

CLASSICAL TRANSFER OF ATTITUDES , COMPOUND CONDITIONAL STIMULUS AND ESTIMULUS EQUIVALENCE.

Jaime Ernesto Vargas-Mendoza¹

Asociación Oaxaqueña de Psicología A.C. /Centro Regional de Investigación en Psicología. México

ABSTRACT :

3 groups of students were submit to classical conditioning attitude transfer. Two female (CSs) names were associated with a list of 20 pleasant words (UCSs) and other three female names associated to a list 20 unpleasant words in a delay procedure. Later occur the transfer measured by means of a semantic differential printed protocol. Also was monitored the conditional response to compound stimulus conformed with some combinations of the female names. Results are discussed in the light of equivalence relations and relational frame theory. It is suggested the existence of classical relational frames.

KEY WORDS : classical conditioning, attitude transfer, stimulus equivalence, compound conditional stimulus.

The first experimental studies using verbal stimuli as CSs were conducted in the late nineteen twenties and early thirties in the laboratories of A. G. Ivanon-Smolensky and N. I. Krasnogorsky (Ivanon-Smolensky, 1956). There has also been an increase in interest in the area, probably due to the review of selected Russian studies of semantic conditioning by Razran (1961). Hartman (1965) reviewing this literature identify studies in word-word CR transfer within words of a general class, e.g., rural words, war words (an area sometimes called “semantic conditioning”). An interesting study was that of Acker and Edwards (1963), they differentially conditioned vasoconstriction to the words “good” and “bad”, and transfer was tested to fifteen words, five each from groups of words that were high, low, or intermediate on the good-bad scale of semantic differential.

Previously, Razran (1938) do the first experimental attempt to affect attitudes toward various objects via pairing an attitude object (CS, a political slogan) with other valenced objects (US, a free lunch). Staats and Staats (1958) reported their study on attitudes established by classical conditioning were words was used as US. The experimental procedure was the same designed one year before in the report on meaning established by classical conditioning (1957). They think on attitudes as evaluative meaning following Osgood and Tannenbaum (1955). Results have been contended that conditioning effects were simply demand artifacts based on participants deliberate guesswork regarding the experimenter's hypothesis (Page, 1969). Whoever, Olson and Fazio (2001) have demonstrated the effect in a new classical conditioning paradigm were participants displayed no explicit memory for pairings.

Whenever the pattern of stimulation which operationally defines the CS consists of more than one component, each subject to independent variation, then this pattern is called a compound CS. Interest on intensity of a component is one rather obvious factor. Evaluation of associative strength of components can be obtained by giving an equal number of conditioning trials to each component and then testing the compound. There are four possible outcomes of such experiment: Summation, when strength of the CR

¹ Correspondence to Jaime Vargas: je_vargas@yahoo.com.mx
Web site : www.conductitlan.net

to this compound may exceed the strength of CR to the strongest component tested singly, Overshadows when CR to compound CS is equal to CR to the strongest component alone, Averaging if the compound CR falls between CR strength to the strongest and weakest components, and Strong Interaction when CR to the compound is weaker than CR to the weaker component (Gormezano and Moore, 1969). Of course, the reinforcement history of a component determines its contribution to a compound. Grings and his associates have demonstrated summation when reinforced components are combined, interaction when conditioned and nonreinforced components are mixed together, and minimal CR strength to compounds consisting only of nonreinforced components (Grings & Kimmel, 1959).

For Tonneau (2001) all Pavlovian views of symbolic responding emphasize the phenomenon of functional equivalence and its dependence on stimulus correlations. Nevertheless, function transfer most often has been studied in relation to stimulus equivalence, originally defined as the emergence of reflexivity, symmetry, and transitivity in conditional discrimination tasks (Sidman, 1994). Alternative operant views are Relational Frame Theory - RFT (Hayes, Barnes-Holmes & Roche, 2001) and Horne & Lowe (1996) naming theory.

Even when Tonneau (2001) argued on the role of Pavlovian conditioning in derived relational responding, (as noted by Hayes, Barnes-Holmes & Roche, 2003), he also points out that his Pavlovian approach to anything beyond the most simple transfer performances will be too complex to yield to experimental analysis.

In this study are employed compound CSs to evaluate relational responding and opinion learning in young human subjects.

METHOD :

Subjects.- 3 groups with 10 subjects each. Groups were comfort of elementary, high school and undergraduate students. The study was conducted at the classroom they use.

Materials.- 5 cards (21.5 x 14 cm) with the names impressed of the conditioned stimulus employed (black ink in fonts and white background), fonts were 5 cm tall. When not use cards were hold in a close box. There was also a tow sheets protocol for collecting the data. A clock let us administered time.

Variables : Unconditional Stimulus: lists of 20 "pleasant" and 20 "unpleasant" words. Pleasant words: alegría (happiness), hermoso (beautiful), regalo (gif), libertad (freedom), dormir (sleep) , beso (kiss), leche (milk), felicidad (fortunate), agua (water), paz (peace), bienestar (well been), saludo (salute), risa (smile), dulce (sweet), paseo (stroll), comida (food), descanso (rest), pastel (cake), amor (love) y placer (pleasure).

Unpleasant words: dolor (pain), brujería (witchcraft), feo (ugly), tristeza (sadness), muerte (death), soledad (loneliness), malo (bad), miedo (fear), desesperación (despair), ruido (noise), droga (drug), enfermedad (illness), prisión (jail), guerra (war), cancer (cancer), rencor (resentment), oscuridad (darkness), golpe (beat), odio (hate) y angustia (distress).

Conditional Stimulus: 5 names : Susan, Nancy, Pamela, Diana and Margaret. Randomly tow names were selected (Susan and Diana) as positive conditional stimulus (CS+) for been associated with the list of good words. Nancy, Pamela and Margaret was the negative conditional stimulus (CS-) associated with bad words.

Procedure .- Pilot Study: For the independent evaluation of the unconditional stimulus they were presented in random order list to a different group of height school students (n = 10). This subjects classify

them as “pleasant” or “unpleasant”. Experimental Study: Was carry on a unique 50 minutes session with each group started reading the following instructions: “Next practice evaluate your attention and your semantic memory. You will see some words, meantime you will ear some other words read from a list. When we finish you will answer a quit quiz. Thank you.” Then was run the conditioning trails (50) reading the words corresponding in front to the cards with the names. Series of names was repeated 10 times randomly. The conditioning procedure was a delay one. Card with the name (CS) was show lasting 15 seconds and during the final 5, was read the word of the corresponding list (UCS). Inter stimulus interval was 10 sec., and inter trial interval 30 sec. At the end in each case was applied the evaluation of the conditional response (CR). The protocol first page evaluate conditional stimulus as “very pleasant” (+2), “pleasant” (+1), “unpleasant” (-1) or “very unpleasant” (-2). Second page of the evaluation protocol have 15 items with compound stimulus for scoring them by means of the same kind of numbered “semantic differential” (Appendix 1).

RESULTS.

Subjects of the pilot study scored as “pleasant” and “unpleasant” the words of the respective lists with a 95% of confidence and make them qualify as effective unconditioned stimulus. As we see in Table 1, all three groups shows a conditioned response of great magnitude in presence of the CS+’s when each CS was available alone (extinction procedure).

Table 1. Magnitude of conditioned responses in semantic differential with single CSs.

		VP +2	P +1	U -1	VU -2	R	CS
Elementary School Group	Susan	+6	+4	-2	-2	+6	+
	Nancy	+4	+5	-1	-4	+5	-
	Pamela	+6	+1	-2	-8	-3	-
	Diana	+10	+1	-3		+8	+
	Margaret	+2	+5+	-2	-4	+1	-
High School Group	Susan	+6	+7			+13	+
	Nancy	+2	+1	-5	-6	-8	-
	Pamela		+3	-6	-2	-5	-
	Diana	+8	+6			+14	+
	Margaret		+1	-5	-8	-12	-
Undergraduate Group	Susan	+10	+4	-1		+13	+
	Nancy		+3	-5	-4	-6	-
	Pamela	+4	+1	-5	-4	-4	-
	Diana	+10	+5			+15	+
	Margaret	+2	+2	-2	-10	-8	-

Conditioned response to compound stimulus manifest discernible effects depending of the components. When compound was formed with the simultaneous presentation of two of the same CS+ (Items 1 and 2, see Appendix), the effect was one of Overshadows (Figure 1).

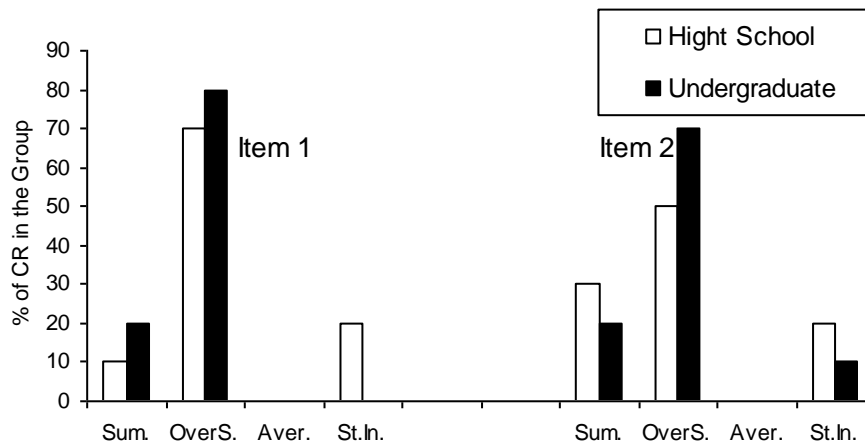


Figure 1. Overshadows effect to CS compound type 2(CS+).

The same effect occurs when compound stimulus consist of two of the same CS- (Items 3, 4 and 5) (Figure 2).

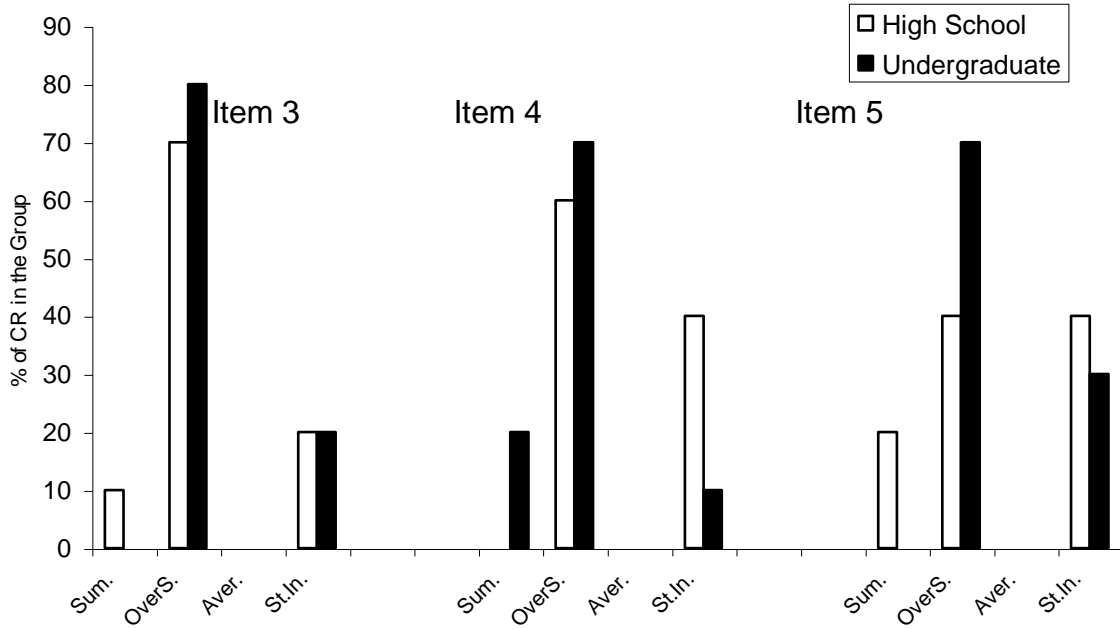


Figure 2. Overshadows effect to CS compound type 2(CS-).
 CR to a CS compound with both different CS+ let to a Overshadows effect (Item 6) (Figure 3).

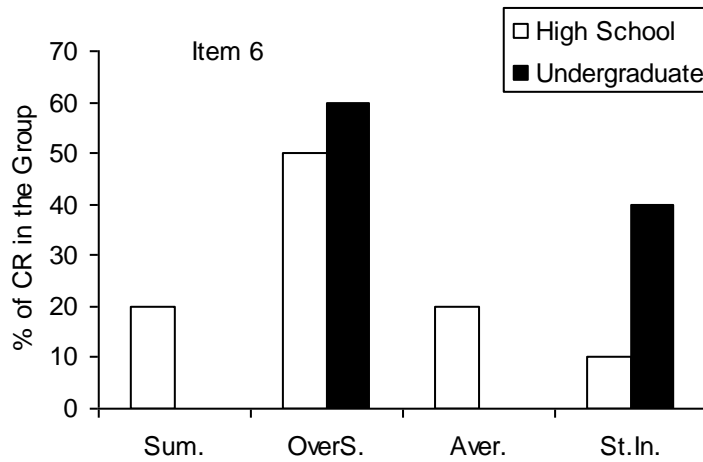


Figure 3. Overshadows effect to CS compound type (CS+)+(CS+).

Same Overshadows effect was seen with both different CS- as a compound CS (Items 8, 9 and 12) (Figure 4).

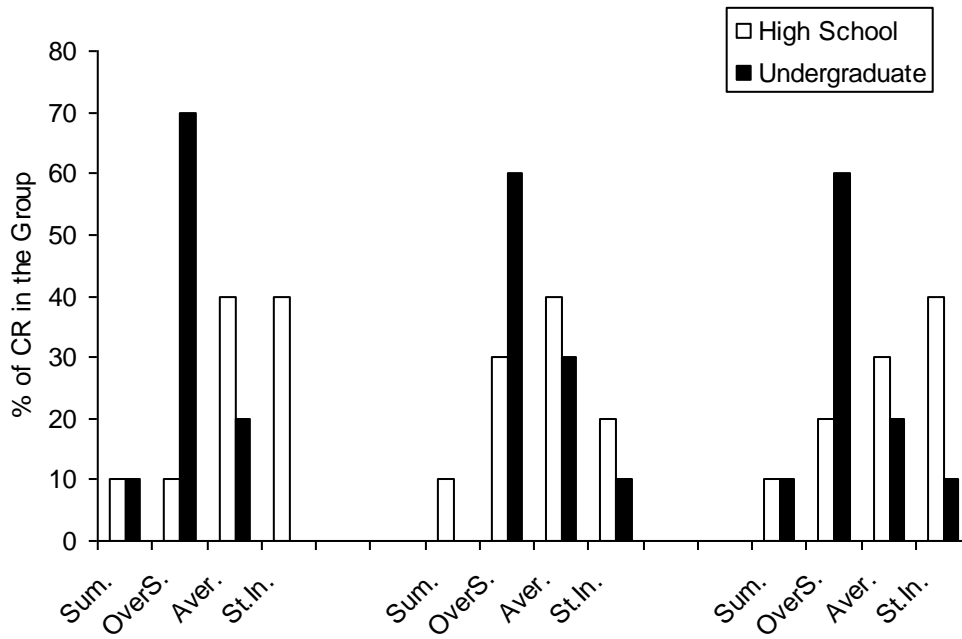


Figure 4. Overshadows effect to CS compound type (CS-)+(CS-).

However, when CS compound contains one CS+ and one CS- as components produce an Average effect (Items 7 and 10) (Figure 5).

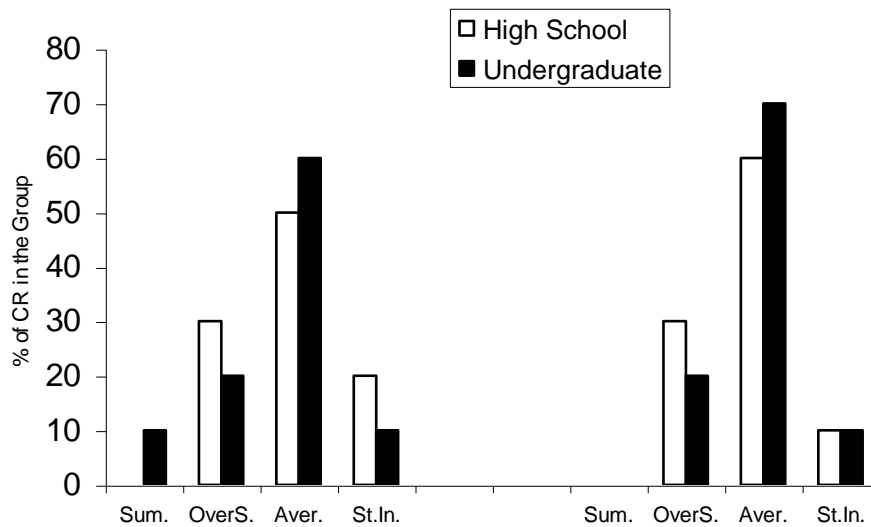


Figure 5. Average effect to CS compound type (CS+)+(CS-).

Average effect is also show to compounds armed with Cs- and CS+ components (Items 11, 13, 14 and 15) (Figure 6).

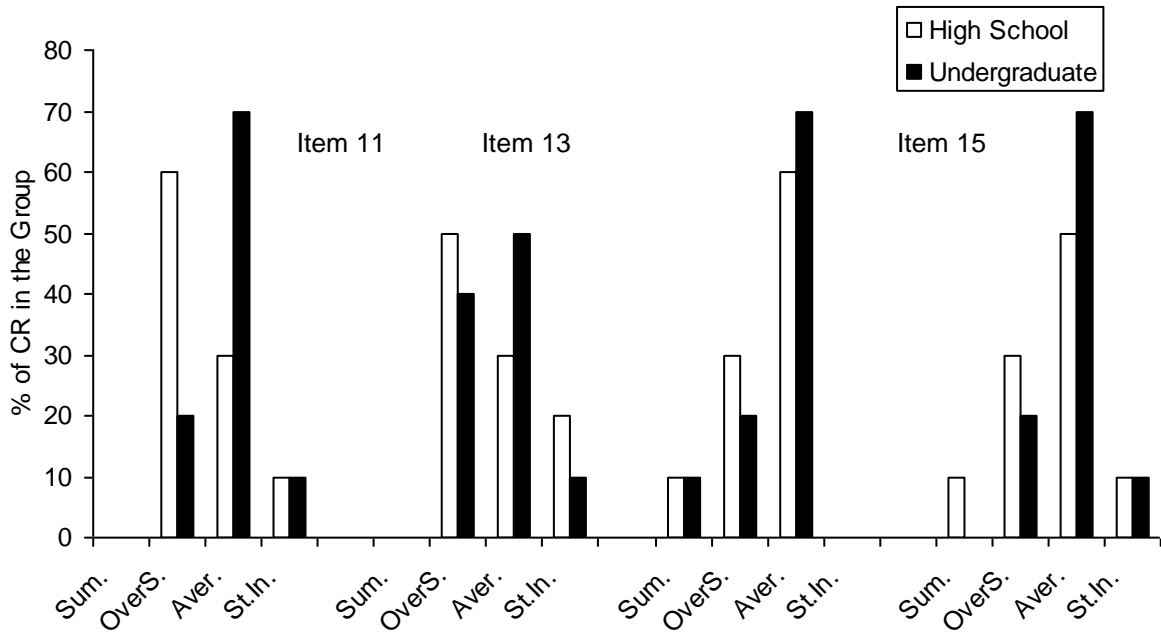


Figure 6. Average effect to CS compound type (CS-)+(CS+).

DISCUSSION.

Pilot Study was conducted to confirm the UCS function of the pleasant and unpleasant words. There was not a similar test for the CSs, instead was chose English names assuming to them a neutral role into a Spanish verbal community.

You can observe in the results that it was attained a classical attitude transfer, so CS1 (Susan) and CS4 (Diana) related to pleasant UCS have been scored like pleasant also, and CS2 (Nancy), CS3 (Pamela) and CS5 (Margaret) related to unpleasant UCS was scored like unpleasant (Table 1).

Conditional stimulus compounds type 2(CS+), 2(CS-), (CS+)+(CS+) and (CS-)+(CS-) didn't show an increase of CR magnitude corresponding to the double intensity of stimulation (Grings & Kimmel, 1959) but fit to the mathematical set union rule (Sidman, 1994). It was probably due to the verbal nature of the component stimulus and the equivalence function related to CR, opposite to Toneau (Toneau & Gonzalez, 2004) claim for a Pavlovian account of function transfer in stimulus equivalence and relational emergent responding

Conditional stimulus compound type (CS+)+(CS-) and (CS-)+(CS+) interact (Grings & Kimmel, 1959) and mutually inhibited according to Rescorla (1975) summation procedure and set intersection rule (Sidman, 1994).

This observations could be of interest to social and clinical endeavors in the enforce to opinion conditioning, prejudice control, publicity or covert counterconditioning of fear , obsessive and drug consumption cues stimulation.

There are several methods for empirically determining whether ordered pairs of events or interrelated stimuli make up an equivalence class. Using a matching-to-sample paradigm (MTS), relations are established with explicit reinforcement contingencies in stimulus pairs called AB and BC. The term conditional discrimination is used to describe such tasks, because responses to particular discriminative stimuli are contingent upon the sample or conditional stimuli. For example, a subject may be trained to choose comparison C conditionally upon sample B (BC matching). Performance on conditional discriminations, however, reveals little about the mechanism underlying the matching behavior. The ability to match visual stimulus A to visual stimulus B following training does not imply that A and B have become mutually substitutable, or equivalent (Sidman & Tailby, 1982). The emergence of equivalence relations is tested by showing that the relations established by the original conditional discrimination procedures can be extended to stimulus pair AA, BB, CC (reflexive), BA and CB (symmetrical) and CA (equivalence) without any reinforcement contingency other than that involved in AB and BC training (Sidman, 1994). This four types of stimulus pairings are termed emergent if they occur without further training. If criteria for emergence of symmetry, transitivity and equivalence are met, then stimuli A, B and C form an equivalence class.

Similar emergent performances have also been recorded with other experimental preparations, such as respondent training procedures (Dougher, Augustson, Markham, Greenway & Wulfert, 1994; Leader, Barnes & Smeets, 1996; Smeets, Leader & Barnes, 1997; Clayton & Hayes, 1999; Leader, Barnes_Holmes & Smeets, 2000; Leader & Barnes-Holmes, 2001; Clayton & Hayes, 2004; Tonneau & Gonzalez, 2004). These studies showed that a pairing procedure was an extremely effective method for producing these relations.

Lets see the procedure employed in this experiment as stimulus relations:

Training :

A ₁₋₂₀ (pleasant)	→	B ₁ (Susan)
		→ B ₄ (Diana)
A ₂₋₂₀ (unpleasant)	→	B ₂ (Nancy)
		→ B ₃ (Pamela)
		→B ₅ (Margaret)

Evaluation :

Symmetrical :	B ₁ →	A ₁	B ₂ →	A ₂
	B ₄ →	A ₁	B ₃ →	A ₂
			B ₅ →	A ₂

(Table 1)

Transitive : A₁ – A₂ → C_{7,10,11,13,14,15} (Compounds) (Figures 5 and 6)

Equivalence : C_{1,2,6} (Compounds) → A₁

C 3,4,5,8,9,12 (Compounds) → A2 (Figures 1,2,3 and 4)

This panorama implicated a equivalence class between A, B and C stimulus (UCS, CS and compound CSs) also Tonneau (2001) could say that cannot defined coherently. Of course, symmetrical, transitive and equivalence relations originally was defined in MTS methodology and no implicate relations otherwise that matching.

Relational frame theory posits that much complex behavior, including equivalence, is better understood as the result of “arbitrarily applicable relational responding” called a *relational frame*. From this vantage point, equivalence is one of many possible relational operants that Hayes et al. (2001) call a *frame of coordination*. They use the terms *mutual entailment* and *combinatorial entailment*, rather than symmetry and transitivity, because in some relational (e.g., opposite to) entailed relations are different from those that emerge from equivalence relations. Thus, relational frame theory is designed to account for a broad range of relations including present findings. This point of view also sustain the necessity of broad verbal experience in developing derived relational responding. For RFT, a relational frame, as an analytic unit, is conceptualized as a three-term contingency. The contextual (e.g., pleasant vs. unpleasant) cue is the third term, the relational response (e.g., responding to stimulus B in terms of A and responding to A in terms of B) is the second term, and a history of differential reinforcement correlated with the contextual cue is the first term in the contingency (Healy, Barnes-Holmes & Smeets, 2000). In accordance with our data : subjects from elementary school did not show systematic effects to compound CSs (and was omitted) and undergraduate present clearer effects than high school subjects (possibly because a lake of training in non-arbitrary or non-verbal perceptual discriminations, and arbitrary or verbal perceptual discriminations, see Luciano, Barnes-Holmes & Barnes-Holmes, 2001). Instead, there is no proper use of relational frame because there wasn't any reinforcement in the experimental procedure. Otherwise we most think in respondent relational frames or overarching respondent behavior (emotional induction of overlapping response classes: Segal, 1972) .

Naming theory (Horne & Lowe, 1996) doesn't offer a clear explanation of results given that subjects never name the stimulus, even when there are the possibility of covert naming (Clayton & Hayes, 2004) to explore in further research.

APPENDIX.

1	SUSAN SUSAN	Pleasant	!-----!-----!-----!-----! +2 +1 0 -1 -2					Unpleasant
2	DIANA DIANA		!-----!-----!-----!-----! +2 +1 0 -1 -2					
3	NANCY NANCY		!-----!-----!-----!-----! +2 +1 0 -1 -2					
4	PAMELA PAMELA		!-----!-----!-----!-----! +2 +1 0 -1 -2					
5	MARGARET MARGARET		!-----!-----!-----!-----! +2 +1 0 -1 -2					
6	SUSAN DIANA		!-----!-----!-----!-----! +2 +1 0 -1 -2					
7	DIANA NANCY		!-----!-----!-----!-----! +2 +1 0 -1 -2					
8	NANCY PAMELA		!-----!-----!-----!-----! +2 +1 0 -1 -2					
9	PAMELA MARGARET		+2	+1	0	-1	-2	
10	SUSAN NANCY		!-----!-----!-----!-----! +2 +1 0 -1 -2					
11	PAMELA DIANA		!-----!-----!-----!-----! +2 +1 0 -1 -2					
12	MARGARET NANCY		!-----!-----!-----!-----! +2 +1 0 -1 -2					
13	PAMELA SUSAN		!-----!-----!-----!-----! +2 +1 0 -1 -2					
14	MARGARET DIANA		!-----!-----!-----!-----! +2 +1 0 -1 -2					
15	MARGARET SUSAN		!-----!-----!-----!-----! +2 +1 0 -1 -2					

REFERENCES.

- Acker, L. E., & Edwards, A. E. (1964) Transfer of vasoconstriction over a bipolar meaning dimension. *J. Exp. Psychol.*, 67, 1-6
- Clayton, M. C., & Hayes, L. J. (1999) Conceptual differences in the analysis of stimulus equivalence. *The Psychological Record*, 49, 145-161
- Clayton, M. C., & Hayes, L. J. (2004) A comparison of match-to-sample and respondent-type training of equivalence classes. *The Psychological Record*, 54, 576-602
- Dougher, M. S., Augustson, E., Markham, M. R., Greenway, D. E. & Wolfert, E. (1994) The transfer of respondent eliciting and extinction functions through stimulus equivalence classes. *Journal of the Experimental Analysis of behavior*, 62, 331-351
- Gormezano, I., & Moore, J. W. (1969) Classical conditioning: Empirical relationship. In : Marx, M. H. (Ed.): *Learning: Processes* The Macmillan Company. Chap.7
- Grings, W. W., & Kimmel, H. D. (1959) Compound stimulus transfer for different sense modalities. *Psychol. Rep.*, 5, 253-260
- Hartman, T. F. (1965) Dynamic Transmission, Elective Generalization, and Semantic Conditioning. In : Prokasy, W. F. (Ed.): *Classical Conditioning: A symposium*. Appleton-Century-Crofts. Chap.5
- Hayes, S. C., Barnes-Holmes, D., & Roche, B. (2001) *Relational Frame Theory: A post-Skinnerian account of human language and cognition*. New York: Plenum.
- Hayes, S. C., Barnes-Holmes., & Roche, B. (2003) Behavior Analysis, Relational Frame Theory, and the Challenge of Human Language and Cognition: A Reply to the Commentaries on Relational Frame Theory: A Post-Skinnerian Account of Human Language an Cognition. *The Analysis of verbal Behavior*, 19, 39-54
- Healy, O., Barnes-Holmes, D., & Smeets, P. M. (2000) Derived relational responding as generalized operant behavior. *Journal of the Experimental Analysis of Behavior*, 74, 207-227
- Horne, P. J., & Lowe, C. F. (1996) On the origins of naming and other symbolic control. *Journal of the Experimental Analysis of Behavior*, 65, 185-241
- Ivanov-Smolensky, A. G. (1956) *Works of the institute of higher nervous activity Pathophysiological series*. Academy of Sciences of the USSR.
- Leader, G., Barnes, D., & Smeets, P. M. (1996) Establishing equivalence relations using a respondent-type training procedure. *The Psychological Record*, 46, 685-706
- Leader, G., Barnes-Holmes, D., & Smeets, P. M. (2000) Establishing equivalence relations using a respondent type procedure III. *The Psychological Record*, 50, 63-78
- Leader, G., & Barnes-Holmes, D. (2001) Matching-to-sample and respondent-type training as methods for producing equivalence relations: Isolating the critical variable. *The Psychological Record*, 51, 429-444
- Luciano, M. C., Barnes-Holmes, Y., & Barnes-Holmes, D. (2001) Early verbal developmental history and equivalence relations. *International Journal of Psychology and Psychological Therapy*, 1, 137-149
- Olson, M. A., & Fazio, R. H. (2001) Implicit attitude formation through classical conditioning. *Psychological Science*, 12, 413-417
- Osgood, C. E., & Tannenbaum, P. H. (1955) The principle of congruity in the prediction of attitude change. *Psychological Review*, 62, 42-55
- Page, M. M. (1969) Social psychology of a classical conditioning of attitudes experiment. *Journal of Personality and Social Psychology*, 11, 177-186
- Razran, G. H. S. (1938) Conditioning away social bias by the luncheon technique *Psychological Bulletin*, 37, 481
- Razran, G. H. S. (1961) The observable unconscious and the inferable conscious in current Soviet psychophysiology: Introceptive conditioning, semantic conditioning, and the orienting reflex.
- Rescorla, R. A. (1975) Pavlovian excitatory and conditioning. In: Estes, W. K. (Ed.): *Handbook of Learning and Cognitive Processes*. Vol.2 Lawrence Erlbaum As.,

- Segal, E. F. (1972) Induction and the provenance of operants. In: Gilbert, R. M. & Millenson, J. R. (Eds.): Reinforcement: Behavioral Analysis. Academic Press.
- Sidman, M. (1994) Equivalence relations and behavior: A research story. Boston: Authors Cooperative.
- Sidman, M. (1982) Conditional discrimination vs. matching-to-sample: An expansion of the testing paradigm. *Journal of the Experimental Analysis of Behavior*, 37, 5-22
- Smeets, P. M. (1997) Establishing stimulus classes in adults and children using a respondent-type training procedure: A follow-up study. *The Psychological Record*, 47, 285-308
- Staats, A.W., & Staats, C. K. (1957) Meaning established by classical conditioning. *Journal of Experimental Psychology*, 54, 74-80
- Staats, A. W., & Staats, C. K. (1958) Attitudes established by classical conditioning. *Journal of Abnormal and Social Psychology*, 57, 37-40
- Tonneau, F. (2001) Equivalence relations: A critical analysis. *European Journal of Behavior Analysis*, 2, 1-128
- Toneau, F., & González, C. (2004) Function transfer in human operant experiments: The role of stimulus pairings. *Journal of the Experimental Analysis of Behavior*, 81, 239-255