopko, D. R., Lejuez, C. W., & Hopko, S. D. (2004). Behavioral activation as an intervention for coexistent depressive and anxiety symptoms. *Clinical Case Studies, 3*, 37-48.
- Hopko, D. R., Lejuez, C. W., LePage, J. P., Hopko, S. D., & McNeil, D. W. (2003). A brief behavioral activation treatment for depression. A randomized pilot trial within an inpatient psychiatric hospital. *Behavior Modification, 27*, 458-469.
- Jacobson, N. S., Dobson, K. S., Truax, P. A., Addis, M. E., Koerner, K., Gollan, J. K., et al. (1996). A component analysis of cognitive-behavioral treatment for depression. *Journal of Consulting and Clinical Psychology, 64*, 295-304.
- Jacobson, N. S., Follette, W. C., & Revenstorf, D. (1984). Toward a standard definition of clinically significant change. *Behavior Therapy, 17*, 308-311.
- Jacobson, N. S., & Gortner, E. T. (2000). Can depression be de-medicalized in the 21st century: Scientific revolutions, counter-revolutions and the magnetic field of normal science. *Behaviour Research & Therapy, 38*, 103-117.
- Jacobson, N. S., Martell, C. R., & Dimidjian, S. (2001). Behavioral activation treatment for depression: Returning to contextual roots. *Clinical Psychology: Science and Practice, 8*, 255-270.
- Jacobson, N. S., Roberts, L. J., Berns, S. B., & McGlinchey, J. B. (1999). Methods for defining and determining the clinical significance of treatment effects: Description, application, and alternatives. *Journal of Consulting and Clinical Psychology, 67*, 300-307.
- Jacobson, N. S., & Truax, P. (1991). Clinical significance: A statistical approach to defining meaningful change in psychotherapy research. *Journal of Consulting and Clinical Psychology, 59*, 12-19.
- Kendall, P. C. (1998). Empirically supported psychological therapies. *Journal of Consulting and Clinical Psychology, 66*, 3-6.
- Kendall, P. C., Marrs-Garcia, A., Nath, S. R., & Sheldrick, R. C. (1999). Normative comparisons for the evaluation of clinical significance. *Journal of Consulting and Clinical Psychology, 67*, 285-299.
- Kessler, R. C., Berglund, P., Demler, O., Jin, R., Koretz, D., Merikangas, K. R., et al. (2003). The epidemiology of major depressive disorder: Results from the National Comorbidity Survey Replication (NCS-R). *Journal of the American Medical Association, 289*, 3095-3105.

- Kimerling, R., Ouimette, P. C., Cronkite, R. C., & Moos, R. H. (1999). Depression and outpatient medical utilization: a naturalistic 10-year follow-up. *Annals of Behavioral Medicine, 21*, 317-321.
- Kovacs, M., & Beck, A. T. (1978). Maladaptive cognitive structures in depression. *American Journal of Psychiatry, 135*, 525-533.
- Lecrubier, Y. (2001). The burden of depression and anxiety in general medicine. *Journal of Clinical Psychiatry, 62*, 4-9; discussion 10-11.
- LeVine, P. (1998). *Morita therapy and the true nature of anxiety-based disorders (Shinkeishitsu)*. Albany, NY: State University of New York Press.
- Lewinsohn, P. M. (1974). A behavioral approach to depression. In R. M. Friedman & M. M. Katz (Eds.), *The psychology of depression: Contemporary theory and research*. New York: Wiley.
- Lewinsohn, P. M., & Atwood, G. E. (1969). Depression: A clinical-research approach. *Psychotherapy: Theory, Research, and Practice, 6*, 166-171.
- Lewinsohn, P. M., Biglan, A., & Zeiss, A. S. (1976). Behavioral treatment of depression. In P. O. Davidson (Ed.), *The behavioral management of anxiety, depression and pain* (pp. 91-146). New York: Brunner/Mazel.
- Linehan, M. M. (1993). *Cognitive-behavioral treatment of borderline personality disorder*. New York: Guilford.
- Martell, C. R., Addis, M. E., & Jacobson, N. S. (Eds.). (2001). *Depression in context. Strategies for guided action*. New York: W. W. Norton.
- McLean, P. D., Ogston, K., & Grauer, L. (1973). A behavioral approach to the treatment of depression. *Journal of Behavior Therapy and Experimental Psychiatry, 4*.
- Moher, D., Schulz, K. F., & Altman, D. (2001). The CONSORT statement: Revised recommendations for improving the quality of reports of parallel-group randomized trials. *Journal of the American Medical Association, 285*, 1987-1991.
- NIMH (2005). *Breaking Ground, Breaking Through: The Strategic Plan for Mood Disorders Research*. National Institutes of Mental Health, U. S. Department of Health and Human Services.
- Otto, M. W., Pava, J. A., & Sprich-Buckminster, S. (1996). Treatment of major depression: Application and efficacy of cognitive-behavioral therapy. In M. H. Pollack & M. W. Otto (Eds.), *Challenges in clinical practice: Pharmacologic and psychosocial strategies* (pp. 31-52). New York: Guilford Press.

- Persons, J. B., Burns, D. D., & Perloff, J. M. (1988). Predictors of dropout and outcome in cognitive therapy for depression in a private practice setting. *Cognitive Therapy and Research, 12*, 557-575.
- Porter, J. F., Spates, R. C., & Smitham, S. (2004). Behavioral activation group therapy in public mental health settings: A pilot investigation. *Professional Psychology: Research and Practice, 35*, 297-301.
- Robinson, P., Wischman, C., & DeVento, A. (1996). *Treating depression in primary care*. Reno, NV: Context Press.
- Roth, A. D., & Fonagy, P. (1996). *What works for whom? A critical review of psychotherapy research*. New York: Guilford Press.
- Simons, A. D., Levine, J. L., Lustman, P. J., & Murphy, G. E. (1984). Patient attrition in a comparative outcome study of depression. A follow-up report. *Journal of Affective Disorders, 6*, 163-173.
- Spitzer, R. L., Williams, J. B., Gibbon, M., & First, M. B. (1992). The Structured Clinical Interview for DSM-III-R (SCID). I: History, rationale, and description. *Archives of General Psychiatry, 49*, 624-629.
- Steer, R. A., Ball, R., Ranieri, W. F., & Beck, A. T. (1999). Dimensions of the Beck Depression Inventory-II in clinically depressed outpatients. *Journal of Clinical Psychology, 55*, 117-128.
- Steer, R. A., & Clark, D. A. (1997). Psychometric characteristics of the Beck Depression Inventory-II with college students. *Measurement & Evaluation in Counseling & Development, 30*, 128-137.
- Steinbrueck, S. M., Maxwell, S. E., & Howard, G. S. (1983). A meta-analysis of psychotherapy and drug therapy in the treatment of unipolar depression with adults. *Journal of Consulting and Clinical Psychology, 51*, 856-863.
- Warren, W. L. (1996). *Manual for the revised Hamilton Rating Scale for depression*: Western Psychological Services.
- Williams, J. M. G. (1992). *The psychological treatment of depression. A guide to the theory and practice of cognitive behaviour therapy* (2nd ed.). London: Routledge.

World Health Organization. (2005). *WHO initiative on depression and public health*. Accessed January 1, 2005, 2005, from <http://www.who.int/mentalhealth/management/depression/definition/en/print.html>

Zeiss, A. M., Lewinsohn, P. M., & Munoz, R. F. (1979). Nonspecific improvement effects in depression using interpersonal skills training, pleasant activity schedules, or cognitive training. *Journal of Consulting and Clinical Psychology, 47*, 427-439.

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# THE BEHAVIOR ANALYST TODAY

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*A Context for Science with a Commitment to Behavior Change*

## ERRATA

In the article Cautilli, J.D., Riley-Tillman, T.C., Axelrod S. and Hineline, P. (2005): "The Role of Verbal Conditioning in Third Generation Behavior Therapy" - The Behavior Analyst Today, 6.(2), Page 138-145, all references to Boiling should be Bolling.

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