77-32,882

STEIGLEDER, Michele Kathrine, 1951-
THE DRIVE PROPERTIES OF COMPETITIVE BEHAVIOR.

The University of Oklahoma, Ph.D., 1977
Psychology, social

University Microfilms International, Ann Arbor, Michigan 48106

THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

THE DRIVE PROPERTIES OF COMPETITIVE BEHAVIOR

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

BY

MICHELE K. STEIGLEDER

Norman, Oklahoma

1977

THE DRIVE PROPERTIES OF COMPETITIVE BEHAVIOR

APPROVED BY

R. F. Weiss

Charles Getty

Larry E. Toothaker

Dayle A. Denton

DISSERTATION COMMITTEE

ACKNOWLEDGEMENTS

One's professional and personal life is deeply rooted to and significantly affected by special people. My graduate training has been filled with such people and I would like to thank them.

I wish to thank the members of my dissertation committee, Dr. Robert Frank Weiss, Dr. Daÿle Denton, Dr. Charles Gettys, and Dr. Larry Toothaker all of whom command my sincerest respect and admiration.

My appreciation and graditude for the pleasure they have given me during my graduate career are extended to Jim Hunsicker, Robert Cramer, Susan Siclari, Aviva Weiss, Cory and Justin. To Bryan McGrath I owe a special thanks for his encouragement and emotional support.

To my mentor, Dr. Robert Frank Weiss, I owe it all. His warmth, caring, intellect, and devotion to science have not only guided my professional development but have given me a sense of home in a place where "monsters live." Long after the complexities of graduate school are over, he shall remain one of my dearest and most treasured friends.

Those who have failed to know Joyce J. Weiss have suffered a misfortune, indeed. A more compassionate and intelligent woman I have yet to meet. Joyce, I am thankful for the time you have shared so generously, for your sincere concern and most of all for the privilege of knowing you.

I would like to dedicate this dissertation to my parents, Joseph and Betty Berman, and to my husband Steven Seidenfeld. We have successfully managed to live, love, and even laugh through it all.

TABLE OF CONTENTS

Abstract

This paper systematically demonstrated an empirical correspondence between known drive effects and the drive aroused by competition. Two experiments centered on an instrumental escape conditioning model from which predictions about the aversive drive properties of competition were derived and tested. Deductions from the model answered questions about the character of the drive underlying competitive behavior. Other drive characteristics were examined beyond those found in the escape conditioning paradigm. The third experiment produced a pattern of results which strongly suggested, as is characteristic of known drives, that the drive aroused by competition exerted a general energizing effect on behavior.

The Drive Properties of Competitive Behavior

Traditionally competitive behavior has been defined in terms of two social factors--rivalry and social facilitation (e.g., Allport, 1920, 1924). This conceptualization into dichotomous factors has resulted in competitive behavior frequently being subsumed under the rubric of social facilitation (e.g., Allport, 1920; Klinger, 1969; Martens & Landers, 1972). Clearly the presence of other people (social facilitation) must be recognized in competing situations, however, the dichotomous approach minimizes the opportunities for obtaining a potential wealth of information about competition by relegating the effects of competition to the presence of others in a competing situation and only minimally attributing the effects of competition to competition per se. Recent attempts (Wankel, 1972) to isolate audience, coaction, and rivalry components clearly demonstrated the importance of rivalry as an essential motivational component in competitive situations. Little or no evidence was obtained for the presence of others as a motivational component of competition; coaction may help to intensify feelings of rivalry and, thus, only indirectly influence performance.

Research directly concerned with the motivational structure underlying competitive behavior (Steigleder, Weiss, Cramer, & Feinberg, Note 1) demonstrated a striking correspondence between the effects of a reinforcer in escape conditioning and the effects of competition termination in competitive performance. Employing escape conditioning as a model for the effects of competition made it possible to predict that speed of a drive-reducing (competition termination) instrumental response would be (1) an increasing function of the number of reinforced trials; (2) a monotonic decreasing function of the length of the delay of reinforcement; (3) impaired when the reinforcing termination of competition occurred on only 50% of the trials; and (4) an increasing function of the magnitude of the contingent noncompetitive periods.

This theory of competitive behavior, by dint of its construction, permits further predictions to be tested about the motivational structure of competition. Thus, by simply constructing additional Rules of Correspondence relating the variables of escape conditioning to analogous variables in the research area of competitive behavior new theoretical predictions can be derived and tested (see Steigleder et al., Note 1, p.4). Verifying additional predictions from the escape conditioning model of competitive behavior not only speaks to the robust character of the theoretical analysis, but, given that specific theoretical deductions or analogies are examined, also permits known drive effects to be tested. Examining known drive effects beyond those typically obtained in a single experimental paradigm is an essential requirement for systematically expanding and testing the breadth of phenomena a given theoretical analysis can address. Thus, for example, noxious drives not only have the ability to punish via sudden onset, and reinforce via drive reduction, but drive is also assumed to have a general energizing effect on whatever response tendencies exist in a given situation (Dollard & Miller, 1950; Hull, 1943; Logan, 1959; Spence, 1956; Spence & Spence, 1966).

The general strategy underlying this paper is the systematic verification of the correspondence between demonstrated drive characteristics and the drive aroused by competition. Employing escape conditioning as a model for the effects of competition permitted competitive analogs of mangitude of reinforcement and intermittent shock to be derived and tested. Establishing a correspondence between the effects of magnitude of reinforcement and intermittent shock effects in escape conditioning and analogous variables in competitive behavior empirically support the relationship between known drive effects and the drive aroused by competition.

Beyond the escape conditioning paradigm additional evidence for the drive properties of competition behavior is obtained. Specifically, the general energizing effect characteristics of drive states, employing the standard learning paradigm of a test of an irrelevant drive on behavior, is investigated. In combination this series of experiments clearly establishes the drive properties of competitive behavior. Moreover, in that these drive characteristics of competitive behavior are examined and tested across a variety of experimental paradigms the breadth and implications of this theory of competitive behavior are broadened.

General Method

Theoretical Method

The use of a model in theory construction is employed to guide and integrate research. The modeling technique involves the specification of a dictionary of analogies (Rule of Correspondence) which relates the independent and dependent variables of the model to the independent and dependent variables of the research area to be predicted and explained. Once the analogies are drawn the relationship holding among the model variables, must theoretically, hold between the analogous variables in the research area (e.g., Brodbeck, 1959; Campbell, 1920; Lachman, 1960; Oppenheimer, 1956). Systematically employing learning theory as a model for the effects of competitive performance makes it possible to use known conditioning principles to determine whether analogous principles function in the competitive situation. However, drawing systematic and accurate analogies between the research area and known principles of conditioning further requires the specification of the learning paradigm which is analogous to the social conditions under investigation (e.g., instrumental reward conditioning, instrumental escape conditioning, selective learning); different learning paradigms differ sharply in certain regards.

In this research program instrumental escape conditioning is used as a model for predicting the effects of competition. In discrete-trials escape conditioning the subject learns, upon presentation of a cue (CS), to make an instrumental response which is followed by reinforcement. Since most of the known laws of escape conditioning involve response speed, the strength of the instrumental response is assessed by response speed (100/Latency, where latency is measured from the presentation of the cue until the occurrence of the instrumental response). In this competition research, the reinforcing termination of competition was contingent upon an instrumental switch throwing response. The dependent variable was speed (100/Latency, measured from the presentation of a cue until the instrumental switch throwing response). An analog of the basic drive--cue--response--reinforcement structure of a typical escape conditioning trial is found in the corresponding sequence of competitive scoring--signal light cue-- toggle switch throwing response--termination of competitive scoring (see also Steigleder et al, Note 1, for further elaboration of the theoretical method and technique of theory construction).

Deception and Masking Task

The experiment was presented as a study of the effects of different scoring methods and procedures on competitive performance. Subjects were instructed to score as many points as possible with the individual scoring the most points being designated as the "winner" of the competition. In actuality, scored points were never tallied, rather this deception was used to mask the learning task so that the conditioning process would not be overridden by the subjects' normal use of their higher mental processes (Spence, 1960).

Apparatus

In one of the experiments reported in this series additional apparatus was employed. The competitive apparatus, common to all three experiments in the series, will be discussed here.

The competitive apparatus was a commercially marketed game, Labyrinth, manufactured by Reiss Games Incorporated. This game was specifically selected because of its moderate level of difficulty; any improvement over the duration of the experiment was improbable. Two such games, one for each subject, were used. The task required subjects to manipulate a steel ball through a maze without permitting it to fall into any of the 49 holes on the surface of the maze. Subjects were told to point values were associated with each hole although point values were not printed on the maze. The game was wired so that an experimenter could record the freqency and occurrence of balls that fell through the holes. In addition, four colored lights, two red and two blue, were wired to the apparatus. These served as the CS and reinforcement lights.

The competitive phase of the experiment was conducted in a room partitioned so that the two subjects would never meet. Each partitioned section contained a set of headphones to be worn by the subject, the competitive apparatus, and an experimenal control panel. Labels on subjects' control panels were stated in terms of the masking task instructions: (1) "End Tallying Switch, " (2) Machine Reset--No Scoring" lights. Also mounted on the panel was a red signal light which indicated when the tallying device was to be reset (CS).

The experimenter's room contained the controls for turning on the various signal lights, a casette tape player (Craig 2603), a digital stop clock (Lafayette 5720, 1/100 sec. digital readout stop clock), a sixty second interval timer (Kodak 8239), two interval timers (Lafayette 5001-A), and a series of instruction tapes.

Procedure

Two subjects, always of the same sex, were seated in separate rooms, each containing the competitive apparatus and received the deceptive rationale and operating instructions over the headphones. Points were ostensibly tallied by a machine of limited capacity which required one of the subjects to participate in the tallying device program cycle. Data were collected only for the subject who was instrumental in the tallying reset. Subjects were told that the individual who scored the most points was to be designated the winner. Instructions also informed the subjects that ties were not possible.

The first trial began after the experimenter answered any questions concerning the operation of the apparatus or nature of the experiment. CS onset, occurring every 65 seconds, started the latency timer and illuminated the subjects' signal lights. Upon presentation of the CS, the subject threw the "End Tallying Switch" (instrumental response) which ostensibly reset the tallying apparatus, stopped the latency timer, and illuminated the panel light on each subject's console which indicated that the tallying device was resetting and scoring was no longer taking place. Only the termination of competitive scoring was contingent on the instrumental response; subjects continued to work on the experimental task during the reinforcement period. Thus competition offset was not confounded with task offset. After a 20 second reinforcement period the "No Scoring--Machine Reset" light was turned off and the next trial began. Although trials were discrete the experimental cycle was designed ,for purposes of deception, to appear continuous. At the beginning of each trial a taped recording reminded the subjects that performace was being scored. During the reinforcement period the taped recording reminded subjects that the tallying device was resetting.

Experiment 1: Magnitude of Reinforcement

Once analogies or Rules of Correspondence are assumed between the variables of instrumental escape conditioning and the variables of competition the functional relationship holding among the learning variables should hold among the corresponding competition variables. In escape conditioning, magnitude of reinforcement refers to the degree to which the noxious drive (typically shock) is reduced. Thus, for example, corresponding to a large magnitude of reinforcement would be a shock intensity of 200 volts which, contingent upon an instrumental response, is reduced to 0 volts, and corresponding to a mall magnitude of reinforcement would be a shock intensity of 100 volts reduced to 0 volts. Generally, larger magnitudes of reinforcement result in better conditioning with the speed of an instrumental response being positively related to the amount of drive reduction contingent on the instrumental response (Bower, Fowler, & Trapold, 1959; Campbell & Kraeling, 1953; Woods, Davidson, & Peters, 1964).

Analogously in competitive behavior, magnitude of reinforcement can be manipulated in terms of the amount of competitive drive reduction that is contingent upon an instrumental switch throwing response. Corresponding to a large magnitude of reinforcement, e.g., 200 volts to 0 volt reduction, in competitive behavior, is the termination of competitive scoring among four competitors. Similarly, corresponding to a small magnitude of reinforcement, e.g., 100 volts to 0 volt reduction, is the termination of competitive scoring between two competitors. Thus, if a larger number of competitors arouses a larger amount of drive than a smaller number of competitors and an instrumental response terminates the competition among the opponents then we have a basic escape conditioning analog of magnitude of reinforcement. Given this magnitude analog, it is predicted that competing groups of four should exhibit better conditioning than competing groups of two.

Method

Subjects and Design

The design was a 2 by 10 repeated measures in which groups of two or four competitors competed for a total of 10 discrete trials. The subjects were 32 college students, 16 randomly assigned to each group, recruited from an introductory psychology class.

Deception and Masking Task

The experiment was presented as the study of the effect of different scoring procedures and methods on competitive performance.

Subjects in the four competitor group were told they would be competing against a total of four opponents, while subjects in the two competitor group were told they would be competing against one another.

Results and Discussion

As shown in Figure 1 response speeds for groups of two and four competitors are approximately equal on trial one. As predicted, speed of the instrumental response was an increasing function of the number of reinforced trials and positively related to the amount of drive reduction contingent upon the instrumental response. Competing groups of four

---

Insert Figure 1 about here

(large magnitude of reinforcement) exhibited better conditioning than competing groups of two (small magnitude of reinforcement). A 2 by 10 repeated measures analysis of variance (Number of Competitors by Trials) performed on response speed revealed a significant Trials main effect, $F(9,270)=17.29$, $p < .001$. and a significant Number of Competitors main effect, $F(1,30)=5.20$, $p < .028$. The statistical significance of the repeated trials factor remained on computation of the Geisser-Greenhouse correction (Conservative test, Kirk, 1968, p.262).

Experiment 2: Intermittent Shock

In the investigation of human motivation the underlying character of a putative drive is frequently unknown. The researcher who has identified an interesting social reinforcer may face an indeterminate problem if the appetitive or aversive character of the relevant drive is unknown (Weiss, Note 2). Thus, the problem involves not only being able to identify the drive relevant to a given social reinforcer but also to determine the appetitive or aversive character of the drive. Fortunately, within the context of instrumental conditioning methodology certain results appear to differentiate between escape (aversive) and reward (appetitive) conditioning. One such variable is partial reinforcement; partial reinforcement facilitates response speed in reward conditioning (Amsel, 1958; Spence, 1960; Weinstock, 1958) and impairs speed in escape conditioning (Bower, 1960). Steigleder, Weiss, Cramer, and Feinberg (Note 1) previously demonstrated that response speeds of subjects competing on a partial reinforcement schedule were significantly inferior to response speeds of subjects competing on a continuously reinforced schedule. The results clearly followed a pattern characteristic of instrumental escape conditioning thereby providing an empirically based clarification of the aversive underlying nature of the competitive motive.

The intermittent shock effects of escape conditioning appear to have no functionally equivalent parallel in reward conditioning (e.g., Franchina, 1966, 1969a) and as such exhibit a pattern of results which also distinguishes between escape and reward conditioning. Moreover, this variable identifies and pinpoints the locus of the aversive drive.

Intermittent shock procedures involve shocking the subject on only some of the trials. Speed of the shock terminating instrumental response is a function of the percentage of shock trials with subjects shocked on only some of the trials still performing the instrumental response but more slowly than subjects who receive shock on all trials. The competitive analog of intermittent shock involves the omission of the noxious competition on some of the trials. As in intermittent shock procedures, speed of the competition terminating instrumental response should be a function of the percentage of competitive trials; subjects receiving competition on all trials should exhibit better learning of the instrumental response than subjects receiving competition on only some of the trials. Thus, this procedure offers the opportunity to not only provide additional empirical evidence for the aversive character of competition but to also pinpoint the locus of the noxious drive in the competition between opponents.

Method

Subjects and Design

The design was a 3 by 12 repeated measures in which groups, varying in the percentage of competitive trials, competed for a total of 12 discrete trials. Specifically, a group competed on 100% of the trials (12 trials), 66% of the trials (8 of 12 trials), or 33% of the trials (4 of the 12 trials). Eight subjects were randomly assigned to each of the three groups. The trials on which competition was omitted were simply noncompetitive trials in which the experimental task continued in the absence of competitive scoring. Four random orders of intermittent competition were used in the 66% and 33% groups.

Deception and Masking Task

As in experiment 1, the study was presented as an investigation of the effect of different scoring procedures and methods on competitive performance. However, an additional deception was used to plausibly account for the occurrence of the noncompetitive trials required by the intermittent shock procedure. Subjects were informed that there might be times when competition could not occur because of the ongoing statistical analysis performed on the scores.

Results and Discussion

Figure 2 shows the acquisition effects in competition which are analogous to those found in instrumental escape conditioning studies of intermittent shock: the group receiving competition on 100% of the trials is faster than the group receiving competition on 66% of the trials which is faster than the group receiving competition on 33% of the trials. A 3 by 12 (Levels of Intermittent Competition by Trials) repeated measures analysis of variance computed on instrumental response speeds revealed a significant main effect for Levels of Intermittent Competition, $F(2,21)= 11.06$, $p < .001$, and a significant Trials main effect, $F(11, 231)= 15.65$, $p < .001$. The statistical significance of the Trials effect was confirmed after computation of the Geisser- Greenhouse correction (Conservative test,

Insert Figure 2 about here

Kirk, 1968, p. 262). Main effects tests further indicated that all three groups acquired the instrumental response: $F(11,231)=5.87$, $p < .01$ for the 33% group; $F (11, 231)= 3.48$, $p < .05$ for the 66% group; and $F(11, 231)= 9.76$, $p < .01$ for the 100% group.

Planned comparisons, employing the Tukey method (Kirk, 1968) performed on group means revealed the 66% group to be significantly faster than the 33% group, $q(3,21)=3.66$, $p < .05$, and the 100% group to be significantly faster than the 33% group, $q(3,21)=6.86$, $p < .01$.

Experiment 3: Drive Energization

Experiment 3 examines the drive properties of competition in the context of the standard learning paradigm of a test for the energizing effect of an irrelevant drive on behavior. In this paradigm neither the onset nor the satisfaction of the drive is contingent upon the behavior of the subject.

Drive is assumed to have a general energizing effect on whatever response tendencies exist in a given situation, whether or not those responses reduce the drive (Dollard & Miller, 1950; Hull, 1943; Logan, 1959; Spence, 1956; Spence & Spence, 1966). Generalized drive (D) energizes all habits, both correct and incorrect, with the greatest benefits from increments in drive going to the response with the strongest habit strength. Thus, when a task elicits a single correct habit, relatively free of competing habits, increments in drive facilitate performance. If a task elicits strong incorrect habits which can effectively compete with a weaker correct response the energization of all habits by drive benefits the stronger incorrect responses to the detrement of the correct response.

Experiment 3 did not merely test for the energizing effect of the competitive motive, but rather tested for this effect while simultaneously addressing another property of learned drives. There is impressive evidence (e.g., Anderson, Johnson, & Kempton, 1969; Kamil, 1969; McAllister & McAllister, 1964) for the higher order conditioning of drives. Given the clearly demonstrated drive properties of competition, individuals who have been associated with this noxious competitive drive should acquire the capacity to elicit noxious drive. Thus, the dual purpose of the present study was to demonstrate the general energizing effect of the competitive drive by showing that an individual associated with noxious competition acquires noxious drive capacities and that his/her presence exerts a general energizing effect on subsequent performance.

Method

The experiment consisted of two phases: competition pretreatment followed by paired-associates learning. The competitive pretreatment phase was designed to establish the association between an individual and the noxious competitive drive so that this individual would acquire noxious drive properties. The acquired noxious drive properties conditioned to the individual were assessed in the subsequent paired-associates learning phase of the experiment.

Subjects and Design

In order to test for the acquired drive characteristics of a prior competitor three experimental groups were employed (n=16/group). Experimental groups consisted of subjects learning the complex paired-associates (P-A) list, developed by Spence, Farber, and McFann (1956) in the presence of a prior competitor, in the presence of an unknown subject, or alone. Prior to the learning of the P-A list experimental subjects participated in the competitive pretreatment phase of the experiment. Thr prior competitor group tested for the acquired noxious properties of an individual associated with competition. The performance of the subjects learning the P-A list in the presence of the prior competitor was compared to the performance of the subjects learning the P-A list in the presence of an unknown observer. This comparison was critical for establishing that impaired P-A performance in the prior competitor group was not merely the result of the simple presence of an observer.

The remaining subjects were assigned to one of two paired-associates learning control groups (n=16/group). The two control groups also learned the complex P-A list alone or in the presence of an unknown subject. However, control groups never received a competitive pretreatment and were occupied with an unrelated task for approximately the same amount of time as experimental subjects, prior to assignment to the control conditions. These control groups were included to insure that any effect on verbal learning performance in the three experimental groups was not merely the result of drive carrying over from the competition pretreatment phase to the P-A learning phase of the experiment. Thus, the design was a simple one-way ANOVA with 16 subjects assigned to each of the three experimental and two control groups.

Apparatus

The three experimental groups received the competitive pretreatment on the same competitive apparatus previously detailed in the General Method. For the paired-associates task a Lafayette model 303-A memory drum was employed.

Deception and Masking Task

The experiment was presented to the subjects as two separate and unrelated experiments. Subjects receiving the competitive pretreatment were told the purpose of the competition phase was to study the effects of different scoring procedures under competitive conditions. Control subjects were asked to help the experimenter by rating a game task before starting the actual experiment. The paired-associates learning task was presented as a study of the effects of learning verbal material under observed and unobserved conditions.

Procedure

Competitive pretreatment. The competitive pretreatment employed with the three experimental groups was the same as detailed in the General Method. After the two subjects completed the competition phase one or both of the subjects remained for the second ostensibly unrelated verbal learning study. Experimental subjects assigned to the group in which learning of the P-A task occurred in the presence of the prior competitor required both subjects be requested to participate in the verbal learning study. This group was designed to test for the acquired noxious properties of an individual associated with competition. Thus, a prior competitor should acquire the capacity to elicit drive and learning the complex P-A list in the presence of the prior competitor should be impaired relative to control subjects and subjects learning the list in the presence of an unknown individual.

Subjects assigned to the experimental groups in which learning the P-A task took place alone or in the presence of an unknown subject required one of the competitors be excused from participating in the "second experiment." When a subject had to be dismissed, because of the requirements of a given experimental group, the experimenter carefully appeared to randomly select one of the subjects to remain so that no assumption would be made about a relationship between the two experiments.

Paired-associates learning. Subjects learned the complex P-A list alone, in the presence of an unknown subject, or in the presence of a prior competitor. If a second subject observed the P-A learning, s/he was requested to move as close to the list learning subject as possible and to carefully observe the learning process.

A memory drum was placed in front of the subject who was to learn the list and a practice list was used to familiarize the subject with the procedure. The subject was then presented with the complex P-A list. The stimulus items of the list were exposed every 4 seconds including a two second anticipation interval, with a 4 second interval between successive presentations of the list. The list was presented in three random orders to prevent serial learning. All subjects were run to a standard verbal learning criterion of two successive perfect trials or until they had been through the list 35 times.

Results and Discussion

Three standard verbal learning dependent variables were analyzed (trials to criterion, total errors, and total number of omissions of the correct response) in separate one-way analyses of variance. Performance on this list should be impaired under drive conditions. As predicted, the results demonstrated that an individual associated with noxious competition acquires the capacity to elicit drive, and that the presence of this prior competitor exerts a general energizing effect on performance.

For all three dependent variables the results of the one-way ANOVAs revealed a significant group effect: $F(4,75)=5.09$, $p < .01$ for the trials to criterion; $F(4,75)=6.20$, $p < .01$ for total errors; and $F(4,75)=6.02$, $p < .01$ for total number of omissions of the correct response.

Planned comparisons employing the Tukey method (Kirk, 1968) revealed that it was only when a subject learned the complex P-A list in the presence of a prior competitor that performance was impaired relative to subjects learning the list alone or in the presence of an unknown subject. Consistently across all three standard dependent measures, the performance of the groups learning the P-A list alone was equal to the performance of the groups learning the list in the presence of an unknown subject. These four groups did not differ from each other in spite of the fact that two of the groups received competitive pretreatments. Thus, prior exposure to a competitive situation did not affect the subsequent learning of complex verbal material, nor did learning a complex P-A list in the presence of an unknown person affect performance.

The prior competitor condition was significantly and predictably inferior to all other groups on omission responses and total errors, with all other groups being statistically equivalent. On the trials to criterion variable the prior competitor condition was statistically inferior to the groups that learned the list alone, regardless of the presence or absence of competitive pretreatment; and statistically inferior to the group experienceing no competitive pretreatment and learning the list in the presence of an unknown subject.

General Discussion

Employing escape conditioning as a model for the effects of competitive behavior has permitted the development and testing of certain aspects of competitive behavior (Steigleder et al., Note 1). The three experiments reported in this paper clearly support an empirical correspondence between demonstrated characteristics of known drives and the characteristics of the drive aroused by competition.

The escape conditioning methodology, used as a model for predicting the effects of competition, facilitated the demonstration of known characteristics of drive in the area of competitive behavior. Thus, examining rigorous deductions from the theory answered questions about the character, or source of the drive underlying competition. A competitive analog of intermittent shock, which differentiates between the appetitive or aversive character of motives, empirically verified the aversive character of the drive underlying competition. Moreover, the results of the intermittent shock study pinpointed the locus of the aversive drive in the competition between the opponents. The results of the present paper lend additional support to studies of the motivational properties of competition (Steigleder et al., Note 1) which demonstrated such reinforcement and drive properties as acquisition, magnitude of reinforcement, delay of reinforcement, and partial reinforcement effects.

While an escape conditioning model of competitive behavior permits the testing of rigorous theoretical deductions, our knowledge of drive effects extends far beyond this single experimental paradigm. If competition is a source of aversive drive then other known characteristics of drives should be investigated. Therefore, the general energizing effect, characteristic of drive states, was investigated. Support for this energizing function (1) strengthened the empirical correspondence between characteristics of known drive and competition and (2) transformed the competitive social drive by examining it across a variety of experimental paradigms, thus, broadening the scope and implications of the theory of competitive behavior.

Reference Notes

1. Steigleder, M.K., Weiss, R.F., Cramer, R.E., & Feinberg, R.A. The motivating and reinforcing functions of competitive behavior. Manuscript submitted for publication, 1977.

2. Weiss, R.F. Escape conditioning methodology for research in human motivation. Unpublished manuscript. (Available from the University of Oklahoma, Norman, OK. 73019).

References

Allport, F.H. The influence of the group upon association and thought. Journal of Experimental Psychology, 1920, 3, 159-182.

Allport, F.H. Social psychology. New York: Houghton-Mifflin, 1924. (a).

Amsel, A. The role of frustrative nonreward in noncontinuous reward situations. Psychological Bulletin, 1958, 55, 102-119.

Anderson, D.C., Johnson, D., & Kempton, H. Second-order conditioning as revealed through augmentation of a startle response: Part-II. Psychonomic Science, 1969, 16, 7-9.

Bower, G.H. Partial and correlated reward in escape learning. Journal of Experimental Psychology, 1960, 59, 126-130.

Bower, G.H., Fowler, H., & Trapold, M.A. Escape learning as a function of amount of shock reduction. Journal of Experimental Psychology, 1959, 58, 482-484.

Brodbeck, M. Models, meaning, and theories. In L. Gross (Ed.), Symposium on sociological theory. Evanston, Illinois: Row, Peterson, 1959.

Campbell, N.R. Physics, the elements. Cambridge, England: Cambridge University Press, 1920.

Campbell, B.A., & Kraeling, D. Response strength as a function of drive level and amount of drive reduction. Journal of Experimental Psychology, 1953, 45, 97-101.

Dollard, J., & Miller, N.E. Personality and psychotherapy. New York: Mcgraw-Hill, 1950.

Franchina, J.J. Effects of shock schedules on the acquisition and extinction of escape behavior. Psychonomic Science, 1966, 4, 277-278.

Franchina, J.J. Intertrial intervals and shock schedules in escape training. Journal of Comparative and Physiological Psychology, 1969, 67, 504-509. (a).

Hull, C.L. Principles of behavior, an introduction to behavior theory. New York: Appleton-Century, 1943.

Kamil, A.C. Some parameters of the second-order conditioning of fear in rats. Journal of Comparative and Physiological Psychology, 1969, 67, 364-369.

Klinger, E. Feedback effects and social facilitation of vigilance performance: Mere coaction versus potential evaluation. Psychonomic Science, 1969, 14, 161-162.

Lachman, R. The model in theory construction. Psychological Review, 1960, 67, 113-129.

Logan, F.A. The Hull-Spence approach. In S. Koch (Ed.), Psychology: A study of a science. Vol. 2. General systematic formulations, learning, and special processes. New York: McGraw-Hill, 1959.

Martens, R., & Landers, D. Evaluation potential as a determinant of coaction effects. Journal of Experimental Social Psychology, 1972, 8, 347-369.

McAllister, D.E., & McAllister, W.R. Second-order conditioning of fear. Psychonomic Science, 1964, 1, 383-384.

Oppenheimer, R. Analogy in science. American Psychologist, 1956, 11, 127-135.

Spence, K.W. Behavior theory and conditioning. New Haven: Yale University Press, 1956.

Spence, K.W. Behavior theory and learning. Englewood Cliffs, New Jersy: Prentice-Hall, 1960.

Spence, K.W., Farber, I.D., & McFann, H.H. Relation of drive level to performance in competitional and noncompetitional paired-associates learning. Journal of Experimental Psychology, 1956, 52, 296-305

Spence, J.T., & Spence, K.W. The motivational components of anxiety: Drive and drive stimuli. In C.D. Spielberger (Ed.), Anxiety and behavior. New York: Academic Press, 1966.

Wankel, L.M. Competition in motor performance: An experimental analysis of motivational components. Journal of Experimental Social Psychology, 1972, 8, 427-437.

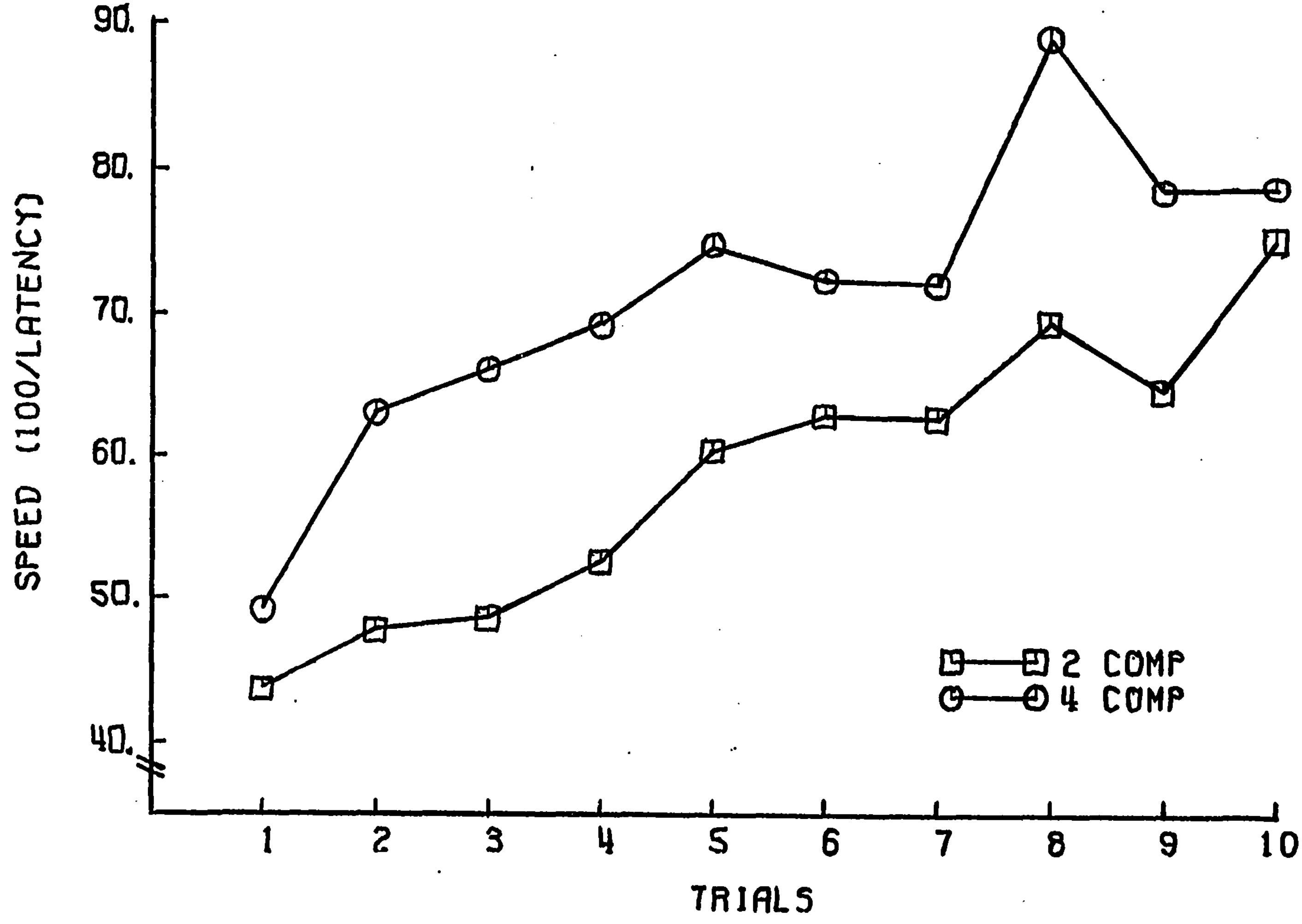
Weinstock, S. Acquisition and extinction of a partially reinforced running response at a 24-hour intertrial interval. Journal of Experimental Psychology, 1958, 56, 151-158.

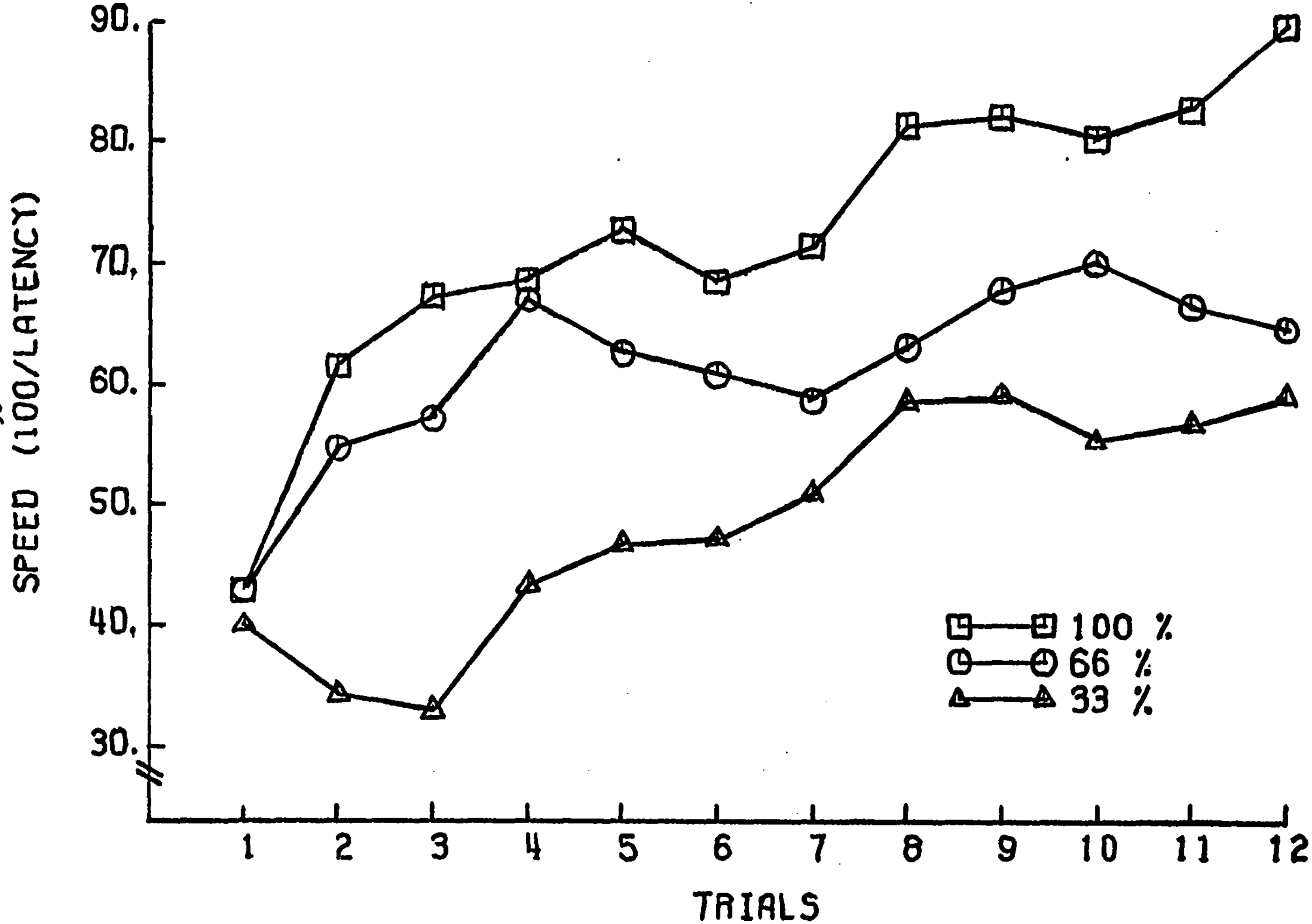
Woods, P.J., Davidson, E.H., & Peters, R.J. Instrumental escape conditioning in a water tank: Effects of variations in drive stimulus intensity and reinforcement magnitude. Journal of Comparative and Physiological Psychology, 1964, 57, 466-470.

Figure Captions

Figure 1. Magnitude of reinforcement analog: Acquisition curves of response speed as a function of the number of competitors.

Figure 2. Intermittent shock analog: Acquisition curves of response speed as a function of three levels of intermittent competition.


SPEED (100/LATENCY)
90.
80.
70.
60.
50.
40.
1
2
3
4
5
6
7
8
9
10
TRIALS
2 COMP
4 COMP



90.
80.
70.
60.
50.
40.
30.
SPEED (100/LATENCY)
1
2
3
4
5
6
7
8
9
10
11
12
TRIALS
100 %
66 %
33 %

APPENDIX A

TOWARD A COMPETITIVE THEORY OF COACTION

Toward a Competitive Theory of Coaction

The effects of the presence of others upon the behavior of individual is generally recognized as one of the most fundamental problems in social psychology. A theoretical account which can predict and explain the phenomena in this area may succeed in isolating one of the many psychological processes which determine individual behavior in social situations (Cottrell, 1972).

The study of the effects of the presence of others on behavior has come to be called social facilitation, despite the fact that the presence of others sometimes facilitates and sometimes impairs performance. Social facilitation research falls into two experimental paradigms: audience and coaction. The audience paradigm manipulates the presence of spectators (audience) while the coaction paradigm manipulates the presence of co-workers who work simultaneously and independently on the same task. Inconsistent results and unsatisfactory explanations employing either of these paradigms, led to a virtual abandonment of the research in this area (Weiss & Miller, 1971). However, a reconciling of the apparent contradictions by Zajonc (1965) once again permitted social facilitation research to flourish. Zajonc placed the variable of the presence of others, either spectators or coactors, in the context of Hull-Spence Theory (e.g., Spence, 1956). The presence of others was assumed to arouse drive (D) which in turn increases the tendency to emit dominant responses. This proposal provided an explanation for the contradictory social facilitation literature which indicated that the presence of others could facilitate or impair performance. The dominant response in any given situation may be correct or incorrect depending upon the requirements of the task. If the dominant responses are correct the presence of others enhances the emission of the dominant correct responses, and, thus, facilitates performance. However, if the dominant responses are incorrect the presence of others enhances the dominant but incorrect responses and performance is impaired.

Cotrell (1968, 1972) modified Zajonc's drive account of social facilitation, imposing a boundary condition on the theory, by proposing that the presence of others is not a primary source of drive, rather the presence of others is a learned source of drive. According to Cottrell, the presence of others will have a nondirect energizing effect on individual behavior only if the presence of others creates anticipations of positive or negative outcomes; it is these anticipations created by other people, not their mere presence, that increases an individual's drive level. Classical conditioning is assumed to establish the positive or negative anticipations with their strength being an increasing function of the number of times the social condition has been followed by positive or negative outcomes. Once established these anticipations could produce a nondirective energizing effect on task performance in the following ways (1) if a noxious or frustrating outcome is anticipated, then conditioned fear or anticipatory frustration could nonselectively energize response tendencies elicited by task stimuli; (2) if positive outcomes are anticipated then an incentive-aroused increment in drive level could energize task response tendencies.

To date, many investigators have assumed that the process that explains or underlies the audience social facilitation is identical or at least similar to that underlying coaction effects. Although Cottrell also makes this parsimonious assumption, considerable detail and exposition is devoted to coaction situations. Cottrell maintained that coaction situations which do not engender feelings of rivalry do not produce coaction effects. It was the competition which was assumed to produce the positive or negative outcomes in coacting groups. Thus, at least for the coaction paradigm, competition is seen as a necessary condition for coaction effects.

The fundamental process of competition has a strong tradition in the social facilitation area. In fact, interest in competition was the initial concern when discussing the effects of the presence of others in coacting groups. Rivalry was seen as naturally occurring, to some degree, in all coacting situations (Allport, 1920); and competition and rivalrous comparison, as distinct from mere coaction, were thought to be determinants of coaction effects (Dashiell, 1930). Studies in the animal literature also point to the competitive factor in coaction. Thus, for example Harlow (1932) concluded that the essential condition for the occurrence of social facilitated eating behavior in rats was the presence of other rats competing with each other for food.

In spite of Cottrell's considered attention to and the specific requirement of competition in coacting groups, emphasis has turned away from the competitive aspects of coaction and focused on evaluation apprehension. It is the potential threat of evaluation present in coaction situations which is commonly assumed to be drive arousing. There have been, however, an increasing number of studies (e.g., Innes, 1972; Martens & Landers, 1972; Seta, Paulus, & Risner, 1977; Thayer & Moore, 1972) which have manipulated evaluation apprehension and have obtained no coaction effects. The failure to support predictions from Cottrell's learned drive theory may in part be a function of the large variety of ways in which evaluation has been defined and operationalized. The operationalization has ranged from manipulations which vary the coactors' ability to see each other, to witness each others' scores, and to witness each others' peformance progress (e.g., Klinger, 1969; Martens & Landers, 1972; Sasfy & Okun, 1974) to those which might more accurately be labelled manipulations of test anxiety (e.g., Herold, 1974; Innes, 1972; Henchy & Glass, 1968; Seta, Paulus, & Risner, 1977). Alternatively, recent suggestions (e.g., Klinger, 1969; Thayer & Moore, 1972) that the operative underlying element in coaction remains unspecified and that the evidence for social facilitation effects in coaction is not very strong, might suggest we focus our attention away from evaluation as the learned source of drive and return the emphasis to competition. Researchers are already beginning to look to other operative variables in coaction (e.g., Seta, Paulus, & Risner, 1977) and are providing evidence which indicates that some other factor beyond simple evaluation apprehension is necessary to explain the complexities of coaction (e.g., Herold, 1974; Van Tuinen & McNeel, 1975).

Definitive evidence for the absence of coaction effects in the presence of only evaluation manipulations would clarify the speculation that competition is the basis for coaction effects. The picture is not that clear and coaction effects sometimes emerge with evaluation manipulations (e.g., Carment, 1972; Klinger, 1969) and sometimes do not (e.g., Innes, 1972; Martens & Landers, 1972; Seta, Paulus, & Risner, 1977; Thayer & Moore, 1972). The complexities of the problem crystallize when consideration is given to the notion that competition is present to some degree whenever two or more individuals simultaneously and independently work on the same experimental task (e.g., Allport, 1920; Innes, 1972; Seta, Paulus, & Risner, 1977). Thus, explicit evaluation may implicitly engender feelings of rivalry whether or not competition is specifically employed as an experimental manipulation; and if rivalry is present coaction effects should emerge. A relatively small number of studies which explicitly deal with the effect of competition have reported typical coaction effects (Dashiell, 1930; Rudow & Hautaluoma, 1975; Wankel, 1972). Moreover, the results of a systematic investigation of the motivating and reinforcing properties of competition (Steigleder, Weiss, Cramer, & Feinberg, Note 1) clearly ascribes drive characteristics to competition. These results of motivational studies of competition and a preliminary study of competition-coaction (Steigleder, Note 2) suggest it may be competition, not evaluation apprehension, that is the learned source of drive and competition is the mechanism or underlying element in coaction effects.

This paper will review evidence which (1) established competition as a learned social drive; (2) indicated that the drive account of competition can predict and explain particular coaction effects without invoking the anticipation of positive or negative outcomes as a source of drive arousal; and (3) presents preliminary evidence which demonstrates coaction effects only under competitive conditions.

Motivational properties have frequently been attributed to competition, however, the nature of the motivation which underlies competition has never been systematically investigated. Thus, while such motivational indices as heightened states of arousal (e.g., Scott & Cherrington, 1974; Shaw, 1958); increased measures of self-reported alertness (e.g., Church, 1962); increased heart rate and decreased accuracy during mirrow drawing tasks (e.g., Ogawa, Osato, Misumi, & Nakano, 1973) have been reported in competitive environments the significant question regarding the nature of the motivation has remained unanswered.

Many motivational concepts in the social psychological literature have been conceived of in terms of drive or drive-like concepts (e.g., Byrne & Clore, 1967; Cottrell, 1968; Festinger, 1957; Dollard & Miller, 1950; Spence & Spence, 1966; Zajonc, 1965). Since most of the drives of interest to social psychologists are acquired drives based on primary noxious drives and therefore are aversive in nature, escape conditioning methodology serves to increase the research implications of the motivational concept, and provides an empirically based clarification of the underlying nature of the motive (Weiss, Note 3). Moreover, the escape conditioning methodology permits the researcher to ascertain whether the hypothesized drive or reinforcer does, in fact, exhibit the known characteristics of drive and reinforcers and can, thus be shown to be functionally analogous to known drive and reinforcers.

Employing escape conditioning as a model for the effects of competition revealed a striking point-for-point correspondence between the effects of a reinforcer in escape conditioning and the effects of competition termination in competitive behavior. Moreover, the manipulation of key escape conditioning variable analogs (partial reinforcement, intermittent shock) provided diffinitive evidence that competition does, indeed, function as an arouser of noxious drive and is a source of motivation which is clearly aversively based.

Establishing the drive properties of competition at least raises a question about the source of arousal in coacting groups. One might ask if Cottrell had known about the properties of competition would anticipations of positive and negative outcomes have been invoked as the explanatory mechanism for coaction effects. Clearly, an element of the anticipation of outcomes (evaluation) is involved in competing groups, but, as we have already seen, the evidence for simple evaluation mediating coaction is diminishing.

Investigations of coaction have lead to the uncovering of certain variables which yield differential effects in coaction. If a competitive analysis of coaction also predicts these results it does not quarantee nor does it provide conclusive evidence that the underlying source of motivation in coacting groups is competition. However, if competition is the underlying motivator, it _is_ required that the competition analysis be able to obtain results conceptually similar to those of demonstrated coaction manipulations. Furthermore, insofar as we are willing to postulate that explicit evaluation implicitly engenders feelings of rivalry similar results must be obtained in competing situations.

The facilitation or impairment of individual performance in coacting groups is in part a function of the level of task proficiency of the coactors. Proficient subjects appear to be less susceptible to the effects of the presence of others than nonproficient subjects (e.g., Allport, 1924a; Cottrell, Rittle, & Wack, 1967). Similarly, facilitation or impairment of individual performance is a function of the number of coactors present; evaluation apprehension increases with increasing numbers of coactors (e.g., Martens & Landers, 1972).

In our studies of competition which manipulated these coaction variables we obtained results consistent with an evaluation apprehension interpretation of coaction effects. In the first experiment (see Experiment 1, Generals) subjects were made to believe they were proficient or nonproficient on the experimental task on which they would be competing. Both proficient and nonproficient subjects acquired an instrumental response the reinforcement for which was the termination of competition. However, the nonproficient subjects found the escape from competition more reinforcing than proficient subjects. These results could not have been a function of differential task difficulty since post-hoc questionnaires revealed both proficient and nonproficient subjects found the task equally difficult.

In a second experiment (see Experiment 1 in Dissertation) subjects competed against either one opponent or three opponents. Consistent with an evaluation interpretation of coaction, subjects competing against three opponents found competition more aversive than those competing against only one opponent.

It is important to note that the results of both competition studies are obtained under conditions in which the evaluation account of coaction might not predict such results. Martens & Landers (1972) concluded that coaction effects emerge if the following three conditions are met (1) coactors must be able to see each other; (2) coactors must have access to each others' scores; and (3) coactors must be able to witness each others' performance progress. These conditions were <u>not</u> met in either of the studies detailed above; our subjects were always physically separated, had no access to scores, and could not see each others' performance. Our experimental situations qualify as no evaluation conditions. Yet, we obtained results predicted by an evaluation apprehension analysis of coaction.

A final experiment demonstrated that when an individual has previously been associated with competition the presence of this competitive coactor impairs the performance of an individual learning a difficult paired-associates list (typical coaction effect). However, list learning performance in the presence of an evaluation coactor did not impair performance.

During the first phase of this experiment two subjects competed on an experimental task. In that competition has clearly been shown to be an arouser of noxious drive an individual who has been associated with competition should acquire some of the noxious properties of competition. Following this competitive phase, subjects were assigned to one of three experimental groups. A subject who had just finished competing learned a difficult paired-associates list alone, in the presence of a neutral evaluator (neutral in that s/he was not a previous competitor), or in the presence of a prior competitor. In the neutral evaluator and prior competitor conditions the observers attempted to silently learn the list along with the list-learning subject. These "coacting observers" met all the necessary conditions (Martens & Landers, 1972) for evaluation:

the subjects were able to see each other, because a paired-associates task provides immediate feedback the list learner's score was available, and the performance progress of the list learner was blantantly obvious--the verbal task continued until the subject either mastered the 12 pair list or had been through the list 35 times ! In meeting these evaluation criteria we never mentioned "evaluation" to our subjects. According to the learned drive theory of Cottrell this is not a necessary condition. What is required is to set the stage, so to speak, so that an observer can signal negative or positive outcomes. In meeting Martens and Landers' guidelines we did, indeed, define signals for negative outcomes (e.g., embarrassment, lost of self-esteem).

Two control groups were also included. Control subjects either learned the list alone or in the presence of a neutral evaluator, but they received no competition premanipulation. These control subjects were included to insure that any effect in the experimental groups was not merely the result of drive being carried over from the competitive to the verbal learning phase of the experiment.

The results of the experiment, in terms of three major dependent variables (trials to criterion, errors, and omissions of the correct response) indicated (1) control groups were identical to those experimental groups learning the list alone or in the presence of a neutral evaluator. Thus, in the experimental groups, drive did not carry over from one phase of the experiment to the other. (2) The performance of the subject learning the list alone was identical to the performance of the subject learning the list in the presence of a neutral evaluator. (3) It was only when a subject learned this difficult paired-associates list in the presence of an evaluator who was a prior competitor that coaction effects emerged. The neutral evaluator and the prior competitor both maintained "postures of evaluation" and therefore should be cues for positive or negative outcomes. It was however, only the prior competitor condition which affect performance; the effect of a neutral evaluator on performance was the same as the effect of the absence of an evaluator!

Summary and Conclusions

Recent evidence for the drive properties of competition, old evidence equating rivalry and coaction effects, and original theoretical speculation about the requirement of competition for coaction effects all point to considering competition as the source of motivation underlying coaction effects. Although Cottrell maintained that it was the anticipation of positive or negative outcomes created by competition that mediated coaction, when competition is removed from evaluative situation coaction effects frequently do not emerge. If coaction effects are the result of the anticipation of positive or negative outcomes this evaluation is intimately tied to, or many entirely depend upon, competition.

Considering competition as the basis for arousal in coacting groups clarifies portions of Cottrell's learned drive theory and brings it more in line with known conditioning principles. Cottrell maintains that the anticipation of positive outcomes results in an incentive-aroused increment in drive level. As point out by Weiss and Miller (1971) the evidence for incentive-aroused drive is not well supported (see, Stein, 1957; Trapold, 1962). If competition is the source of motivation in coacting groups, even in the advent of the anticipation of positive outcomes, competing coactors should continue to arouse drive. The aversive motivational properties of competition predict drive arousal without appealing to the energizing property of conditioned incentive.

There is some indirect evidence from our lab supporting the drive characteristics of competition in the presence of positive outcomes. In the proficient/nonproficient competition study presented in this paper task proficient subjects found competition aversive even though they should have anticipated a positive outcome (winning). Zajonc and Nieuenhuyse (1964) provide evidence which more directly supports our analysis. Subjects competed for a monetary prize for best performance on a pseudorecognition task. Prior to testing word habits of differing strength were experimentally established. The competition was assumed to have arousal properties and the words with the greatest habit strength should be energized under competing instructions. The performance of subjects competing in the anticipation of a positive outcome (money) showed energization and emission of the word responses with the greatest habit strength. Thus, both of these studies employing competitive manipulations reported drive effects in the presence of positive outcome anticipations. These results can be predicted from a competitive theory of coaction without requiring the additional assumption of arousal properties of conditioned incentive.

A competition theory of coaction need not be regarded as a complete discontinuity in theoretical thinking. This modification of Cottrell's proposal is by no means a fundamental one. The predictive elegance of learned drive theory is retained; the change emerges not in the nature of the theorizing but in aspects of the process which underlies the theory.

Reference Notes

1. Steigleder, M.K., Weiss, R.F., Cramer, R.E., & Feinberg, R.A. The motivating and reinforcing functions of competitive behavior. Unpublished manuscript. (Available from the University of Oklahoma, Norman, OK 73019).
2. Steigleder, M.K. The drive properties of competitive behavior. Unpublished manuscript. (Available from the University of Oklahoma, Norman, OK 73019).
3. Weiss, R.F. Escape conditioning methodology for research in human motivation. Unpublished manuscript. (Available from the University of Oklahoma, Norman, OK 73019).

References

Allport, F.H. The influence of the group upon association and though. Journal of Experimenal Psychology, 1920, 3, 159-182.

Allport, F.H. Social psychology, New York: Houghton-Mifflin, 1924. (a).

Byrne, D., & Clore, G.L. Effectance arousal and attraction. Journal of Personality and Social Psychology Monographs, 1967, 6, (whole No. 638).

Carment, D.W. Rate of simple motor responding as a function of coaction, competition, and sex of the participants. Psychonomic Science, 1970, 19, 342-343.

Church, R.M. The effects of competition on reaction time and palmar skin conductance. Journal of Abnormal and Social Psychology, 1962, 65, 32-40.

Cottrell, N.B. Performance in the presence of other human beings: Mere presence, audience, and affiliation effects. In E.C. Simmel, E.A. Hoppe, & G.A. Milton (Eds.), Social facilitation and imitative behavior. Boston: Allyn & Bacon, 1968.

Cottrell, N.B. Social facilitation. In C.G. McClintock (Ed.), Experimental social psychology. New York: Holt, Rinehart, & Winston, 1972.

Cottrell, N.B., Rittle, R.H., & Wack, D.L. The presence of an audience and list type (competitional or noncompetitional) as joint determinants of performance in paired-associates learning. Journal of Personality, 1967, 35, 425-434.

Dashiell, J.F. An experimental analysis of some group effects. Journal of Abnormal and Social Psychology, 1930, 25, 190-199.

Dollard, J., & Miller, N.E. Personality and psychotherapy. New York: McGraw-Hill, 1950.

Festinger, L. A theory of cognitive dissonance. Evanston, Illinois: Row, Peterson, & Co., 1957.

Harlow, H.F. Social facilitation of feeding in the albino rat. Journal of Genetic Psychology, 1932, 41, 211-221.

Hency, T., & Glass, D.C. Evaluation apprehension and the social facilitation of dominant and subordinate responses. Journal of Personality and Social Psychology, 1968, 10, 446-454.

Herold, P.L. Evaluation apprehension and implied evaluation as co-determinants of social facilitation. Disseration Abstracts International, 1974, 35(1-B), 534.

Innes, J.M. The effect of co-workers and evaluative feedback on performance of a simple reaction time task. European Journal of Social Psychology, 1972, 2, 466-470.

Klinger, E. Feedback effects and social facilitation of vigilance performance: Mere coaction versus potential evaluation. Psychonomic Science, 1969, 14, 161-162.

Martens, R., & Landers, D.M. Evaluation potential as a determinant of coaction effects. Journal of Experimental Social Psychology, 1972, 8, 347-359.

Ogawa, N., Osato, E., Misumi, J., & Nakano, S. The effects of competition on heart rate and task performance on the Mirror Drawing test. Japanese Journal of Experimental Social Psychology, 1973, 13, 166-122.

Rudow, E., & Hautaluoma, J. Competition with oneself versus others as a facilitator in the classroom. The Journal of Social Psychology, 1975, 95, 281-282.

Sasfy, J., & Okun, M. Form of evaluation and audience expertness as joint determinants of audience effects. Journal of Experimental Social Psychology, 1974, 20, 461-467.

Scott, W.E., & Cherrington, D.J. Effects of competition, cooperative and individualistic reinforcement contingencies. Journal of Personality and Social Psychology, 1974, 30, 748-758.

Seta, J.J., Paulus, P.B., & Risner, H.T. The effects of group composition and evaluation on task performance. Bulletin of the Psychonomic Society, 1977, 9, 115-117.

Shaw, M.E. Some motivational factors in cooperation and competition. Journal of Personality, 1958, 26, 155-169.

Spence, K.W. Behavior theory and conditioning. New Haven: Yale University Press, 1956.

Spence, J.T., & Spence, K.W. The motivational components of anxiety: Drive and drive stimuli. In C.D. Spielberger (Ed.), Anxiety and behavior. New York: Academic Press, 1966.

Stein, L. The classical conditioning of the consummatory response as a determinant of instrumental performance. Journal of Comparative and Physiological Psychology, 1957, 50, 269-278.

Thayer, R.E., & Moore, L.E. Reported activation and verbal learning as a function of group size (social facilitation) and anxiety-inducing instructions. The Journal of Social Psychology, 1972, 88, 277-287.

Trapold, M.A. The effect of incentive motivation on an unrelated reflex response. Journal of Comparative and Physiological Psychology, 1962, 55, 1034-1039.

Van Tuinen, M., & McNeel, S.P. A test of the social facilitation theories of Cottrell and Zajonc in a coaction situation. Personality and Social Psychology Bulletin, 1975, 1, 604-607.

Wankel, L.M. Competition in motor performance: An experimental analysis of motivational components. Journal of Experimental Social Psychology, 1972, 8, 427-437.

Weiss, R.F., & Miller, F.G. The drive theory of social facilitation. Psychological Review, 1971, 28, 44-57.

Zajonc, R.B. Social facilitation. Science, 1965, 149, 269-274.

Zajonc, R.B., & Nieuenhuyse, B. Relationship between word frequency and recognition: Perceptual processes or response bias? Journal of Experimental Psychology, 1964, 67, 276-285.