Derived relations as a response transfer network for Cocaine Use Disorder: A Pilot Study

Kenneth M. Carpenter, Richard W. Foltin, Margaret Haney, & Suzette M. Evans.

BACKGROUND:

- Respondent conditioning plays a critical role in understanding substance use and specific components of substance use disorders (SUD; e.g. cravings, urges, withdrawal).
- Evidence suggests stimuli can acquire the respondent eliciting functions of other stimuli indirectly, via derived relations, highlighting an important learning process rarely addressed in SUD behavioral treatments.
- We investigated the emergence of stimulus equivalence and the transfer of differential respondent eliciting functions of stimuli paired with smoking cocaine to other stimuli in accordance with the derived relations evidenced in a Matching to Sample protocol.

METHODS:

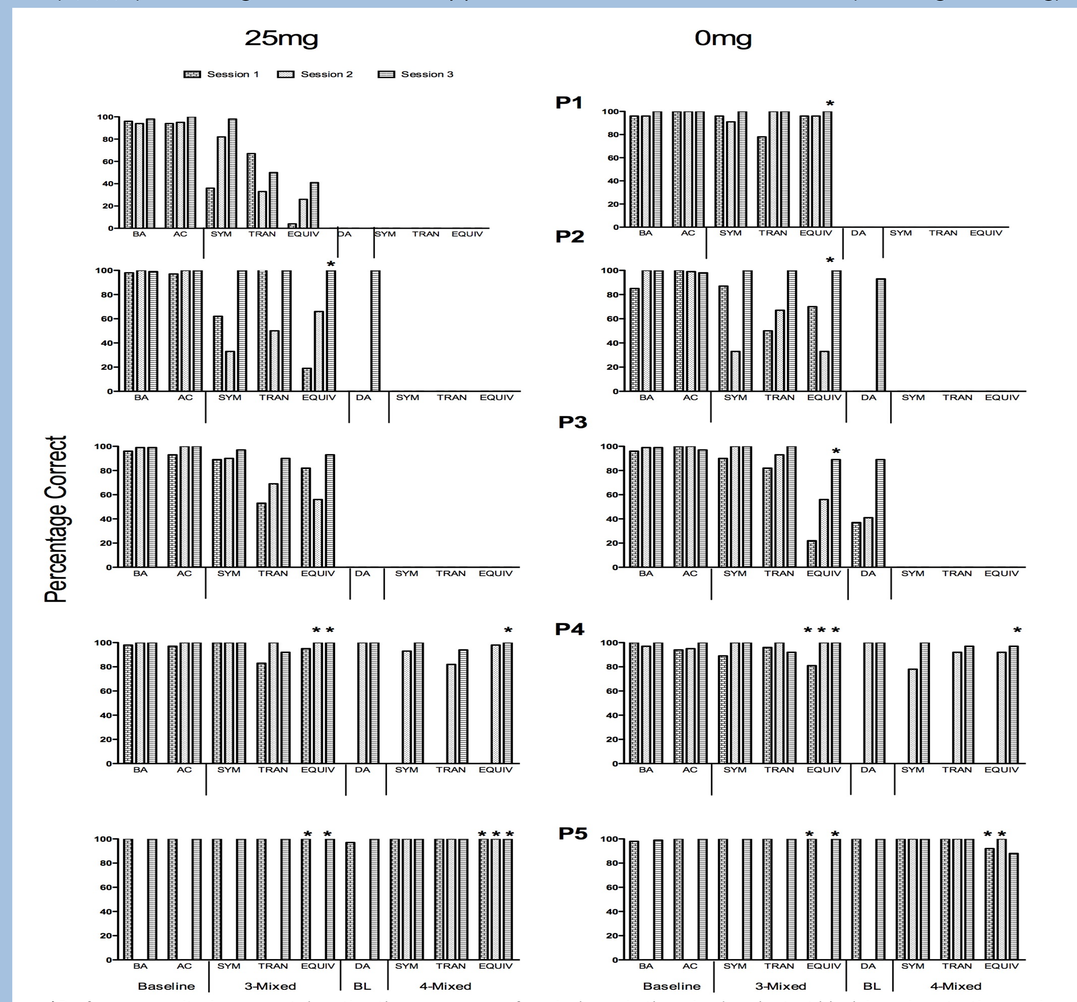
- 5 participants meeting criteria for a Cocaine Use Disorder (see Table 1) and not seeking treatment were admitted to a residential research facility (Mon-Fri).
- BA, AC, DA conditional discrimination training trials were presented using a serial MTS protocol (Table 2). Simultaneous testing blocks assessed for the emergence of two 3-member (A1-B1-C1 and A2-B2-C2) and then after DA training, two 4-member equivalence classes (i.e. A1-B1-C1-D1 and A2-B2-C2-D2) across three training sessions.
- Four conditioning sessions were conducted pairing a stimulus from each group of MTS stimuli with either 25mg smoked cocaine doses or placebo 0mg doses: (25mg-B1 and 0mg-B2). Two conditioning sessions occurred **before** and two sessions occurred **after** the MTS training.
- Differential eliciting functions of the B stimuli and the transfer of eliciting functions from the B stimuli to the A, C, and D stimuli were tested in a session in which no drug was administered.
- Changes in baseline Heart Rate (HR) and Diastolic Blood Pressure (DBP) following the presentation of stimuli during the last session of the experimental sequence are the primary outcomes presented in this poster.

RESULTS:

- P4 and P5 (Figure 1) demonstrated the derivation and maintenance of two 4-member equivalence classes. P2 demonstrated the derivation of two 3-member equivalence classes but did not advance to the 4-member test block. P1 and P3 did not demonstrate equivalence in the mixed probe tests.
- Derived equivalence (3-member) was more likely to occur among the stimuli group including the 0mg paired stimulus (B2) among participants not demonstrating equivalence in mixed probe tests (P1, P3).
- P4 and P5 demonstrated a complete transfer of differential respondent conditioning in accordance with 4-member equivalence on measures of HR and DBP, respectively (Figure 2).
- P2 demonstrated transfer of differential respondent conditioning in accordance with symmetry but not equivalence (Figure 2; HR and DBP).
- Transfer was not reliable among participants who failed to demonstrate derived relations in the mixed probe tests (P1 and P3; not shown).

CONCLUSION: Derived relations and the transfer of respondent eliciting functions can be demonstrated under controlled laboratory conditions for some participants. These findings suggest that such relations may play an important role in the acquisition of drug responses across a wide range of stimuli in the natural ecology and the difficulty in achieving abstinence during treatment. Further methodological refinements are needed to identify factors influencing variability in class formation and physiological reactivity within and across participants.

Figure 1. MTS performance across the three training sessions. Results presented separately by the group of MTS stimuli (A,B,C,D) containing the stimulus directly paired with each smoked cocaine dose (B1-25mg or B2-0mg).



*Performance criteria was met denoting the emergence of equivalence in the mixed probe test block in a given testing session

Figure 2: Tests of the transfer of differential eliciting functions of stimuli directly paired with smoked cocaine (B1-25mg; B2-0mg) to other stimuli (A, C, D) in accordance with the relations derived in the MTS testing sessions. Results presented among those demonstrating 4-member (P4 & P5) or 3-member (P2) equivalence.

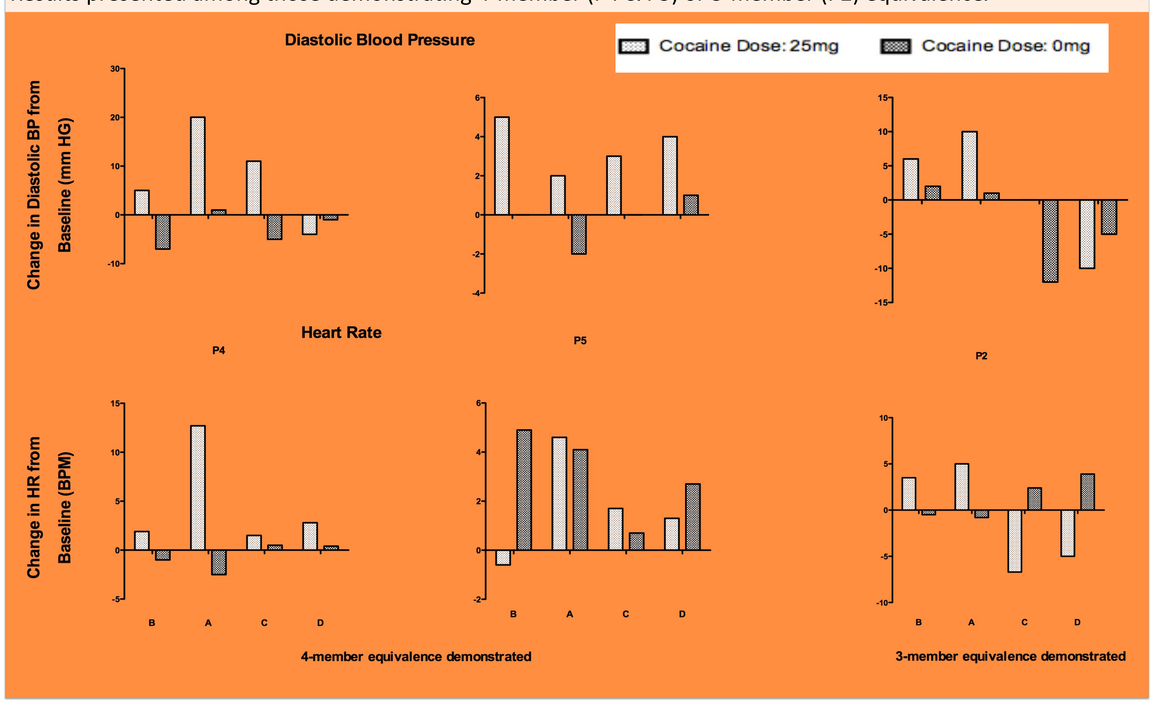


Table 1. Demographic, drug use characteristics, and the number of conditional discrimination trials presented for study participants.

ID	Gender; Race; Ethnicity	Age	Yrs. of educ.	Cocaine use: days per week	Cocaine use: $ spent per week	Yrs. of regular cocaine use	No. of baseline conditional relations trials presented across all three training sessions
P1	M; Black; NH	45	11	5	$150	17	470
P2	M; Black; NH	49	9	3	$75	24	736*
P3	M: White; NH	36	12	4.5	$300	25	588
P4	M; Black; NH	45	14	7	$250	24	704**
P5	M: White; H	36	15	6	$250	9	564**

M=Male; NH=Non Hispanic; H=Hispanic.
* Derived equivalence demonstrated in the 3-member mixed probe tests.
** Derived equivalence demonstrated in both the 3-member and 4-member mixed probe tests.

Table 2. Sequence of training and testing probes during the Simple to Complex MTS Protocol.

Blocks (in order of training)	Trials with feedback	Mastery Criterion	Relations trained and/or tested within each block (no. times trials presented in each block)	
Train BA	100%	100%	B1:A1 (8)	B2: A2 (8)
Train BA	75%, 25%, 0%	100%	B1:A1 (4)	B2: A2 (4)
Train AC & BA	100%	100%	A1:C1 (6) B1:A1 (2)	A2:C2 (6) B2:A2 (2)
Train AC & BA	75%, 25%, 0%	100%	B1:A1 (2) A1:C1 (2)	B2:A2 (2) A2:C2 (2)
3-mix probe tests for symmetry, transitive, equivalence relations* (80 Trials per block; 3 block maximum)	0%	100%	B1:A1 (5) A1:C1 (5) A1:B1 (9) C1:A1 (6) B1:C1 (6) C1:B1 (9)	B2:A2 (5) A2:C2 (5) A2:B2 (9) C2:A2 (6) B2:C2 (6) C2:B2 (9)
Train DA (with BA & AC probes)	100%	100%	D1:A1 (6) B1:A1 (2) A1:C1 (2)	D2:A2 (6) B2:A2 (2) A2:C2 (2)
Train DA (with BA & AC probes)	75%, 25%, 0%	100%	D1:A1 (2) B1:A1 (2) A1:C1 (2)	D2:A2 (2) B2:A2 (2) A2:C2 (2)
4-mix probe tests for symmetry, transitive and equivalence relations (72 trials per block; 6 block maximum)	0%	100%	A1:B1 (4) C1:A1 (4) A1:D1 (4) B1:C1 (4) D1:C1 (4) D1:B1 (4) B1:D1 (4) C1:B1 (4) C1:D1 (4)	A2:B2 (4) C2:A2 (4) A2:D2 (4) B2:C2 (4) D2:C2 (4) D2:B2 (4) B2:D2 (4) C2:B2 (4) C2:D2 (4)

*Below mastery performance prompted a sequence of serial testing blocks for symmetry, transitivity, and equivalence relations prior to beginning DA discrimination training phase.

Scan code for a more detailed description of the methods.

Supported by grant K23 DA021850 (KMC): contact Ken Carpenter - ken.carpenter@nyspi.columbia.edu

COLUMBIA
COLUMBIA UNIVERSITY
DEPARTMENT OF PSYCHIATRY
NEW YORK STATE OF OPPORTUNITY. New York State Psychiatric Institute