The Application of Operant Conditioning to Address Poverty and Drug Addiction

Kenneth Silverman

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The Therapeutic Workplace

An intervention to address the interrelated problems of drug addiction and poverty.
Collaborators

• JHU Faculty
  – Maxine L. Stitzer
  – George E. Bigelow
  – Eric C. Strain
  – Dace Svikis
  – Michael Fingerhood
  – Conrad J. Wong
  – Annie Umbricht
  – Sigurdur Sigurdsson
  – Anthony DeFulio
  – August F. Holtyn

• Software Developers
  – Michael Grabinski
  – Leonard Onyiah

• Postdoctoral Fellows
  – Elias Robles-Sotelo
  – Jesse Dallery
  – Darlene Crone-Todd
  – Todd W. Knealing
  – Wendy D. Donlin
  – Anthony DeFulio
  – Jeffrey J. Everly
  – Will M. Aklin
  – Kelly E. Dunn
  – Mikhail N. Koffarnus
  – August F. Holtyn
  – Brantley Jarvis
  – Shrinidhi Subramaniam
Poverty is Associated with Poor Health

- **Obesity:** Drewnowski et al. (2004). Am J Clin Nutr. 79, 6-16
- **Smoking:** Hiscock et al. (2012). Ann. N. Y. Acad Sci, 1248, 107-123
- **HIV:** Oldenburg et al. (2014). AIDS, 28, 2763-2769
- **Heart Failure:** Hawkins et al. (2012). Eur J Heart Fail, 14, 138-146
- **Stroke:** Addo et al. (2012). Stroke, 43, 1186-1191
- **Cancer:** Ward et al. (2004). CA Cancer J Clin, 54, 78-93
- **Injection Drug Use:** Armstrong (2007). Arch Int Med, 167, 166-173
- **Death:** Muennig, et al. (2010). Am J Public Health, 100, 1758-1764

*Silverman, Holtyn and Jarvis (2016). Preventive Medicine, 92, 58–61.*
Poverty is Associated with Shortened Lifespan

Poverty is Associated with Shortened Lifespan

Poverty is Associated with Shortened Lifespan

"equivalent to decrement in longevity from lifetime smoking"

Relative HIV Rates in Drug Users in High Poverty Areas in US

HIV Diagnoses by Poverty, Education, Unemployment

Percentage of Residents in Census Track

- < Poverty Level
- < High School Ed
- Unemployed

Percentage of HIV Diagnoses

- MSM
- IDU
- Het

Silverman, Holtyn and Jarvis (under review). Preventive Medicine.
Injection Drug Use by SES (NHSDA)

*P ≤ 0.05
Promoting Health In People Who Live in Poverty

- Develop interventions that promote health behaviors in people who live in poverty

- Develop interventions to reduce poverty

Drug Addiction In People Who Live in Poverty

- Develop interventions that promote drug abstinence in people who live in poverty

- Develop interventions to reduce poverty in low-income adults who have long histories of drug addiction

Develop Interventions that Promote Drug Abstinence in People Who Live in Poverty

Abstinence Reinforcement Interventions

Voucher-Based Reinforcement-Higgins et al. 1991

Abstinence Reinforcement is an Effective Approach

- Meta-Analysis of Psychosocial Treatments

- Review of Cocaine Addiction Treatments

- National Institute on Health and Clinical Excellence (NICE) Review of Psychosocial Interventions
  - Pilling et al. (2007). British Medical Journal, 335, 203-205

- Review of Interventions for Pregnant Smokers
Parameters Key to Effectiveness

• Reinforcement magnitude
  – Stitzer and Bigelow (1983). Behavior Therapy, 14, 647-656
  – Higgins et al. (2007). Addiction, 102, 271-81
Relapse is Common After Reinforcement Ends

- **Alcohol and Benzodiazepines**

- **Cigarettes**

- **Cocaine**

- **Heroin**
A Laboratory Model of a Therapeutic Workplace

Employment-Based Abstinence Reinforcement

Drug-Free Urine → Work → Wages
Phases of Therapeutic Workplace Treatment

PHASE 1: Training and Abstinence Initiation

- **JOB:** Training
- **PAY:** Vouchers
- **DURATION:** Limited

PHASE 2: Therapeutic Workplace Business

- **JOB:** Work
- **PAY:** Paycheck
- **DURATION:** Unlimited
Models for Maintaining Abstinence Reinforcement

Phase 1

Therapeutic Workplace

Adult Education & Job Skills Training‡

Learning & Health Incentives*

Phase 2

Social Business*

Abstinence-Contingent Employment*

Cooperative Employer†

Abstinence-Contingent Employment†

IPS & Wage Supplement†

Abstinence-Contingent Wage Supplements†

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We understand the importance of accuracy and integrity of research data and are committed to providing you with the highest quality of data entry services. We have developed a computerized system and innovative procedures to provide accurate, efficient, and cost-effective data entry and management.

Promoting Cocaine Abstinence in Methadone Patients

• Cocaine use is widespread in methadone patients

• Injection and crack cocaine use associated with increase risk of HIV infection
  - Chaisson et al. (1989). JAMA, 261, 561-565
  - Grella et al. (1997). Drug and Alcohol Dependence, 37, 15-21
Initial Clinical Trial: Evaluation of Prototype

Random Assignment

Center for Addiction & Pregnancy

Phase 1
Phase 2

Therapeutic Workplace (n=20)

Usual Care Control (n=20)

Years

Attendance in the Therapeutic Workplace Over 4 Yrs

Maintenance of Cocaine Abstinence


Cocaine Abstinence

Employment Outcomes

Employment Outcomes

Therapeutic Workplace Business to Maintain Abstinence

Enrolled (N = 128)

Random Assignment

Abstinence Contingent Work

Phase 1

Employment Only (n = 24)

Abstinence-Contingent Employment (n = 27)

Phase 2

Consecutive Months

Monday, Wednesday, Friday Urinalysis


- Cocaine Positive
- Cocaine Negative
Monday, Wednesday, Friday Urinalysis

Cocaine Abstinence in Year of Phase 2 Employment

Attendance in Year of Phase 2 Employment

Post-Treatment Cocaine Abstinence

Post-Treatment Cocaine Abstinence

OR = 4.57 (1.37-15.25)  
P = 0.01

Post-Treatment Cocaine Abstinence

OR = 4.57 (1.37-15.25)  
P = 0.01

P = NS

Summary of Main Studies

Silverman et al. (2012). Preventive Medicine, 55, S46–S53.
Developing Interventions to Reduce Poverty
Anti-Poverty Programs in the United States

- Large-scale implementation
- Limited effectiveness
- Little evaluation of elements

Conditional Cash Transfer for Low-Income Families

Welcome

All parents care about the health and success of their families. That's the idea behind Opportunity NYC Family Rewards!

Riccio et al. (2013).
## Incentives in Anti-Poverty Programs

<table>
<thead>
<tr>
<th>Program</th>
<th>Location</th>
<th>N</th>
<th>Population</th>
<th>Training Stipends</th>
<th>Wage Supplements</th>
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</thead>
<tbody>
<tr>
<td>Opening Doors</td>
<td>Louisiana</td>
<td>1,019</td>
<td>Parents</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Performance Scholarship</td>
<td>Ohio</td>
<td>2,285</td>
<td>Parents</td>
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<td></td>
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<tr>
<td>Performance Scholarship</td>
<td>New York</td>
<td>1,502</td>
<td>Adults</td>
<td>X</td>
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<tr>
<td>New Hope</td>
<td>Wisconsin</td>
<td>1,362</td>
<td>Welfare</td>
<td></td>
<td>X</td>
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<tr>
<td>Jobs First</td>
<td>Connecticut</td>
<td>4,803</td>
<td>Welfare</td>
<td></td>
<td>X</td>
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<tr>
<td>ERAP</td>
<td>Texas</td>
<td>5,331</td>
<td>Welfare</td>
<td></td>
<td>X</td>
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<tr>
<td>Opportunity NYC</td>
<td>New York, NY</td>
<td>4,800</td>
<td>Families</td>
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<td>X</td>
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<tr>
<td>Opportunity NYC 2.0</td>
<td>New York, NY</td>
<td>2,400</td>
<td>Families</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

Wage Supplements for Low Income Adults

* = P < 0.05

Features That May Limit Effectiveness

- Delay to incentive payment
- Incentives delivered infrequently
- Large response requirements
- Small incentive magnitudes
- Lack of prerequisite skills
- Incentive system not clearly described

Therapeutic Workplace Anti-Poverty Program

• **Education and job skills training**

• **IPS supported employment**
  – Bond et al. (2012). World Psychiatry. 11, 32-39

• **Abstinence-contingent wage supplements**
  – Berlin et al. (2007), The Future of Children 17, 17-42
Poverty Rates by Educational Level in US (2012)

- College: 5%
- Some College: 11%
- HS: 15%
- <HS: 30%

Participants with High School Education Across Studies

Total N = 569

Academic Levels of Therapeutic Workplace Participants

Incentives to Promote Education and Training

- **Attendance in training**
  - Silverman et al. (1996). Drug and Alcohol Dependence, 41, 197-207
  - Koffarnus et al. (2011). Alcohol and Alcoholism, 46, 561-569

- **Punctuality and complete work shifts**
  - Wong et al. (2004). Drug and Alcohol Dependence, 74, 319-323

- **Productivity on training programs**
  - Koffarnus et al. (2013). J of Applied Behavior Analysis, 46, 395-406
  - Koffarnus et al. (2013). J of Applied Behavior Analysis, 46, 582–591
  - DeFulio et al. (2009). J of Applied Behavior Analysis, 42, 627-640
Effect of Monetary Incentives on Performance

Effect of Monetary Incentives on Performance

- **Population**: Out-of-treatment injection drug users

- **Study Groups**:
  - Group A
    - Typing program: Performance Pay
    - Keypad program: Hourly Pay
  - Group B
    - Typing program: Hourly Pay
    - Keypad program: Performance Pay

Effects of Performance Pay on Work Output

Effects of Performance Pay on Work Output

Effects of Performance Pay on Work Output

Liking Ratings of Performance Pay and Hourly Pay

ATTAIN: Stipend-Supported Computer-Based Training

- Authoring and course presentation system
- Can create courses on wide range of topics
- Easy creation of courses without programming
- Teach skills to high levels of accuracy and speed
- Integrates stipends for training performance
Abstinence-Contingent Wage Supplements

Random Assignment

Abstinence Contingent Work

Enrolled

IPS & Abstinence-Contingent Wage Supplements

Individual Placement & Support (IPS)

Consecutive Months

Phase 1

Phase 2

Consecutive Months

1 2 3 4 5 6 1 2 3 4 5 6 7 8 9 10 11 12

Enrolled

R01 DA037314, In Progress
Office of Drug & Alcohol Policy & Compliance

The Omnibus Transportation Employees Testing Act of 1991 requires testing of individuals in the transportation industry who are involved in safety-sensitive transportation, including individuals who operate motor vehicles, those who handle hazardous materials, and individuals who work with pipelines, and other transportation equipment. This includes testing for both drug and alcohol use.

These regulations cover all transportation workers who are involved in safety-sensitive positions, such as truck drivers, locomotive engineers, and those who work with hazardous materials. The Federal Regulations (CFR) Part 40 (ODAPC) publishes, implements, and enforces these regulations.

American Substance Abuse Professionals (ASAP) provides DOT SAP evaluations and services. ASAP maintains a nationwide SAP network, and a DOT Substance Abuse Professional is just a phone call or click away.

For more information, visit http://www.dot.gov/odapc/ and https://www.go2asap.com/.
Abstinence-Contingent Wage Supplements (ACWS)

![Graph showing IPS Hours Per Week for IPS & ACWS and IPS Only groups.](image)

R01 DA037314, In Progress
A Model of a Comprehensive Anti-Poverty Program

**Adult Program**

- Therapeutic Workplace
  - Adult Education & Job Skills Training†
    - Learning & Health Incentives*

**Infant, Child & Adolescent Program**

- Early Intervention Learning Center
  - 0 to 5 Years
    - Learning & Health Incentives

**Social Business***
- Abstinence-Contingent Employment*

**Cooperative Employer†**
- Abstinence-Contingent Employment†

**IPS & Wage Supplement †**
- Abstinence-Contingent Wage Supplements†

**After School and Summer Learning Center**
- 6 to 18 Years
  - Learning & Health Incentives

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• The Therapeutic Workplace can promote and maintain drug abstinence in people who live in poverty

• The Therapeutic Workplace may be useful in reducing poverty in low-income adults who have long histories of drug addiction, but more research is needed