

## INFORMATION TO USERS

This reproduction was made from a copy of a document sent to us for microfilming. While the most advanced technology has been used to photograph and reproduce this document, the quality of the reproduction is heavily dependent upon the quality of the material submitted.

The following explanation of techniques is provided to help clarify markings or notations which may appear on this reproduction.

1. The sign or "target" for pages apparently lacking from the document photographed is "Missing Page(s)". If it was possible to obtain the missing page(s) or section, they are spliced into the film along with adjacent pages. This may have necessitated cutting through an image and duplicating adjacent pages to assure complete continuity.
2. When an image on the film is obliterated with a round black mark, it is an indication of either blurred copy because of movement during exposure, duplicate copy, or copyrighted materials that should not have been filmed. For blurred pages, a good image of the page can be found in the adjacent frame. If copyrighted materials were deleted, a target note will appear listing the pages in the adjacent frame.
3. When a map, drawing or chart, etc., is part of the material being photographed, a definite method of "sectioning" the material has been followed. It is customary to begin filming at the upper left hand corner of a large sheet and to continue from left to right in equal sections with small overlaps. If necessary, sectioning is continued again—beginning below the first row and continuing on until complete.
4. For illustrations that cannot be satisfactorily reproduced by xerographic means, photographic prints can be purchased at additional cost and inserted into your xerographic copy. These prints are available upon request from the Dissertations Customer Services Department.
5. Some pages in any document may have indistinct print. In all cases the best available copy has been filmed.

**University  
Microfilms  
International**

300 N. Zeeb Road  
Ann Arbor, MI 48106



8408989

**Beck, Hall Pugh**

**A COMPARISON OF DRIVE, COGNITIVE-ATTENTIONAL, AND CYBERNETIC  
MODELS OF TEST ANXIETY AND SOCIAL FACILITATION**

*The University of North Carolina at Greensboro*

PH.D. 1983

**University  
Microfilms  
International** 300 N. Zeeb Road, Ann Arbor, MI 48106

**Copyright 1984**

**by**

**Beck, Hall Pugh**

**All Rights Reserved**



A COMPARISON OF DRIVE, COGNITIVE-ATTENTIONAL,  
AND CYBERNETIC MODELS OF TEST ANXIETY  
AND SOCIAL FACILITATION

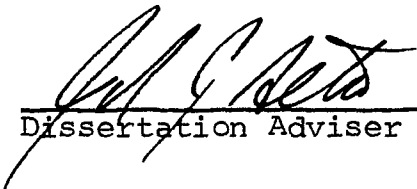
by

Hall P. Beck

A Dissertation submitted to  
the Faculty of the Graduate School at  
The University of North Carolina at Greensboro  
in Partial Fulfillment  
of the Requirements for the Degree  
Doctor of Philosophy

Greensboro  
1983

Approved by

  
\_\_\_\_\_  
Dissertation Adviser

APPROVAL PAGE

This dissertation has been approved by the following committee of the Faculty of the Graduate School at the University of North Carolina at Greensboro.

Dissertation  
Adviser

J. J. White

Committee Members

Jacques W. White  
J. R. Soderquist  
Harvey J. Bourbonnais  
Marion Franklin

Sept 23, 1983  
Date of Acceptance by Committee

Sept 23, 1983  
Date of Final Oral Examination

© 1984

HALL PUGH BECK

All Rights Reserved

BECK, HALL P. A Comparison of Drive, Cognitive-Attentional, and Cybernetic Models of Test Anxiety and Social Facilitation. (1983) Directed by Dr. John Seta. Pp. 136.

Twenty high- and twenty low-test-anxious females performed a paired-associates task either alone or in the presence of an evaluative audience. One purpose of the study was to compare predictions generated from Zajonc's drive theory, Wine's cognitive-attentional model, and Carver and Scheier's cybernetic approach. Since the task was primarily composed of items in which the dominant response was initially incorrect, Zajonc's theory hypothesized that the audience would have a negative impact on the performance of both high- and low-test-anxious persons. Wine's analysis indicates that the spectator should have a more beneficial or less detrimental effect on the performance of low- than high-test-anxious individuals. Carver and Scheier's theory contends that the directional effects of an audience depend on expectation level. Since all subjects were led to anticipate success, their cybernetic interpretation predicts that the audience will facilitate the performance of high- as well as low-test-anxious persons.

The audience improved the performance of high- and impaired the performance of low-test-anxious subjects. Since neither Zajonc, Wine, nor Carver and Scheier predicted the results, two post hoc interpretations were suggested. The first was a modification of Carver and Scheier's theory.



It hypothesized that (1) there is an inverted U relationship between expectations and attempted discrepancy reduction and (2) the audience increases self-focus. The second analysis contended that (1) a curvilinear function describes the relationship between anxiety and performance, and (2) the audience attenuates anxiety by providing social support. An examination was made of these two interpretations, and their implications for basic and applied research were discussed.

## ACKNOWLEDGMENTS

I would like to thank Drs. John Seta, Aaron Brownstein, David Soderquist, Jacqueline White, and Marian Franklin for their evaluations and criticisms of this dissertation. My friend, Chris Carstens, made many insightful comments and aided in the development of this paper. Also, Mrs. Elizabeth Hunt's professionalism and faith were greatly appreciated. This manuscript is dedicated to Janet and my parents. Without them to share the drama, there would be no reason for the play.

## TABLE OF CONTENTS

	Page
APPROVAL PAGE . . . . .	ii
ACKNOWLEDGMENTS . . . . .	iii
LIST OF TABLES . . . . .	v
LIST OF FIGURES . . . . .	vi
CHAPTER	
I. INTRODUCTION . . . . .	1
The Pioneers . . . . .	2
Zajonc's Drive Theory . . . . .	20
Cottrell's Learned Drive Theory . . . . .	30
An Evaluation of Learned Drive Theory . . . . .	41
Nature of Drive . . . . .	43
Distraction/Conflict Hypothesis . . . . .	49
Effects of the Length of Recall Interval . . . . .	56
Effects of Feedback on Coaction . . . . .	58
Range of Cue Utilization . . . . .	64
Impression-Management . . . . .	66
Objective Self-Awareness . . . . .	68
Control Theory . . . . .	73
Proposal . . . . .	80
Comparisons of Drive, Cognitive-Attentional, and Control Theories . . . . .	85
Hypotheses . . . . .	92
II. METHOD . . . . .	95
Subjects . . . . .	95
Apparatus and Tasks . . . . .	95
Procedure . . . . .	97
III. RESULTS . . . . .	101
IV. DISCUSSION . . . . .	110
FOOTNOTES . . . . .	121
REFERENCE NOTES . . . . .	123
BIBLIOGRAPHY . . . . .	124

LIST OF TABLES

	Page
Table	
1 Free Recall List . . . . .	96
2 Competitive Paired-Associate List. . . . .	98
3 Mean Trials to Criterion on the Paired-Associates Task . . . . .	102
4 Analysis of Variance Applied to Trials to Cri- terion Data. . . . .	102
5 Mean Percentage of Correct Anticipations of Nonassociated Pairs. . . . .	103
6 Analysis of Variance Applied to Nonassociated Pairs Data . . . . .	104
7 Mean Percentage of Correct Anticipations of Associated Pairs . . . . .	10
8 Analysis of Variance Applied to Associated Pairs Data . . . . .	10

LIST OF FIGURES

	Page
Figure	
1 Learning curves for high-test-anxious subjects under alone conditions on nonassociated pairs . .	105
2 Learning curves for low-test-anxious subjects under audience and alone conditions on nonassociated pairs . . . . .	106

CHAPTER I  
INTRODUCTION

The study of human social facilitation deals with how the mere presence of one person affects the performance of another. Research on the effects of mere presence has typically used the audience and coaction paradigms. In audience investigations, subjects perform in the presence of passive spectators, while coaction studies involve people working concurrently and independently on the same task. For both paradigms, the effects of social facilitation are determined by a comparison to the performance of a subject working alone.

Not all situations in which two or more people are present are appropriate for assessing the influence of mere presence. The term mere presence refers to social arrangements in which other individuals provide neither cues nor selectively reinforce particular behaviors (Cottrell, 1972; Zajonc, 1965). While investigations of human social facilitation have been restricted to the audience and coaction paradigms, mere presence is an aspect of almost all interpersonal interactions (Zajonc, 1965). Most complex social phenomena can be viewed as the result of mere presence and additional factors.

## The Pioneers

The empirical investigation of social facilitation began at least as early as 1887. In that year, Féré used a procedure that is very similar to the modern coaction paradigm. Before introducing the social stimulus, Féré measured a single subject's strength of grip on a dynamometer. The force exerted was 23kg on the right hand, and 15 kg with the left. Féré then made 20 flexions with his own hand in front of the subject. The purpose of this action was to increase the "idea of that movement." When retested, the subject's right hand grip increased to 46 kg while a slight decrease in pressure was recorded for the left hand. This demonstration was given as evidence that the energy expended in movement is proportional to the idea of a particular movement.

Eleven years after Féré's work, Norman Triplett (1898) conducted a frequently cited coaction experiment. Triplett's interest in coaction was prompted by a pattern found in the records of paced and unpaced bicycle races. It was widely known among cycling enthusiasts that the slowest times were recorded when a single unpaced rider ran against the clock. Times could be improved if a swift tandem was used to set the pace for the contestant. Speeds were even faster when two or more riders ran simultaneously behind the pacemaker.

Triplett proposed that the presence of a coworker provided competition and thereby facilitated performance. To test

this hypothesis, a laboratory experiment was designed. His subjects were 40 children, and their task was to turn a fishing reel as rapidly as possible. On some trials, the children worked with a coactor, while on others only the experimenter observed the subject perform. As was predicted, most children turned the reel faster when a coactor was present. With some subjects, coaction had the opposite effect, resulting in hasty uncoordinated movements that reduced reel turning.

Tripletts suggested that competition was responsible for both performance increments and decrements. The presence of a coactor was said to produce increases in stimulation. If this increase was moderate, a facilitation of performance was thought to occur. The negative effects of coaction were attributed to overstimulation, caused by an intense desire to win. Although he did not use mathematical terms, Tripletts explained the relationship between stimulation and performance as an inverted U function. His analysis is of historical interest in that it predates the Yerkes-Dodson law (Yerkes & Dodson, 1908) by ten years.

Tripletts (1898) also performed an experiment to verify Fére's findings. Instead of using a dynamometer, muscular exertion was measured with a finger ergograph. When using an ergograph, a subject's own arm is first strapped to a table and a weight suspended from his finger. Upon a signal, the person is required to lift the weight to the maximum



height possible. In Triplett's arrangement, signals were first provided by the beat of a metronome, and later by the raising of the experimenter's finger. Triplett's results paralleled those of Féré. Eight of twelve subjects raised the weight to a greater height when the signal to lift was a finger movement.<sup>1</sup>

The idea for one of the first audience studies was suggested by a fortuitous event. Meumann (1904) reported that one evening he chanced to enter the laboratory while a subject was working with a finger ergograph. Although the person's performance had stabilized, muscular effort showed a definite increase upon Meumann's entry. This finding was later corroborated in an experiment with seven adolescents. All subjects did more ergographic work in front of a group of ten spectators than alone.

The early research was not confined to the investigation of motor skills. Meumann (1904) also tested the effects of coaction on rote memory. Children were read lists of disyllabic words, either alone or with a group. Immediately after completion of the reading, the subjects wrote down all the words they could remember. The group facilitated the memory of 8 and 9 year olds, but had little effect if the subject was 13 or 14.

Investigations of social facilitation were also performed by educators interested in comparing the efficiency of work done in class to homework. For example, Schmidt (1904)

found that children in class made fewer errors on copying, multiplication, and division assignments. Homework was superior only on an essay writing task. An interesting observation concerned the nature of errors. Superfluous letters and words were characteristic of classwork, while omitted letters and words were more common in homework.

Another pioneering study was carried out by Mayer (1903) in Würzburg, Germany. Students were instructed to take dictation, perform mental and written arithmetic, learn nonsense syllables, and complete written phrases. For all tasks, subjects were instructed to go quickly and to do their work well. The assignments were done in groups of 14 or only in the presence of the experimenter. The group had a beneficial influence on all tasks except the one requiring students to complete written phrases. Mayer concluded that written phrases were the exception, because solitude favored imaginative thought.

In 1910, Burnham provided the first comprehensive review of the social facilitation literature. He defined the problem as being concerned with effects produced by "the mere presence or absence of other individuals" (p. 766) on performance. In doing so, Burnham differentiated the effects of mere presence from those produced by more complex social relations. The available data base was not extensive, and by today's standards some of his conclusions were not adequately substantiated. Despite this, his analysis is important

in that he discussed a number of issues that will reoccur throughout the history of the literature.

First of all, Burnham recognized that the presence of other individuals was not only a stimulus for increased exertion, but also had affective components. His position on the nature-nurture question was that these emotions were the product of "social impulses inherited from the past" (p. 764). The directional effects of group initiated emotionality were said to be dependent on intensity. While in many instances affective stimulation increased the ability to do work, too much stimulation could impair performance.

The effect of the presence of others on attention was also considered. This discussion was based on Meumann's (1904) finding that children could recall more disconnected words when working together than when tested alone. Burnham (1910) accepted Meumann's interpretation that the presence of others is a distractive stimulus the subject resists by focusing on the task. Attention supposedly improves in group situations, because the person over-compensates for the distractions.

Perhaps, Burnham's most important assessment concerned the relationship between the type of task and performance. He concluded that the effects of social facilitation were

of course, relative to the kind of work . . . for some kinds of work the stimulus of the social group is needed. For some kinds of work, especially where original thinking is demanded, the environment of solitude is better. (p. 765)

However, the issue was not as near to a resolution as this quotation suggests. Indeed, an understanding of the effects of the task variable would become one of the central questions of social facilitation.

The research done before 1910 not only produced the coaction and audience paradigms but also brought forth many important factors influencing behavior. Interest had been shown in the emotional effects of coaction, and how different levels of stimulation affected performance. Idea of movement, distraction, and attention had already been proposed as cognitive explanations of social facilitation. Also, it was recognized that tasks requiring a great deal of thought were affected differently by group presence than more mechanical motor tasks were.

Four years after Burnham's review, Moede (194) provided evidence of the reciprocal nature of coaction. The tapping speeds of 17 boys were measured, both alone and in groups. While the group had the overall effect of raising tapping speed, the most interesting finding came from a more molecular analysis of the data. The most rapid tappers in the alone condition experienced a slight decrement when placed with the group, and the slower boys showed pronounced increments. By reducing the scores of the more rapid workers, and increasing those of the slower tappers, the presence of the group lessened individual differences in performance.

Moede (1914) extended these findings by having the boys who tapped at a fast pace work together. He now found a social increment instead of the decrease he previously obtained. Taken together, these two experiments indicate that the effect of coaction is not simply to increase or decrease performance. To predict the behavior of a given individual, one must know the ability levels of the subject and his coworkers.

One of the most significant contributions to the early coaction literature was a series of investigations Allport (1920, 1924) conducted with college students. His procedure for each investigation was basically the same. In his together (T) condition, groups of four or five students performed a task while seated around a table. The same subjects also worked alone (A). When tested in the A condition, students performed concurrently, but in separate rooms. Each test required a constant amount of time, so no student could finish before the others. All experiments used instructions that were designed to minimize competition between coworkers.

In one study, students were given columns of newspaper material, and asked to cross out all vowels as rapidly as possible. Five of seven students marked more vowels in the T than in the A situation. No attempt was made to count the number of vowels the subjects overlooked.

A different group of students were asked to free-associate. The test sheet consisted of a single stimulus word, and space

for writing up to 100 associations. After each minute had passed, subjects were signalled to draw a line under the last word they had written. In this manner, the effects of time were measured. Signals were given by the experimenter in the T situation, and by a buzzer in the A condition. Each test lasted only three minutes.

Fourteen of 15 students made more associations in the group than when alone. This increment was not equally distributed over the test session. The average gain of T over the A condition was 1.4 words during the first minute, 1.3 for the second, and .7 words for the final minute. Allport suggested that during the initial minute, associations came with great facility, but that during the latter part of the test, fatigue and exhaustion of vocabulary made the production of associations more difficult. A greater degree of concentration was therefore required during the last minute. Being alone was said to favor concentration, minimizing the advantage of the group condition. A second explanation of the effects of time was also put forth. According to that view, the social stimulus provides an initial spurt then decreases as the subject adapts to the presence of others.

An experiment was also conducted to determine how group presence affected the evaluation of stimuli. Students were asked to smell a variety of odors and rate each as to its pleasantness or unpleasantness. Although the subjects were not aware of each other's ratings, the group had the effect

of moderating judgments. Unpleasant odors were rated less unpleasant in a group, and pleasant stimuli were considered less pleasant. Allport suggested that the moderating effect of a group occurred because students did not want to vary from the judgments he imagined his coworkers were making. This submission to group standards was termed social conformity.

In another investigation, students were required to calculate a series of two-digit by two-digit multiplication problems. The presence of coworkers appeared to have a facilitatory effect on speed, as 8 of 12 students attempted more problems in the T than in the A situations. An assessment of the quality of work indicated that 53% of the students made fewer errors in the T than in the A condition. A difficulty with the accuracy measure is that total errors could be affected by the number of problems done. That is, a subject could make more errors simply because he did more work. A valuable additional statistic would have been the proportion of errors (number of errors/number of problems attempted). Unfortunately, Allport did not provide sufficient information to calculate this measure.

A second study of the relationship between quantity and quality was made using a reversible perspective task. Under one set of instructions students were presented with a hollow-cube figure, and asked to produce as many reversals as possible. The number of reversals reported was taken as an index of the amount of mental work accomplished. Another

group of students were told to fixate on a dot in the center of the figure, and to try to keep reversals from occurring. It was assumed that given these directions, a reversal represented a lapse in attention or accuracy. Seventeen students produced a greater amount of work in the group and six alone. On the accuracy measure only half the students were positively affected by the group.

Allport also tested the hypothesis, suggested by Mayer (1903) and Burnham (1910), that "higher" intellectual processes and original thinking were best performed in solitude. Each test consisted of a single passage taken from the works of Epictetus and Marcus Aurelius. The students were to refute the statements with arguments of their own. Over a two-month period, each of nine subjects took approximately 40 tests.

Both the number and quality of epigrams were examined. Each argument was given a grade of 1, 2, or 3, three being superior. All students wrote more epigrams in T than A conditions. On the other hand, six of nine students had a higher percentage of superior arguments while working alone.

In a review of the coaction literature, Allport (1924) concluded that

it is the overt responses, such as writing, which receive facilitation through the stimulus of coworkers. The intellectual or implicit responses of thought are hampered rather than facilitated. (p. 274)

The influence of coactors was attributed to two psychological processes. The first of these he called social



facilitation. Social facilitation was the result of the sights and sounds of others performing the same task. Its effect was to increase the subject's own responding. Rivalry was the second process. It provided an affective component to coaction, "reinforcing the struggle to assert various prepotent needs and interests" (p. 285). While experimenters might minimize its influence, Allport felt that rivalry was inherent in all situations involving coworkers. Its effect was to increase the quantity of work, rather than to improve quality. In some individuals, rivalry produced over-stimulation, leading to a decline in quality.

A problem with Allport's (1924) analysis is that the effects of social facilitation and rivalry are difficult to distinguish. Since all co-activity is said to generate rivalry, the subject's response would necessarily be a composite of both processes. As evidence for the independent existence of social facilitation, Allport pointed out that racing cyclists record better times when being paced by a faster multicycle than when running alone. He also referred to Triplett's ergograph experiment in which subjects exerted more effort if the starting signal were the bending of the experimenter's finger than if it were the beat of a metronome. The results of both the ergograph study and paced racing were attributed to social facilitation, since "rivalry had been fairly eliminated". Despite Allport's efforts, the relationship between rivalry and coaction was not soon to be resolved.

Forty-four years later, Cottrell (1968) would propose that rivalrous comparisons were necessary to produce coaction effects.

If Allport (1924) were correct in assuming that coworkers are a stimulus for rivalry, then the effects of competition become vital to an understanding of coaction. Whittmore (1924) supplemented Allport's work by varying the amount of rivalry. On half the trials, college students were instructed to aim for both quantity and quality, and not attempt to defeat their coworkers. Instructions for the remaining trials were to try to "beat their fellow-workers." For both competitive and noncompetitive conditions, pairs of students printed copies of newspaper material with rubber stamps.

The verbal statements of students taken after the experiment indicated that some degree of rivalry entered into the noncompetitive condition. Despite this, all 12 subjects copied more material in the competitive situation. The slowest six students on the noncompetitive trials had an average gain of 31%, while the fastest increased by only 17%. Whittmore also found that although competition facilitated the quantity of output, it impaired the quality of each subject's performance. The six students who had the poorest noncompetitive quality ratings decreased by 9% under competitive instructions, while the six highest declined by 4%.

Each of the studies that have been reviewed has consisted of either a coaction or an audience arrangement. One question

that has yet to be considered is the relationship between the two paradigms. In 1930, Dashiell conducted several investigations comparing a noncompetitive coaction, a competitive coaction, and an audience condition to subjects working alone.

His first three experiments used a repeated measures design. Except for the task, the procedures for the three studies were identical. Undergraduates were run simultaneously in the alone condition, and were tested in different rooms. In a together (T) situation, coworkers were asked not to compete, and informed that their performances would not be compared. Conversely, coactors in a rivalry (R) condition were directed to compete and told that a comparison of their scores would be made. In an under-observation (O) manipulation, two students watched a third perform. Competition may have affected this manipulation, since the spectators later served as subjects.

Before beginning each task, students were instructed to "work as accurately and fast as you can." Each student worked on the test for the same amount of time. In one experiment, subjects were required to calculate a group of two-digit by two-digit multiplication problems. Another investigation used a mixed relations or analogies task. These analogies were arranged so that the easiest preceded the hardest. A problem with this sequence was that faster students encountered more difficult questions than did the slower

subjects. The third study involved a free serial word-association test. Students were told to speak words silently, using "any words that come to you, only they must not make phrases or sentences." The instructions were to write down only the first two or three letters of every second association.

A speed measure, based on either the total problems attempted or the number of words jotted down, was taken for each test. An accuracy variable, reflecting the frequency of errors, was also determined for the multiplication and mixed relations tasks. When interpreting the accuracy measure, it should be noted that total errors could increase while the percentage of errors could remain constant or even decrease. Dashiell did not analyze the raw data, but instead ranked each subject's quantitative and qualitative scores with regard to the four experimental situations. For instance, if a particular subject completed the most multiplication problems in the R condition and least in the T arrangement, R was ranked first and T fourth.

On all three tasks, the R and O manipulations facilitated speed and reduced accuracy. Since the directional effects of R and O were the same, these results provide some justification for using one theory to explain audience and coaction. The small differences in the performances of subjects in the T and A conditions could be interpreted as evidence that coaction effects occur only in situations involving

rivalry. An alternative explanation is that even in the A condition, students were affected by others. Such a view is tenable, since subjects were aware they were being tested simultaneously.

Dashiell (1930) conducted three additional experiments to find if the A arrangement used by Allport (1920, 1924) and himself achieved a true isolation. In each of these studies, two types of alone situations were contrasted with a T condition. Students in the alone manipulations were either tested at the same (AS) or different (AD) times.

Speed on multiplication, mixed relations, and serial associations was greatest in the T arrangement. AS was faster than AD on multiplication and mixed relations, but AD was ranked higher on serial associations. Accuracy scores for both multiplication and mixed relations were best in the AD and lowest in T manipulation. These findings indicate that in the AS condition students were under social influence. The differences between the T and AD situations suggest that either rivalry is not necessary to produce coaction effects or that only a minimal degree of competition is required.

Travis (1925) was interested in how the presence of an audience would affect hand steadiness. Before introducing the audience, he gave college students a large number of trials on a pursuit rotor. Each trial consisted of 20 revolutions, and performance was measured by a counter wired to a target disc. Ten points were scored for each complete

rotation that the stylus remained in contact with the disc. After the student's performance reached an asymptotic level, 10 additional trials were conducted in front of an audience of 4 to 8 upperclassmen.

The average of the ten scores with the audience present was compared to the highest ten consecutive alone scores. Eighteen of 22 students made higher scores in front of an audience than alone. In the alone condition, subjects averaged 172.76 points per trial, while in the audience the mean was 177.42.

Throughout the literature one of the most recurrent themes has been the use of distraction or attention as an explanation of audience and coaction. In 1926, Sengupta and Sinha adopted a theory originally proposed by Meumann (1904) to explain an increment in performance on a vowel cancellation test. According to this view, subjects worked to overcome distractions provided by the presence of others, and in doing so increased attentiveness to the task.

A more extensive study by Pessin (1933) compared the effects of social distractors, mechanical distractors, and an alone condition in the learning of nonsense syllables. Pessin, himself, provided the social distraction by watching the person learn the list through a window. Mechanical distractors consisted of a variety of visual and auditory distractors that accompanied the presentation of the list.

Memorization proceeded with the greatest speed and fewest errors when the subject was alone. When tested for savings

one day later, the students who learned the syllables in the social and mechanical distractor conditions were superior. For both the acquisition and savings measures, the directional effects of mechanical and social distractors were the same.

Dashiell provided the third review of the literature in 1935. While his article is notable for its thoroughness, it contains no new theoretical orientation. After 1935, the number of audience and coaction investigations rapidly decreased. Emphasis shifted to other areas, and for the next 30 years the study of human social facilitation was neglected. In retrospect, it seems peculiar that one of the basic issues of social psychology was ignored for so long. Yet it cannot be denied that social facilitation had become an area that was briefly mentioned in textbooks, and avoided by the experimenters of the day.

Why should a long popular area suddenly decline? Certainly not because the effects of social facilitation were resolved. On the contrary, Dashiell's review reveals a diversity of findings resulting from a variety of methodologies. Although the early researchers recognized the importance of such factors as type of task, attention, distraction, emotion, and rivalry, the field still lacked direction. What was most needed was an integration of large amounts of data (Zajonc, 1965). Progress in social facilitation awaited the development of a more comprehensive theoretical approach.

Several well-designed experiments were performed between 1935 and 1965, and these deserve mentioning. Bergum and Lehr (1962) examined the effects of coworkers on a vigilance task. Their apparatus consisted of a circular panel containing 20 red lights. Normally, the lamps were lit in a clockwise progression. Signals were provided by the failure of a lamp to illuminate in its usual order. National Guard trainees were told to indicate the occurrence of a signal by pressing a button. Although the mean detection scores of the coaction and alone groups did not differ, the effects of coaction were specific to the pairs involved. Either both members of a pair had high or both had low detection scores. It was suggested that the directional effects of coaction were dependent upon the degree of stimulation. The effect of mild stimulation was thought to be facilitative, while more intense stimulation adversely affected vigilance. While this interpretation describes the results, a stronger argument could have been made if the intensity of stimulation were assessed.

In 1963, Bergum and Lehr conducted an audience study using the same equipment. The audience was either a Master Sergeant or Lieutenant Colonel who from time to time visited the booth where the trainees were performing the task. During these visits, failures to detect the signals were pointed out. The detection accuracy of trainees in the audience condition averaged 34% higher than alones. The authors concluded that the audience facilitated performance, because



the presence of higher status observers was threatening to the trainees.

### Zajonc's Drive Theory

This section will discuss nothing less than the resurrection of an area. As was previously mentioned, the early researchers did not develop an adequate system for organizing their findings. Probably most troublesome was the fact that in some instances social facilitation improved and in other cases hindered performance. Although Burnham (1910), Allport (1924), and others were correct in assessing that the directional effects of social facilitation depended on the extent to which the task required imaginative thought, their formulations were not successful in generating a continued series of experiments.

In 1965, Robert Zajonc provided an analysis suggesting that the task variable was the key to unravelling the conflicting results. After reviewing the literature, he determined that the mere presence of others facilitates performance if the task is well-learned or simple (e.g., Bergum & Lehr, 1963; Travis, 1925), and impairs performance if the task is complex (e.g., Dashiell, 1930; Pessin, 1933).

To provide a theoretical account for his conclusions, Zajonc drew upon Hull-Spence theory (e.g., Hull, 1943; Spence, 1956). According to Hull, not all behaviors are equally likely to be emitted in a given situation. In other words, there is a hierarchy of responses based on their

probability of occurrence. The most frequently observed behavior is termed the dominant response, while all other responses may be ordered in the extent to which they are subordinate.

The probability of a response occurring is in part determined by its habit strength (H). If other factors are equal, the dominant response will be the behavior with the greatest habit strength. A second important variable is generalized drive (D). In the Hull-Spence model, drive energizes all responses in the hierarchy. The strength of a response is considered a function of both habit strength and drive.<sup>2</sup> One of the basic tenets of Hull-Spence theory is that there is a multiplicative relationship between D and H. It follows from the multiplicative law ( $D \times H$ ) that elevations in D should increase the response strength of the dominant more than subordinate responses. Any factor that heightens the magnitude of D should therefore augment the probability of the dominant response.

To bring social facilitation within the purview of Hull-Spence theory, Zajonc (1965, 1980) hypothesized that the presence of others acted as a source of drive. If mere presence is in fact drive inducing, the multiplicative law predicts that the presence of others should enhance the emission of the dominant response. Whether this has a positive or a negative effect on performance depends on the correctness of the dominant response. Mere presence should

improve performance if the dominant response is correct and impair performance if the dominant response is incorrect.

Zajonc contended that when first encountering a complex task, the dominant response is likely to be wrong. At this point in the learning process, any increase in the probability of the dominant response would impair performance. As the subject masters the task, the correct response necessarily becomes dominant. By augmenting the probability of the dominant response, mere presence should therefore facilitate performance on a well-learned or simple task, and impair performance on a complex task.

Tests of Zajonc's theory require a means of socially producing arousal, and a dependent variable that allows a hierarchy of responses to be distinguished. Zajonc and Sales (1966) established a hierarchy by differentially training responses during an initial experimental period. Their procedure was to vary the number of times nonsense words were exposed to the subject. On each presentation, the experimenter showed one of the words to the subject, pronounced it, and then had the subject repeat it once. It was assumed that the more often the person saw and spoke the word, the more dominant the response would be.

After training, the students were told that the second part of the experiment was a test of subliminal perception. Their task was to call out the nonsense word that was flashed on a screen. The session consisted of 41 trials, 31 of

which actually involved pseudorecognition. On each pseudorecognition trial, the stimulus was presented for too brief a duration to be identified. Since the students could only guess on these trials, their responses were considered a function of their previous training. To insure competition between responses, students were compelled to answer on every trial.

The data for the pseudorecognition trials of alone and audience subjects was then plotted on a graph. The frequency of prior exposure (abscissa) was related to the average number of times each nonsense word was reported (ordinate). The slope was found to be greatest for the audience, indicating that the presence of others enhanced the emission of the dominant response. This finding supports Zajonc's contention that an audience has the same effects on the response hierarchy as those produced by increasing generalized arousal.

While Zajonc and Sales (1966) assessed the response hierarchy before testing for social facilitation, Matlin and Zajonc (1968) calculated the response hierarchy after the data were obtained. The hierarchy was based on the number of times subjects made a particular free association to the stimulus word. The more frequently an association was given, the more dominant it was assumed to be. A within-subjects design was used in which half the subjects first performed alone, and the others initially worked in view of a single passive spectator. Tape recorders in an adjacent room were

used to present the stimulus words and to measure the latency of response. It was predicted that the presence of an audience would reduce latencies and increase the probability of the dominant response.

As was hypothesized, latencies were shorter when the spectator was present. The effects of an audience on response hierarchy provided only partial support for the original predictions. Facilitation of the dominant response occurred only when the subject was first tested in front of an audience. Alone and audience conditions did not differ if the subject first performed alone.

Matlin and Zajonc (1968) speculated that the nature of free associations changed over time. As the task became more familiar, there was an increased tendency to give idiosyncratic responses. This effect was countered by the influence of the audience, which was to increase the emission of the dominant response.

Recently, Blank, Staff, and Shaver (1976) conducted another study of observer effects on free association. Unlike Matlin and Zajonc (1968), Blank et al. (1976) did not find that an observer affected latency. Their results reveal that the greatest effect of the audience was to reduce the frequency of unique associations. While this result is consistent with drive theory, Blank et al. (1976) point out that subjects may simply have inhibited uncommon responses in order to make a good impression on the observer.

Another method for assessing a response hierarchy is to rank a subject's preferences for a group of objects when he is alone. The effects of audience and coaction are then examined by assigning the same subjects to treatment and control conditions. A study on color selection by Goldman (Note 1) provides a good example of this procedure. During the first 30 trials, preferences were determined by having students write which of five colors they liked most at the moment. The colors were then ordered according to the frequency with which they were chosen. Half of the subjects were given 30 additional trials alone, while the others worked in groups of four. Coaction was found to increase the subject's selection of his own most preferred color. Since the favorite color was presumably dominant, these results provide further substantiation of Zajonc's theory.

Several studies have used population norms to determine response hierarchies. This method involves assessing hierarchies for a given task on one sample of subjects, and then conducting the experiment with a second group. Cottrell, Rittle, and Wack (1967) used normative data to construct a noncompetitive and a competitive paired-associates list. The noncompetitive list consisted of synonym pairs, and was developed so that the most probable response tended to be correct. On the other hand, the competitive list was designed to maximize the strength of incorrect responses. In an earlier study, Spence, Farber, and McFann (1956) found

that high drive level, as measured by the MAS, facilitated performance on the noncompetitive and impaired performance on the competitive list. Cottrell et al. (1967) used the same lists to test Zajonc's hypothesis that an audience acts as a source of drive.

Before introducing the test lists, subjects were given five anticipation trials on a practice list. Based on the outcome of these trials, students were divided into slow, medium, and fast learners. As was predicted, the audience condition made more errors on the competitive list, but fewer errors on the noncompetitive list than isolated subjects. These findings were confined to students who were less proficient in the practice trials. Cottrell et al. (1967) suggested that the drive of individuals of high ability may not be affected by the presence of an audience.

Instinctive as well as learned behaviors may form response hierarchies and should therefore be sensitive to socially induced drive. Zajonc, Heingartner, and Herman (1969) made use of a finding by Gates and Allee (1933) that cockroaches have an instinctive tendency to avoid bright light. Their equipment consisted of a straight runway, and a cross-shaped maze. Both were made of transparent plexiglass and had a powerful floodlight situated behind the startbox. The runway was so designed that the roach's dominant tendency to run away from the light led him to a darkened goalbox. In the

maze, direct movement away from the floodlight would bring the roach to a lighted arm of the maze. Each animal was given ten trials, and run either alone or in coacting pairs. Zajonc et al. (1969) recognized that in his coaction condition behavior could be affected either by generalized drive or imitation. To eliminate the possibility of imitation, a second study compared escape times of an audience and alone condition. In this experiment, spectator roaches were accommodated in four plexiglass boxes placed adjacent to the alleyway.

The audience and coaction arrangement produced similar results. The presence of others impaired performance in the maze, and improved performances in the runway. These findings were interpreted as supporting the proposition that "the presence of conspecifics acts as an energizer of dominant responses in the cockroach" (p. 89). This conclusion was based on the supposition that only mere presence was involved in the audience condition. A careful reading of Zajonc et al. (1969) reveals the potential for directive cues. It seems probable that the floodlight stimulated spectator as well as subject roaches. The spectators would be expected to run to the part of the audience chamber that was farthest from the light. Either the spectators' position in the chamber or the direction of their running could be the cues that determined the subject's response. In both the cross-shaped



maze and the runway, these cues should lead the subject roaches to run directly away from the light.

Still another way to determine the effects of arousal on response hierarchy is to measure performance both during acquisition and after the task has been mastered. When presented with a new task, the correct response is often weak and relatively unlikely to occur. As training progresses, the appropriate responses become increasingly dominant. The effects of socially produced drive should therefore be more positive on the later than early trials.

Martens (1969) tested this prediction with a complex motor skill. Students were told to roll a cursor down a track so that it collided with a moving target. Error scores were based on the difference between the arrival times of the target and cursor at an interception point. During their initial trials, half the subjects were alone, and half were observed by a group of ten passive spectators. The subjects continued to work at the task until they obtained a preset criterion. The two groups were then redivided, and half of each group performed before the audience, and half worked alone.

During the acquisition trials, when the dominant response was assumed to be incorrect, the alone group was superior to the audience condition. In the second phase of the experiment,

the presence of the audience improved performance, presumably because the dominant response was now appropriate.

Similar results were obtained by Hunt and Hillery (1973) on a complex maze task. They found that on early trials, when the probability of a correct response was less than .5, subjects run alone learned faster than a coaction group. When the correct response became dominant, coaction accelerated the rate of learning. These effects were only found with females; a male sample did not show a coaction effect.

The advantage of the coaction group in the latter part of Hunt and Hillery's experiment should be interpreted with caution. The superiority of the coaction arrangement could be due to the number of trials required for the correct response to become dominant. A more appropriate procedure would have been to train the alone and coaction groups until the probability of a correct response was .50. Half of each of the groups would then perform alone, and half in coaction.

Most of the studies reviewed in this section offer strong support for Zajonc's claim that audience and coaction arrangements increase the probability of the dominant response. This conclusion is in accord with predictions based on Hullian theory, if the presence of others is viewed as a source of drive.

### Cottrell's Learned Drive Theory

Although early experimenters, such as Triplett (1898), Allport (1920, 1924), and Dashiell (1930), identified a number of important variables; they did not develop a heuristic theory of social facilitation. A comprehensive theory was lacking until Zajonc introduced a Hullian view of social facilitation in 1965. Zajonc's approach enjoyed quick success, renewed interest in the area, and gained much empirical support. Science, however, cannot progress unless the tenets of existing theories are continually questioned. To date, the most prominent challenge to the mere presence hypothesis has been Cottrell's (1968, 1972) learned drive theory. This section will first present Cottrell's analysis of social facilitation and later review the literature contrasting the mere presence and learned drive hypotheses.

Cottrell (1972) proposed "that the drive-increasing property of the presence of others is created through social experience and is not as implied by the Zajonc hypothesis, a biological given" (p. 222). According to Cottrell, newborns do not have a motivational reaction to the mere presence of others. People are said to become arousal-producing stimuli only as a result of a learning process. During an individual's life he experiences a variety of positive and negative events that act to increase general drive level. Many of these stimuli have been spatially and temporally contiguous

with the presence of conspecifics. It is as a result of classical conditioning that the presence of others comes to elicit increases in arousal.

Since in the past other people have been associated with positive and negative consequences, subjects learn to anticipate evaluation by an audience. Cottrell hypothesized that apprehension over evaluation is necessary to augment arousal in an audience arrangement. The necessary condition to elevate arousal in coaction conditions is held to be rivalry or competition. Arousal is increased because the subject anticipates positive or negative consequences from his competition with the other coactor. In the absence of rivalrous comparisons, coaction effects should not occur.

In summary, Cottrell's theory contends that: (1) drive generated by the presence of others is learned rather than innate; (2) anticipation over evaluation should act to increase drive; and (3) mere presence as defined by Zajonc is not sufficient to heighten arousal.

The studies attempting to determine the minimum conditions sufficient to produce social facilitation follow the same basic design. In one arrangement, an audience or coactor is present and is considered a source of evaluation or competition. A second audience or coaction condition is identical to the first, except that the potential for evaluation or competition is removed. Both of these manipulations

are then compared to an alone group. The results would be contrary to Zajonc's position only if audience or coaction effects were confined to the evaluative or rivalrous conditions.

Cottrell, Wack, Sekerak, and Rittle (1968) used a pseudorecognition procedure to determine whether mere presence was sufficient to produce an audience effect. In the audience condition two undergraduates watched another student perform. Mere presence was arranged by blindfolding the spectators. The function of the blindfolds was to preclude the possibility of evaluation by the audience. As both Zajonc and Cottrell would predict, the evaluative audience increased the emission of the dominant response relative to an alone condition. The strength of the dominant response was not, however, affected by the mere presence of others.

Henchy and Glass (1968) also used a pseudorecognition task to study the effects of mere presence on response hierarchy. It was assumed that evaluation apprehension would be produced by an audience of "experts," but not by "nonexpert" spectators. The strength of the dominant response was greater in the expert than the nonexpert and alone conditions. The response-emission slope of subjects performing before the nonexpert audience was also steeper than the control group, although this difference was not significant. While these results indicate that evaluation augments the effects of social facilitation, they offer neither clear confirmation nor rejection of Zajonc's mere presence hypothesis.

More powerful support for Cottrell's position comes from a cleverly designed study by Paulus and Murdoch (1971). They were able to vary mere presence independent of evaluation by an alteration in the usual pseudorecognition procedure. Instead of having subjects call out their responses, students privately wrote down their decisions. Half of the students were told that after the task their performance would later be evaluated, while the remaining students were not given these instructions. Students made a higher percentage of dominant responses in the evaluative conditions, but the presence of the audience did not significantly affect the emission of the dominant response.

In another study contrasting Cottrell's and Zajonc's positions, Sasfy and Okun (1974) had students perform a complex motor task in front of an observer who was described as an expert or nonexpert. The expert and nonexpert audiences viewed the subjects under one of three conditions. In the direct evaluation manipulation the spectator could see the subject perform, and had knowledge of the outcome of each trial. The observer in the indirect evaluation condition could not see the subject's actual response, but was told the results of each trial. A no evaluation condition was similar to the indirect evaluation manipulation, except that the audience was not given feedback of the subject's

performance. The scores of these six groups were then compared to an alone condition.

The presence of experts in the direct and indirect evaluation conditions had an equally detrimental effect on motor performance. The presence of an expert observer was found to have no effect if he could not evaluate the subject's behavior. Also, none of the three nonexpert audience conditions significantly affected the subject's performance. These results indicate that audience characteristics and the form of evaluation interact in determining the extent of evaluation. Sasfy and Okean's findings also support Cottrell's view that some potential for evaluation is necessary for arousal induction to occur.

In defense of the mere presence hypothesis, Zajonc (1980) referred to several studies in which it would be difficult to specify what would specify a "good" or "bad" performance. Without some meaningful criteria with which to assess the quality of behavior, he reasoned apprehension over evaluation could not occur.

Zajonc (1980) used Goldman's (Note 1) study on color preferences as an example of a task for which dominant responses could be identified, but which had no performance criteria. As was previously mentioned, Goldman found that the presence of coactors increased the number of times subjects selected their favorite color. Zajonc also reported an

experiment in which students used a stylus to traverse a maze. Despite instructions to minimize errors, subjects working before a spectator went through the maze more rapidly than performing alone. Zajonc contended that if fear of negative evaluation was motivating subjects, the presence of others should have caused the students to work cautiously.

Recently, Markus (1978) contributed another study supporting the mere presence hypothesis. Her task involved putting on and taking off familiar and unfamiliar clothing. Students worked either alone, in front of an inattentive audience, or before attentive observers. In no condition were the subjects aware that changing clothes was the behavior being measured. Both audience arrangements facilitated well-learned, and impaired unfamiliar responses. Nonsignificant differences were found between attentive and inattentive audience conditions. Markus concluded that her results indicated that mere presence was sufficient for social facilitation to occur.

In 1977, Rajecki, Ickes, Corcoran, and Lerner examined the effects of a blindfolded and nonblindfolded audience on students performing a simple maze task. The audience was a single student who was supposedly to participate in some later unrelated experiment. Two dependent variables, the time to complete the maze and the number of errors, were recorded. Subjects performing before a blindfolded and a nonblindfolded audience finished the maze faster than those



tested individually. Students in both audience conditions also made fewer errors than subjects working alone, although this difference only attained significance for those in the blindfolded condition. Since the blindfolded audience could not evaluate the subjects' performance, Rajecki et al. (1977) interpreted their results as supporting Zajonc's theory.

Cottrell's proposal, that without rivalrous comparisons coaction effects would not occur, prompted a series of investigations of the role of competition in coaction. Carment (1970a) had students work on a simple motor task, either alone or in dyads. In the alone condition, subjects were aware of the number of successful responses they had made, while coactors knew their own as well as the other person's performance level. Half of the coactors and half of the isolated subjects were given directions to promote competition, and the others received noncompetitive instructions. The noncompetitive directions neither explicitly encouraged nor discouraged competition.

The effects of coaction were greatest when competition was stressed. Coaction also improved the performance of subjects who received neutral instructions. This result should not be taken as evidence that competition is not necessary for coaction to occur. Since coactors given neutral directions could compare performances, the opportunity for competition was present. What Carment's findings do indicate is that competition is an important variable, and that no

more than a minimal degree of competition is required to produce coactive effects.

Carment and Latchford (1970) used the same simple motor task in a related study. Subjects worked either alone or in coaction, and either in the presence or absence of the experimenter. Students in the coaction condition were not aware of the performance level of the other coactor. The effects of coaction interacted with the presence or absence of the experimenter. If the experimenter was present, coaction increased the rate of response. When the experimenter was absent, coaction caused a small decline in performance. Thus the more typical coaction effect, a facilitation of performance on a simple task, was observed only when some form of evaluation was possible.

In 1972, Wankel conducted a reaction time study that included both coaction and audience arrangements. Half of the subjects in each of these groups received instructions designed to promote competition, while the others were asked not to attend to other individuals. These four conditions were compared to an alone group that was told to do as well as it could on the task. As Cottrell would predict, the mere presence of a coactor or an audience did not affect reaction times. Coaction and audience conditions only produced facilitation if the instructions were designed to promote rivalry.

One method for regulating the intensity of competition is to vary the type of feedback. For instance, rivalry

should be greater if coactors can compare their performances than if they cannot make such judgments. In 1969, Klinger conducted a study to assess the importance of feedback on a simple vigilance task. A "mere coaction" condition allowed students visual contact, but did not provide feedback of their own or the other coactor's errors. A second coaction arrangement informed subjects of their own as well as the other coactor's mistakes. When compared to an alone condition, only subjects receiving feedback showed improvement. Unfortunately, it is not possible to determine if the advantage of the coaction-with-feedback group was due to feedback of their own or the other person's performance. To make such an assessment, it would be necessary to include a coaction group that received only feedback of their own errors.

Innes (1972) compared the reaction times of a coaction condition in which the fastest coactor was signalled after every trial, a coaction group that received no feedback, and an alone group. The subjects were told that the experimenter was not interested in their reaction speed, but the pattern of their responses over time. When compared with the alone condition, coaction with feedback decreased latencies, and coaction without feedback increased latencies.

The reaction time task is described by Innes as "simple." If this is the case, coaction should facilitate performance. Since this occurred only in the coaction-with-feedback group, these data support Cottrell's revision of drive theory. More

difficult to explain is why on a simple task any coaction arrangement should impair performance.

One interpretation of this finding is that the presence of the other coactor in the without-feedback group reduced apprehension generated by the experimental situation. Other investigations have found evidence that the presence of others can cause a decline in motivational level (e.g., Schachter, 1959). If such an effect occurred, then the performance of the coaction-without-feedback group would be expected to be below that of isolated subjects. An arousal decrement might also be responsible for a rather unusual finding reported by Carment and Latchford (1970). Using a simple motor task, they found that coaction impaired performance if the experimenter was absent from the test situation.

The Innes study does not include an arousal measure, so there is no direct evidence to support this analysis. Since both Cottrell and Zajonc hypothesize that the presence of others increases drive, it would be of great theoretical importance to demonstrate that certain audience and coaction arrangements reduce arousal. If this was done, an important area of research would be to identify the variables that determine whether the presence of others raises or lowers drive level.

Martens and Landers (1972) compared the effects of three different coaction manipulations to an alone condition. In one arrangement, students could see one another and were

aware of each other's performance level. A second coaction manipulation permitted feedback, but prevented visual contact. Subjects in a "no evaluation" treatment group had neither feedback nor visual contact. Each of the three coaction conditions were run in dyads, triads, and tetrads.

Performance on a motor task was adversely affected if students had visual contact and were given feedback of one another's performance. The extent of this decrement increased as a function of group size. Feedback without visual contact negatively affected performance only when the subjects were run in tetrads. Coactors in the "no evaluation" group did not differ from students run alone. Cottrell's theory receives support since the mere presence of others did not influence performance. The data also indicate that group size and visual contact are important variables in determining the strength of coactive effects.

A previously reviewed study by Hunt and Hillery (1973) also examined the importance of feedback in coaction arrangements. In this investigation, coactors received feedback on the appropriateness of their own, but not the other coactors' responses. Because the subjects were not given feedback of the other coactors' performance, Hunt and Hillery suggested that mere presence was responsible for the coaction effects they observed.

The validity of Hunt and Hillery's interpretation is based upon their contention that the other coactor was not a

source of feedback. Since subjects maintained visual contact, subtle forms of feedback were potentially available to the other coactor. Each member of the pair could observe the other's facial and body movements. These expressions should to some extent reflect the favorableness of the information the other coactor receives about his own responding. Coactors could certainly, though imprecisely, evaluate how one another was performing.

#### An Evaluation of Learned Drive Theory

One of the most important criteria for evaluating the utility of a theory is the research it generates. Learned drive has certainly been a very heuristic theory, and much of the current interest in social facilitation can be traced to Cottrell's conceptualizations. His revision of the mere presence hypothesis ignited the field with controversy and prompted an extended series of investigations. Of the modern theorists, only Zajonc has made a greater impact on the study of social facilitation than Cottrell.

When evaluating Cottrell's postulates by the empirical data base, it is useful to divide his theory into components. His first tenet was that arousal, due to the presence of others, is learned rather than innate. Second, he proposed that evaluation apprehension in the audience and rivalry in the coaction paradigm serve to increase drive. Finally, Cottrell hypothesized that apprehension over evaluation or competition is necessary to produce social facilitation.

The nature-nurture issue in social facilitation is based upon Cottrell's (1968, 1972) interpretation of Zajonc's (1965) theory. Actually, Zajonc never stated that socially induced arousal is innate. Indeed, in 1972 Zajonc (Note 2) quite justifiably claimed that his theory does not address the question. Cottrell seems to have created the learned versus innate drive controversy and cast Zajonc in the role of the opposition.

Cottrell's second hypothesis, that evaluation apprehension or competition augments arousal, is supported by most studies (e.g., Carment, 1970a; Martens & Landers, 1972). This view is not incompatible with Zajonc's concept of mere presence. It is possible that mere presence raises arousal, and that evaluation apprehension further heightens drive.

The proposition that evaluation apprehension is necessary to cause arousal increments is contrary to Zajonc's position. Studies attempting to determine if apprehension is necessary to produce social facilitation have yielded inconclusive results. While many investigations have confirmed Cottrell's revision (e.g., Cottrell et al., 1968; Paulus & Murdoch, 1971), others have upheld the mere presence hypothesis (e.g., Markus, 1978; Rajewski et al., 1977). It would be convenient if some single variable were present in experiments supporting Cottrell's revision, and absent in those upholding Zajonc's original theory. While such a factor may exist, it has not been identified.

### Nature of Drive

An aspect of Cottrell's (1968, 1972) theory that has not yet been considered is whether both anticipations of positive and negative outcomes heighten the level of arousal in social facilitation studies. In 1971, Weiss and Miller pointed out that Cottrell's position was inconsistent with findings indicating that learned drives are based on noxious primary drives like frustration (e.g., Daly, 1969) and pain (e.g., Miller, 1948), and not on appetitive drives such as thirst and hunger (e.g., Myers & Miller, 1954). They reasoned that the drive induced by audience observation must be aversive in nature, and could not be appetitive as Cottrell proposed. According to Weiss and Miller, only anticipations of negative outcomes elevate drive level in social facilitation studies.

The first investigation purporting to contrast Cottrell's and Weiss and Miller's views was conducted by Good in 1973. Prior to working on a low competition, word-association task, students were given the expectation that they would do well or poorly. In addition, half of the students were told they would be evaluated immediately and half informed that evaluation would be delayed. Unfortunately, it is not possible to determine which of the four experimental conditions would have produced social facilitation, since the design did not include an alone group. On a low-competition, word-association task, the most pronounced effects of social facilitation were



expected to be indicated by the fastest response speeds and the greatest commonality of association scores.

Good based his predictions on the assumption that if anticipations affected performance they should have their most pronounced effect in the conditions in which the subjects were immediately evaluated. Since Cottrell postulated that drive increments could be due to both positive and negative anticipations, Good concluded that Cottrell's theory predicted that immediate evaluation should increase the strength of social facilitation in both positive and negative expectancy conditions. In contrast to Cottrell's view, Good interpreted Weiss and Miller's theory as predicting that immediate evaluation should affect performance only when subjects anticipate performing poorly.

Immediate evaluation augmented the effects of social facilitation only when the subjects anticipated performing well on the task. The time of evaluation had no effect when the students were given negative expectancies. These findings therefore offer partial support for Cottrell's position, and are in opposition to Weiss and Miller's hypothesis. As an alternative to Cottrell's and Weiss and Miller's theories, Good suggested that social facilitation occurs only when the subjects expect to obtain social reinforcement from an individual present in the environment.

Clark and Fouts (1973) sought to determine how previous positive and negative experiences with an audience affected performance. Before testing for social facilitation, children

played ring-toss and a second game that required dropping clothespins in a bottle. During the games, the audience was either positive, negative, or neutral in its reactions to the subject. Later the children performed a simple lever-pulling task in the presence or absence of a passive audience.

Children who had previously had negative or neutral experiences showed more intense pulling when being observed than when alone. The presence of a previously positive audience actually produced a decrease in the magnitude of lever pulling. These findings support Weiss and Miller in that only the audiences associated with neutral and negative experiences increase motivation.

In 1977, Geen had females perform a difficult anagram task alone or in one of three audience conditions. Some of the observed subjects were told that the purpose of the audience was to evaluate their work, while others were informed that observations were being made so that the experimenter could advise them on ways to improve their performance. The third audience group was told neither about task evaluation or assistance on a later task.

Females working alone solved the task faster than any of the audience groups. Of the three audience conditions, subjects who expected assistance from the experimenter required the least time to complete the anagrams. Subjects who were simply observed were faster than those who were told their performance was being evaluated. Geen suggested that the

offer of assistance may have decreased anxiety usually present in the audience situation.

In 1978, Steigleder, Weiss, Cramer, and Feinberg conducted several investigations to determine the nature of competition resulting from coaction. Their hypothesis was that competition induces a noxious drive like shock or white noise. If this proposition is correct, then competition should affect behavior in a manner analogous to known aversive stimuli. The motivational and reinforcing aspects of competitive behavior were examined by using a discrete-trials escape conditioning procedure. In this paradigm, a subject learns upon presentation of a CS to make an instrumental response that results in the termination of an aversive stimulus.

The coactors were instructed to compete against each other and to score as many points as possible on a maze task. The experimenters never actually measured maze learning, but used this deception to mask the purpose of the study. The CS used by Steigleder et al. was a light mounted on a maze. When the light came on, the subjects pulled a switch (instrumental response) that terminated competition (tallying of points on the maze task) for a given time. A second light indicated that performance on the maze was not being measured. To prevent competition offset from being confounded with task offset, subjects continued to work through both the competitive and noncompetitive phases of the session.

From reviewing the escape condition literature, Steigleder et al. derived the following predictions:

1. Latencies (time between CS onset and the instrumental response) should decrease as a function of the number of trials in which switch throwing terminates competition.
2. Since delay of reinforcement retards the acquisition of an instrumental response, latencies should be greater the longer the delay between the instrumental response and the termination of competition.
3. In escape conditioning, continuous reinforcement results in faster response speeds than partial reinforcement. Latencies were therefore predicted to be longer when all responses are not reinforced by a withdrawal from competition.
4. Escape tends to be more rapid the greater the magnitude of reinforcement. Magnitude of reinforcement was manipulated by varying the length of time without competition that the instrumental response produced.

Support for all of the above hypotheses was obtained.

While this may indicate that the competitive situation used by Steigleder et al. was aversive, there is another interpretation that can be made from the data. Since the subject was requested to emit the instrumental response when the signal light came on, it could be argued that they were motivated to make a good impression rather than to escape an aggressive stimulus.

Seta and Hassan (1980) recently used a memory task to study the interaction of the presence of others and prior experience. All subjects worked alone during the first session, and were given false feedback concerning their performance in relation to their peers. If subjects were informed that they had done well, it was assumed that they would anticipate success in the second session. On the other hand, subjects who were told that they performed poorly in the initial session were expected to anticipate failing on the second session. Half of the subjects in each of these conditions worked before an audience during the second session and the remainder were alone. As Weiss would predict, the audience only affected the number of words recalled if subjects had failed during the first session.

The spectators in this experiment were presumably unaware of the subject's performance level during the initial session. A second study was conducted to determine if subjects would react in a similar manner to an audience that was aware of their performance on the first session. Students worked either alone, before unaware spectators, or in the presence of an aware audience. In addition, the expectation of success on the second session was varied.

In the low-expectation condition, subjects exposed to the unaware spectators recalled significantly fewer words than either the aware audience or alone manipulation. There was no

significant difference between the performances of the aware audience and alone group. Among students given a prior success experience, the unaware audience condition reported more words than the aware audience arrangement. The alone manipulation was not significantly different from either audience condition.

The data from the second experiment also supports Weiss' position in that the only significant difference between the audience and alone conditions was among subjects who had a history of failure. Seta and Hassan proposed that aware and unaware audiences did not have the same effect on responding, because the spectators in the two arrangements could use different criteria in evaluating the subject's performance. It was suggested that an "aware audience subject can be judged relative to both a personal (his/her own performance) and a social (other individual's performance) criterion. But an unaware audience subject can only be judged socially (relative to other individual's accomplishments)," (Seta & Hassan, 1980, p. 75). These results indicate that when examining the effects of presence of others on performance, it is important to determine the criteria by which a subject is evaluated.

#### Distraction/Conflict Hypothesis

Since Zajonc (1965) first proposed drive theory, the energization of dominant responses by audience and coaction manipulations has been well documented. In the last

12 years, research efforts have shifted from demonstrating that the presence of others has drive-like effects to discovering the necessary and sufficient conditions for their occurrence. Cottrell's (1968, 1972) learned drive theory and the revisions advocated by Weiss and Miller (1971) were two attempts to distinguish the variables that produce audience and coaction effects. More recently, interest in the processes underlying social facilitation has been stimulated by the distraction/conflict (D/C) hypothesis.

The D/C hypothesis contends that spectators and coactors direct attention away from the task. In addition to reducing time spent on the task, social distractors place the individual in a state of conflict. Conflict is experienced in the presence of others, because the person cannot simultaneously attend to the task and the social distractor. One hypothesized effect of attentional conflict is that it augments drive level (Gastorf, Suls, & Sanders, 1980; Sanders, 1981; Sanders & Baron, 1975). Like other drive accounts of social facilitation, the D/C hypothesis asserts that increases in drive serve to strengthen the dominant response.

In sum, distractions caused by the presence of others have two different effects on task performance: (1) impairment of simple and complex task performance by decreasing the amount of attention allotted to the task; and (2) improvement of simple and impairment of complex task performance

by augmenting drive. Sanders and Baron (1975) proposed that elevations in the level of distraction should produce a monotonic decline in complex task performance, and yield a curvilinear function for simple task performance. On simple tasks, the beneficial effect of increased drive should only outweigh the negative effect of decreased attention at low levels of distraction.

Another prediction that may be made from the D/C hypothesis is that the presence of others and nonsocial distractors (e.g., noise) should have similar effects on performance. A number of investigations have found that nonsocial distractors improve simple (e.g., Houston & Jones, 1967) and impair complex (e.g., Eschenbrenner, 1971) task performance. This is the same interaction with the task variable that is typically reported in social facilitation investigations.

Probably the best method for demonstrating equivalent effects is to include a social facilitation condition and a nonsocial distractor in the same experiment. In an early study, Pessin (1933) either exposed subjects to an observational arrangement, a variety of visual and auditory distractors, or had them work alone in a quiet background. Both the audience and nonsocial distraction manipulations increased the frequency of errors made during the acquisition of a list of nonsense syllables.



The D/C hypothesis implies that the magnitude of social facilitation effects will usually increase as a function of the distraction generated by the presence of others. Sanders, Baron, and Moore (1978) tested this proposition by varying the extent to which the other coactor was distracting. In their first experiment, one group of students believed that they were in a pilot study whose purpose was to gain their opinions about several attributes of the task. These instructions were designed to focus attention on the task, and to decrease any tendencies to be distracted by the other coactor's performance. Subjects who received these directions then completed simple and complex copying assignments. On neither task was there a significant difference in the performance of the alone and coaction conditions. These results were interpreted as indicating that the mere presence of others is not sufficient to augment drive.

A second group of students were told that rapid performance was an index of the ability to "delay gratification." It was assumed that these instructions would maximize proclivities to engage in distracting comparisons with the other coactor. Although the presence of a potentially distracting coactor did not affect responding on the complex task, the coaction manipulation did facilitate simple task performance. While the improvement in simple task performance among students in the "delayed gratification" group is compatible with the D/C hypothesis, the data were not entirely supportive. First, it is not clear why the complex task was

insensitive to a distracting coactor. Also, there were no significant intercorrelations between several distraction measures and task performance.

In a second investigation, subjects worked either individually, with a coactor performing a different task, or in the presence of a coactor working on the same task. Since only the latter group could obtain relevant comparison information, distraction was expected to be most pronounced in the coaction-same condition. Half of the students in each of these manipulations received a simple copying task, and the remainder were administered a complex copying assignment. If coactors were given different tasks, their performance did not differ from that of students working alone. Coactors who received identical tests copied more digits correctly on the simple task, and made more errors on the complex task. These results provide additional evidence that social comparison contributes to social facilitation effects. As in the first study, the distraction data was not related to performance measures. However, subjects were able to more accurately estimate the other coactor's performance if he was working on the same than a different task. This suggests that they made more attempts to obtain comparison information, which is an inherently distracting activity.

Baron, Moore, and Sanders (1978) assessed the effects of a spectator on distraction level, after first exposing subjects to a paired-associates task. While the audience did not affect the subject's self-reports of how much they

attended to the task, there was a marginally significant increase in the extent to which they reported attending to something other than the task. A third distraction question asked subjects to recall certain features of the lists, such as the color of the first letter in two of the words. Significantly more recall errors were made in the presence of others, possibly indicating that the spectator heightened distraction. Since this measure involved task-irrelevant features, its validity as an index of distraction has been questioned (Carver & Scheier, 1981a).

Baron et al. (1978) also reported that the presence of others reduced anticipation errors on a noncompetitive list, and increased errors on a competitive list of paired-associates. The D/C hypothesis indicates that an audience should heighten distraction, regardless of the effects of a spectator on performance. Support for that prediction was obtained as the tendency of the audience to elevate distraction level was not influenced by the type of list.

Some of the strongest support for the D/C hypothesis comes from a study by Gastorf, Suls, and Sanders (1980). Gastorf et al. reasoned that if evaluation apprehension and distraction produce social facilitation, then the effects of the presence of others should be most pronounced among individuals who are very concerned with evaluation or social comparison. Such people can be described as engaging in Type A behavior patterns. In comparison with Type B

individuals, those classified as Type A are more coronary-prone (Jenkins, 1971; Jenkins, Zyzanski, & Rosenman, 1976), show a greater desire to master the environment (Carver & Glass, 1978; Krantz, Glass, & Snyder, 1974), are more likely to seek comparison information in stressful situations (Dembroski & McDougall, 1978), and exhibit higher arousal levels when faced with a challenge (Dembroski, McDougall, & Shields, 1977).

A version of the Jenkins Activity Survey Form T (Krantz, Glass, & Snyder, 1974) was used to classify Type A or Type B subjects in a mass testing situation. At a later date, each person was individually pretested on either a simple or a complex copying task. During the main task, subjects were either alone, with a coactor working at the same pace, or in the presence of a faster coactor. In addition to the copying measures, a self-report and a recall test of task-irrelevant items assessed the level of distraction. These were obtained following the pretest and main task.

An analysis of difference scores (main test-pretest) revealed that the presence of both equal and superior coactors facilitated the performance of Type A persons on the simple task and impaired copying the complex task. In contrast, the coaction manipulations had a weak and nonsignificant effect on the copying of Type B subjects. The distraction data were consistent with predictions based on the D/C hypothesis. Greater distraction was reported, and more

recall errors were committed in the coaction arrangements. The distraction measures paralleled the copying variable in that the most powerful effects were found among Type A's. Furthermore, the influence of the coactor on distraction did not depend on task complexity.

In a recent review of the literature, Sanders (1981) presented the findings of 47 social facilitation studies, and concluded that the results of every investigation furnished either a priori or post hoc confirmation of the D/C hypothesis. While this approach has been found to have predictive and explanatory value, the hypothesized effects of the presence of others on the distraction indices have sometimes not been obtained. In several articles (Baron, Moore, & Sanders, 1978; Sanders et al., 1978), this lack of significance has been attributed to an insensitivity of the measures that were used. In designing experiments, it may be of value to consider that Gastorf et al. (1980) obtained repeated measures and found enhanced distraction on a question that was not significant when a between-subjects design was used (Baron et al., 1978; Sanders et al., 1978). While most of the data indicate that the presence of others augments distraction, this appears to be either a weak effect or one that is difficult to detect on questionnaires.

#### Effects of the Length of Recall Interval

As a result of Zajonc's theory, most recent social facilitation research has focused on the relationship between

socially induced arousal and the response hierarchy. Drive, however, has been found to have effects other than those derived from a Hull-Spence model. For instance, high drive at the time of trace formation hinders short-term but facilitates long-term recall (e.g., Kleinsmith & Kaplan, 1963). This section will review the research relating this finding to social facilitation. The rationale for this approach is simple. If the mere presence of others is drive inducing, then an audience or a coaction condition should have effects similar to raising other sources of drive.

In 1933, Pessin found that an audience impaired short-term but improved long-term recall. Geen (1973) later explored this phenomenon with a single-trial, paired-associates task. As was predicted, audience effects were dependent on the interval between training and recall. The performance of females observed by the experimenter was inferior to alone subjects if a 2-minute recall interval was used. Being observed facilitated performance when the recall interval was 45 minutes. These findings were later replicated with a male sample by Deffenbacher, Platt, and Williams (1974).

In a related study, Geen (1974) varied both the degree of evaluation as well as the type of observation. Evaluation was manipulated by informing half the subjects that a paired-associates task was correlated with intelligence, and telling the others that the purpose of the study was to evaluate the list. Half of each of these groups learned the list in the

presence of an attentive observer and half before an inattentive person. The low evaluation group was superior if recall was tested 2 minutes after training, but inferior if a 45-minute interval was used. No significant difference was found between the attentive and inattentive conditions. Since the experiment did not include an alone group, it is not clear what effect, if any, the inattentive audience had on arousal.

#### Effects of Feedback on Coaction

One of the effects of Cottrell's (1968, 1972) learned drive approach was to prompt several investigations of the role of feedback in coaction settings (e.g., Carment, 1970a; Martens & Landers, 1972). While feedback has been recognized as an important variable influencing coaction, few studies have attempted to determine how a subject's behavior is affected by the specific feedback he and the other coactor receive. Since in most real-life coaction situations individuals are aware of how well they and other people are performing, a systematic analysis of the effects of feedback would seem to have important implications for the study of coaction.

Beck and Seta (1980) used a simple motor task to examine the effects of feedback on coaction. In their study, the frequency of feedback was manipulated by varying the number of responses required to produce a tone. Coactors received

a tone after every four (FR4) or seven (FR7) responses, and performed in the presence of another person who was either on a FR4 or FR7 schedule. To furnish a comparison to the coaction conditions, some subjects were tested individually on an FR4 and others on an FR7 schedule. The use of different schedules permitted the experimenters to vary the frequency of feedback in a way that was independent of the particular ability level of the subject.

A modified version of learned drive theory was used to predict the effects of frequency of feedback. Beck and Seta reasoned that since competition is involved in the coaction situation, feedback to the subject or other coactor should serve as a cue for competition. The effect of these competitive cues was hypothesized to be an increase in drive level. It was also proposed that drive produced by feedback to the subject would summate with drive generated by feedback to the other coactor. If these hypotheses are correct, then the level of arousal should increase as a function of the number of times feedback was given in the experimental situation. Since on a simple task, performance is correlated with the drive level, subjects were expected to do better the more often feedback occurred.

The results were as predicted. Subjects working in the coaction groups responded more than those tested individually. Within the coaction conditions, the most responses occurred when both subjects received a FR4 schedule, and the fewest



responses when both coactors were on an FR7 schedule. An intermediate level of responding was observed when coactors were assigned different schedules, with no significant difference in the response totals of the FR4 and FR7 members of the coaction pair. Also, schedule differences were found to have little effect when the subjects were tested individually.

It is interesting to compare Beck and Seta's results to those of another coaction study using a simple motor task (Carment, 1970b). In that investigation, the subjects were on a VR15 schedule and worked across from another coactor who was either on a VR5 or a VR15 schedule. Carment's subjects were found to make fewer responses if the other coactor was on a VR5 than a VR15 schedule. This finding is incompatible with the learned drive approach advocated by Beck and Seta, since the effects of social facilitation did not increase the more often the other coactor was "rewarded".

Social comparison theory (Festinger, 1954) can be used to predict the effects of the coaction with feedback paradigm if one makes the logical assumption that the tendency to make comparisons affects the extent of competition. If that is the case, then competition should be greater in the VR15-VR15 condition than the VR15-VR5 condition. Since competition should facilitate performance on a simple task (Cottrell, 1968), social comparison can successfully account for the finding that subjects on a VR15 schedule make more responses when paired with another person on a VR15 schedule than when working alongside a coactor on a VR5 schedule.

While social comparison theory can explain the results of Carment's experiment, it does not predict the findings of the Beck and Seta study. It is not apparent how social comparison would explain the difference between the FR4-FR4 and FR7-FR7 coaction groups, since in both conditions coactors were paired with someone who appeared to be of a similar ability level. Also, if the tendency to compare or evaluate oneself with others decreases as differences in ability increase (Festinger, 1954, p. 120), then evaluative effects should be weakest and subsequently the smallest coaction effects should have been obtained when one coactor received an FR4 schedule and the other an FR7 schedule. Clearly, these predictions were not confirmed.

Social comparison theory therefore accounts for the findings of Carment's experiment, while a learned drive analysis provides the best explanation of Beck and Seta's data. Although the procedures used in the two studies differed in several respects, the most notable difference is in the schedules of the two coactors. In Carment's investigation, the subject on the VR15 schedule would have had to make three times the responses to equalize the number of "rewards" the VR5 coactor received. The schedules used in Beck and Seta's experiment did not produce such a great difference in apparent performance level. No subject was required to make more than 1.75 times the responses of the other in order to equalize the frequency of "reward."

The results of these two experiments indicate that both differences in the ability levels of coactors, and the frequency of feedback are important factors influencing performance. It is reasonable to assume that both of these variables may potentially affect any situation involving coaction with feedback. Whether differences in the ability levels of coactors or the frequency of feedback is the most important factor depends on the methodology used in the particular study. As one might expect, the utility of social comparison theory to explain the effects of coaction with feedback is greatest when comparing a coaction pair of similar abilities to a coaction pair whose ability levels appear to be very dissimilar. This is the situation that existed in Carment's study. Whenever, as in the Beck and Seta investigation, the ability levels of the coactors do not appear to be highly discrepant, the frequency of feedback appears to be a primary factor influencing performance.

One way of testing the preceding analysis would be to manipulate both the frequency of feedback and differences in ability level in the same experiment. In a recent study, Seta (1982) had subjects on an FR7 schedule work in the presence of a coactor who appeared to be of approximately equal ability (FR7-FR7 condition) or with a superior (FR7-FR4 and FR7-FR2 manipulations). Students on an FR7 regimen made more button presses when the other coactor was on an FR4 than an FR7 schedule. This finding supports the hypothesis

that drive increases as a function of the frequency of feedback. Also, students who received an FR7 schedule responded at a higher rate if paired with a coactor on an FR4 than an FR2 regimen. The attenuation of the coaction effect in the FR7-FR2 condition supports the notion that tendencies to compare performances decrease as differences in ability increase.

Although a frequency of feedback/social comparison interpretation may account for the studies reviewed in this section, it would be difficult to explain performance decrements on a simple task from this perspective. Seta pointed out that an early study by Moede (1914) did find that introducing a coactor of inferior ability reduced the rate of tapping. In order to explain downward comparisons, it was suggested that the criteria by which a person's behavior may be judged should be considered. Individuals in the alone arrangement are said to implicitly estimate the performance level that will meet an evaluator's (e.g., experimenter or parent) criterion. Subjects in the coaction manipulation may also be motivated to achieve this absolute criterion, but may also be affected by their performance in relation to the other coactor. When this relative criterion is not too low and is also within a range that the person can reach, the response rate of the coaction condition may exceed that of the alone arrangement.

If the relative criterion cannot be achieved, a good impression could still be made by meeting the absolute criterion. When the absolute criterion is salient, the response rate of the inferior coactor will approximate this performance in the alone condition. On the other hand, if the inferior coactor is not concerned with the absolute criterion, response rates will be below the alone arrangement. A decrease in a superior coactor's performance may also occur, when there is a low relative criterion, and the absolute criterion is not important. In such a situation, the superior may simply respond at a level that equals or slightly exceeds that of the inferior coactor.

#### Range of Cue Utilization

A third attribute of drive, not based on Hull-Spence postulates, is that it determines the area of the environment from which information will be selected. The effects of arousal on the extent of cue use has a long history. Tolman (1948) suggested that a high level of motivation would produce a narrowing of cognitive maps. In 1959, Easterbrook reviewed the studies up to that time and formulated what is commonly referred to as the cue utilization hypothesis. According to Easterbrook, elevations in arousal produce a restriction in the range of cues that are used. When an individual is in a high drive state, there is a tendency for only a few cues, usually those central to solving the task,

to affect performance. At lower arousal levels, there is an increased tendency for performance to reflect the influence of peripheral as well as central stimuli.

If a spectator augments arousal, then the cue utilization hypothesis (Easterbrook, 1959) suggests that the presence of others should reduce the subject's response to peripheral cues. An audience should, relative to an alone arrangement, show less of a decrement when task-irrelevant cues are added to the situation. However, audience conditions should also show less benefit from task-relevant cues. Bruning, Capage, Kozoh, Young, and Young (1968) tested this proposition with a serial learning task containing 15 items. Each item consisted of a row of seven zeros with a target zero set beneath one of the seven. There were three manipulations which varied the type of peripheral cue. In the relevant cue condition each zero had a subscript which identified its serial position ( $0_1 0_2 0_3 0_4 0_5 0_6 0_7$ ). A no-cue arrangement had no subscripts ( $0 0 0 0 0 0 0$ ), and in an irrelevant-cue condition the digits were randomly assigned to the subscripts (e.g.,  $0_3 0_5 0_4 0_1 0_6 0_2 0_7$ ). Half of the subjects in each of the cue manipulations worked in the presence of a passive spectator, and the remainder were alone. As was expected, there was a main effect for type of cue, as subjects in the relevant-cue condition made the most correct anticipations, while those in the irrelevant-cue arrangement made the fewest. The most important finding was that the audience improved

performance in the irrelevant-cue condition, but tended to impair performance when relevant cues were furnished.

Several years later, Geen (1976) used the same task as Bruning et al. to examine the interaction of the presence of others and test anxiety. He reasoned that the effects of an audience on cue restriction would be greater among subjects high in test anxiety. A main effect for cue condition, and the cue x audience x test anxiety interaction were significant. The triple interaction occurred primarily because the type of cue had the smallest effect in the high anxiety-observed manipulation.

#### Impression-Management

One of the most recurrent themes in the social facilitation literature is that subjects working in the presence of others are motivated to make a positive and/or avoid a negative impression. Some of the theoretical positions discussed in this paper that either explicitly or implicitly include this notion are: competition (Triplet, 1898), rivalry (Allport, 1924), evaluation apprehension (Cottrell, 1972), social comparison (Beck & Seta, 1980), and relative criterion (Seta, 1982). Each of the following studies does not support drive theory, but may be interpreted from an impression-management framework.

Borden (1975) reported that students who worked before a male audience made more aggressive responses than those who were in the presence of females. In a second investigation

(Borden, 1975), subjects were more aggressive if they were told a spectator was a karate expert than if they believed he was a member of a pacifist organization. These results indicate that the characteristics of the audience may determine the directional effects of the presence of others on behavior.

An avoidance learning study by Dua (1977) also supports the need for an impression-management approach. Male college students were required to learn a motor response to avoid an electric shock. The subjects either performed alone or with a single spectator during acquisition, extinction, or both. It was found that acquisition was impaired by the presence of the spectator. Since the dominant response is usually incorrect on novel tasks, this finding may be viewed as support for drive theory. The acquisition data are also consistent with an impression-management analysis, if it is assumed that avoidance learning is motivated by fear and that males repressed fear in order to make a good impression.

Once the subjects mastered the task, avoidance responses should be dominant. Energization of the well-learned responses should then result in a slower rate of extinction. Since the spectator reduced the number of trials to achieve extinction, this prediction was not confirmed. However, the rapid extinction in the audience condition supports an impression-management approach. Repression of fear in the presence of the spectator would be expected to accelerate the rate of extinction.



Grush (1978) found that people who played a Prisoners Dilemma game in front of an audience composed of "previous winners" were more competitive than in an alone condition. However, subjects performing before spectators described as members of a "Human Relations Council" were less competitive than in the alone arrangement. Since the subjects were given a pretreatment manipulation designed to heighten competitive choices, it is probable that competition was the dominant response. These results suggest that directive cues provided by the audience may override any tendency of the presence of others to increase the emission of the dominant response.

While the studies by Borden (1975), Dua (1977), and Grush (1978) indicate the value of an impression-management analysis, their procedures are not representative of most social facilitation investigations. In the majority of experiments reviewed in this manuscript, care has been taken to insure that the attitudes or actions of the spectator do not serve as directive cues. Baron, Dua, and Grush took the opposite approach by providing the audience with cues concerning the response that would obtain a favorable evaluation. Therefore, it could be argued that their findings are not relevant to a drive account of social facilitation.

### Objective Self-Awareness

In 1971, Wicklund and Duval proposed a cognitive account of social facilitation. Their theory is based on a distinction

between subjective and objective self-awareness. During subjective self-awareness, the person concentrates his attention outward, and is concerned with other people, objects, and events. In contrast, objective self-awareness is the state in which the individual directs his attention inward upon the self (Duval & Wicklund, 1972). As a result of this inward focusing there is in most instances a realization of a discrepancy between the ideal and actual self (Wicklund, 1975, 1978). Since the person's actual performance is usually below the level he ideally could be doing, the objectively self-aware individual experiences dissatisfaction. The result of such dissatisfaction is held to be an elevation in motivational level. This motivation is hypothesized to lead to an increased effort to be "correct" by one's own standards.

While Duval and Wicklund (1972) consider drive to be an "unnecessary" concept, it is interesting to note that drive theory and objective self-awareness often lead to similar predictions. If the response required on the task is well-rehearsed, then increasing objective self-awareness is hypothesized to facilitate performance. On the other hand, if

the correct response is a poorly trained one (and subordinate to a relatively incorrect but commonly performed one), the person will be likely to show a decrement in performance when confronted with an audience because he will attempt the most correct response possible and will be unable to execute it effectively. (Wicklund & Duval, 1971, p. 341)

According to Wicklund and Duval (1971), a state of objective self-awareness can be produced in several ways. In

addition to being observed by an audience, objective self-awareness can be induced by having subjects listen to a tape-recording of their own voice, or seeing their reflection in a mirror. Wicklund and Duval (1971) did not study social facilitation directly, but instead used the presence or absence of a mirror to manipulate the degree of objective self-awareness. Their task was a simple one that involved copying German prose. As was predicted, more words were copied when the students worked before a mirror.

Liebling and Shaver (1973) also used a prose-copying task to examine the effects of objective self-awareness on performance. Their design was a 2 x 2 in which subjects performed in either the presence or absence of a mirror, and were given instructions to produce either high or low evaluation. An Evaluation x Mirror interaction was found to be statistically significant. The presence of a mirror facilitated performance in the low-evaluation condition, but led to a decrease in the frequency of words copied in the high-evaluation condition.

In their interpretation of these results, Liebling and Shaver (1973) proposed that the mirror had two effects. It caused the subject to attend more to himself and less to the task, and it also produced a motivational increment. The mirror was said to have improved performance in the low evaluation condition because the detrimental effects of decreased attention were more than compensated for by the beneficial

effects of increased motivation. To explain how the mirror could negatively affect performance, it was assumed "that motivation in our high-evaluation condition was nearly maximal" (p. 304). In the high evaluation condition, the mirror's most important effect was to decrease the amount of attention given to the task, and thereby cause a reduction in the number of words copied.

In 1974, Liebling, Seiler, and Shaver conducted a study designed to contrast drive theory and objective self-awareness. Prior to testing, Liebling et al. (1974) had obtained information that their subjects considered smoking to be an undesirable habit. They predicted from objective self-awareness theory that the presence of a mirror should cause the subjects to concentrate on the difference between their actual and ideal selves, and to produce a decrease in smoking. While a mirror may be considered a means of increasing objective self-awareness, it may also be viewed as a way of elevating arousal. According to Liebling et al. (1974) drive theory would predict that the mirror would energize all responses including smoking.

The subjects were not aware that their smoking behavior was being assessed. Instead, they were led to believe that the purpose of the study was to determine people's reactions to different types of music. As the subjects listened to the musical selections, the experimenter secretly recorded a variety of smoking behaviors such as lighting, flicking,

puffing, etc. The results generally supported drive theory, as more smoking was done in the presence than the absence of a mirror.

There has been some controversy concerning the appropriateness of Liebling, Seiler, and Shaver's (1974) conclusions (Liebling, Seiler, & Shaver, 1975; Wicklund, 1975). It could be argued that the design Liebling et al. (1974) used did not allow a proper test of objective self-awareness. Since the instructions did not emphasize smoking behaviors, it is difficult to see why the mirror should cause the subject to focus on his smoking.

Innes and Young (1975) conducted a study examining whether an audience and a mirror have similar effects on behavior. Their design was a  $2 \times 2 \times 2$  in which audience presence or absence, mirror presence or absence, and high versus low evaluational instructions were manipulated. Before beginning a mirror drawing task, the experimenters stressed that the number of errors was to be minimized. Both the time to complete the task, and the number of errors were assessed. The measures were then used in a formula suggested by Fitts (1962) to provide a single dependent variable. The results indicated that an audience and mirror had different effects. In the low evaluation condition, the audience improved performance while the mirror had no effect. An audience  $\times$  mirror interaction was observed among subjects given highly evaluative instructions. A mirror facilitated

mirror drawing if the subjects were alone, but impaired performance in the audience conditions. The results of the Innes and Young study (1975), as well as investigations by Liebling and Shaver (1973) and Liebling et al. (1974), do not support the objective self-awareness theory proposed by Wicklund and Duval (1971). It must therefore be concluded that at the present time objective self-awareness does not provide an adequate account of social facilitation.

### Control Theory

The preceding review of the literature has to a large extent been an examination of drive theories. One indication of the heuristic success of Zajonc's (1965) conceptualizations is that the great majority of audience and coaction investigations now use methodologies that permit the manipulation of generalized drive and the assessment of changes in the response hierarchy. While there is agreement that the presence of others often has drive-like effects (Cottrell, 1972; Sanders, 1981; Weiss & Miller, 1971; Zajonc, 1965, 1980), there remains a great deal of controversy concerning the conditions that are necessary for producing these phenomena. To date, most of the debate in the literature (see Geen & Gange, 1977; Geen, 1980 for reviews) has been between theorists who share the same basic drive framework. Recently, Carver and Scheier (1981a) have advocated an approach to social facilitation that does not employ a drive construct. Their conceptualizations, which developed from

cybernetic accounts of motivation (e.g., Powers, 1973a, 1973b; Wiener, 1948), are most commonly referred to as control theory.<sup>3</sup> This section will first examine some of the basic tenets of control theory, and then apply this analysis to the audience and coaction literature.

Carver and Scheier assert that motivation involves two types of information-processing systems. One of these analyzes and classifies perceptual input. The product of this system is a behavioral standard, which determines the direction of behavior. In any situation, there are a variety of potential standards that a person could adopt. The standard that a subject in an experiment uses is said to depend on such factors as the instructions or some aspects of the task. For example, a person's standard may be established by telling the subject to rapidly copy prose (Carver & Scheier, 1981b). Other examples of standards that may have been adopted in social facilitation experiments include quickly learning a list of nonsense syllables (Cottrell, Rittle, & Wack, 1967), detecting each signal on a vigilance task (Bergum & Lehr, 1963), or staying up with the other cyclists (Turner, 1889).

The second information-processing system regulates the intensity of behavior. This system utilizes a negative feedback loop, and has been called a "TOTE" unit (Miller, Galanter, & Pribram, 1960). The term TOTE stands for Test-Operate-Test-Exit. During the test phase, a comparison is

made between the existing state and the behavioral standard. If a discrepancy is found, the operate phase of the sequence is initiated. The objective of operate is to reduce any differences between the existing state and the standard. If a second test indicates that there is still a discrepancy, operate occurs again. This process can be interrupted but often continues until there is no discriminable difference between the existing state and standard. The frequency with which test and operate sequences are initiated are regarded as the primary determinant of behavioral intensity.

Control theory contends that the matching-to-standard system is initiated most often when attention is directed inward upon the self. Self-focus may be defined as "selectively attending to information that originates within and concerns the self" (Carver & Scheier, 1981a, p. 35). Conversely, directing attention to sources of information that are aspects of the environment is called environment focus. Like Duval and Wicklund (1972), Carver and Scheier (1981a) assume a relatively fixed-capacity model. Manipulations that direct attention outward reduce attention upon the self, and factors that heighten self-focus diminish attention on the environment. The next group of investigations to be reviewed will consider the effects of a variety of manipulations of attentional focus. If a dichotomy based on sources of information is to have utility, then variables that increase self-focus should have effects that are the opposite of factors that heighten environment focus.



There are a great number of ways that the extent of environment focus can be varied. In organisms as diverse as protozoa (e.g., Applewhite & Gardner, 1971; Beck, Note 3) and humans (e.g., Sokolov, 1969; Uno & Grings, 1965), novel stimuli are more likely to attract attention than are repetitive events. Also, aspects of the environment that are complex or in motion are usually examined in more detail than are simple or stationary arrays (Berlyne, 1969). Duval and Wicklund (1973) induced environment focus by having people rotate a turntable as they responded to some hypothetical attribution-of-responsibility items. A control group was shown the turntable, but did not rotate it while the questionnaire was administered. As was predicted, subjects in the turntable condition were less likely to attribute causality to themselves and more likely to see responsibility as lying in the environment. More recently, Morgan and Pollock (1977) reported that beginning marathon runners sometimes attend to the environment in order to reduce the perception of pain. Pennebaker and Lightner (1980) heightened environment focus by exposing subjects to distracting street sounds as they ran on a treadmill. It was found that attention to these noises tended to attenuate the perception of physical symptoms and fatigue.

Over the last ten years, a variety of different means of enhancing self-focus have been established. If subjects are told to concentrate on internal sensations such as nasal

congestion (Pennebaker & Skelton, 1978) or pain (Kanfer & Goldfoot, 1966), the intensity of these feelings is increased. Several studies have produced self-focus by providing feedback concerning bodily activities. Fenigstein and Carver (1978) found that a rhythmic auditory stimulus, identified to the subjects as their heartbeat, augmented self-attributions on a task similar to those used by Duval and Wicklund (1973). Pennebaker and Lightner (1980) reported that requiring students to listen to their own breathing as they ran a treadmill heightened perceptions of fatigue.

Many investigations on the validity of the self-attention construct have used mirrors, audiences, or television cameras to induce self-focus. In one study, Davis and Brock (1975) led students to believe that they were taking a test of creativity. The subjects were asked to read a series of sentences written in a foreign language, and were told to indicate the English pronouns that corresponded to underlined foreign pronouns. More first-person pronouns were chosen if students were faced with a camera, suggesting that the camera augmented self-focus. Geller and Shaver (1976) modified the Stroop color-word test (Stroop, 1938) to investigate the effects of a camera and mirror presented together. Some of the test words were related to the self (e.g., popular), and others were neutral (e.g., initial). Geller and Shaver reasoned that if the camera and mirror activate thoughts about the self, then the effects of these manipulations should

depend on the meanings of the test words. This prediction was confirmed as the mirror and camera increased the color-naming latencies for self-relevant words, but did not influence the subject's response to neutral words.

In Duval and Wicklund's (1972) theory of objective self-awareness, mirrors and audiences were regarded as equivalent manipulations, since both direct attention inward. Some investigations have found that these two stimuli have similar behavioral effects. For instance, Scheier, Fenigstein, and Buss (1974) gave men the opportunity to administer shock to women before an audience, a mirror, or neither. They determined that both the spectators and the mirror reduced the level of aggression. Also, Carver and Scheier (1978) reported a mirror and an audience increased the proportion of self-focus responses on a sentence-completion blank.

In our review of the theory of objective self-awareness, several studies (Innes & Young, 1975; Liebling & Shaver, 1973) were presented that found that mirrors and audiences did not have the same behavioral effects. When examined together, several dissonance experiments also indicate the need to distinguish between self-focus manipulations. Wicklund and Duval (1971) had subjects write a counterattitudinal essay, half of whom were monitored by a television camera. The camera led subjects to adopt a position that more closely reflected the one taken in their essays. Scheier and Carver (1980) also employed an induced-compliance paradigm, but

used a mirror to heighten self-focus. In contrast to Wicklund and Duval (1971), they found that enhancing self-focus reduced the degree of attitude change.

Froming, Walker, and Lopyan (1982) identified a group of students, who were personally opposed to the use of punishment in learning, but believed that most other people favored it. Several weeks later, these same individuals were induced to deliver shocks to another person supposedly performing a concept-formation task. When compared to an alone condition, subjects who worked before a mirror administered less intense shocks, while subjects in the presence of an evaluative audience gave more severe shocks. Thus, a mirror led subjects to behave in a fashion that was consistent with their personal beliefs. On the other hand, the spectators caused subjects to act in a manner that they believed the majority of people would favor.

In conclusion, most of the studies reviewed in this section indicate that a dichotomy based on sources of information is a useful one. In the last decade, a variety of different manipulations of attentional focus have been empirically validated. Requiring subjects to rotate a turntable and presenting distracting street noises are two means of increasing environment focus. Internal bodily sensations, the sound of one's heartbeat or breathing, television cameras, and audiences have been successfully used to heighten self-focus.

There is ample evidence that all manipulations of self-focus are not equivalent. Carver and Scheier and other investigators (e.g., Buss, 1980; Fenigstein, Scheier, & Buss, 1975; Froming, Walker, & Lopyan, 1982) have proposed a theoretical revision that distinguishes between the private and the public self. Mirrors are one means of directing attention to private self-aspects. When an individual focuses on his private self, his personal standard is the one that is used in the negative feedback loop. On the other hand, spectators make persons increasingly aware of their public self aspects. The presence of others makes the subject more sensitive to the fact that he may be making an impression. In an attempt to present himself in a favorable light, the individual sometimes adopts a standard that is different from the one he personally holds.

### Proposal

In 1965, Zajonc theorized that the directional effects of the presence of others on performance depend on the level of task complexity. On simple tasks, in which the dominant response is correct, audience-induced drive is hypothesized to have a beneficial effect on performance. On complex tasks, in which the dominant response is incorrect, the presence of others should impair performance. As the preceding review indicated, the results of many audience and coaction experiments (e.g., Cottrell, Rittle, & Wack, 1967;

Markus, 1978; Zajonc & Sales, 1966; Zajonc, Wolosin, Wolosin, & Loh, 1970) are consistent with the drive theory of social facilitation.

Since Zajonc's version of drive theory was first proposed, significant progress has been made in identifying the environmental factors that determine the magnitude and the direction of audience and coaction effects. In contrast to the extensive work with environmental variables, only sporadic attempts have been made to study the role of individual differences in social facilitation research.

The purpose of this investigation is to determine how one personality factor, test anxiety, interacts with the presence of other persons. To be more specific, an examination will be made of how three theories--drive theory (e.g., Cottrell, 1972; Zajonc, 1965, 1980), Wine's (1980) cognitive-attentional model, and Carver and Scheier's (1981a, 1981b) cybernetic approach--contend that the presence of others affects the performance of high- (HTA) and low-test-anxious (LTA) persons.

While early theories (e.g., Spence & Spence, 1966) of test anxiety attributed debilitating effects to overstimulation, more recent analyses (e.g., Sarason, 1972, 1975, 1978; Wine, 1971, 1980) have involved cognitions rather than emotional arousal to explain the performance deficits of HTA persons. Jeri Dawn Wine has been one of the leading proponents of the need to consider cognitive and attentional

variables in test anxiety research. In a number of influential articles (e.g., Wine, 1971, 1980), she proposed that the performance differences between HTA and LTA persons are largely the result of differences in attentional focus. While working on a task, the LTA individual focuses on task-relevant stimuli. On the other hand, the HTA person becomes excessively focused upon the self, worries about the impression he is creating, and engages in a great deal of self-deprecatory thinking. It is this preoccupation with the self, which distracts the HTA person away from the task, and produces the performance deficits typically observed in HTA individuals.

Like drive theory, Wine considers task difficulty to be an important variable. Simple tasks typically require less attention to task-related stimuli than do complex tasks. For that reason, the self-preoccupation characteristic of HTA persons is most likely to have a detrimental effect if the task is complex. Evaluation is also given a prominent role in Wine's analysis. Since HTA individuals are very concerned with the impressions they create, they are especially likely to become self-focused in evaluative, stressful situations. The most common finding in the test anxiety literature (e.g., Cox, 1966; Ganzer, 1968; Paul & Erikson, 1964; Pederson, 1970; Sarason, Mandler, & Craighill, 1952; Sarason & Palola, 1960) is that HTA persons perform at an inferior level to LTA persons in evaluative settings.

These results are in accord with Wine's contention that test-anxious people become self-preoccupied and ignore task-relevant variables when placed under evaluative scrutiny.<sup>4</sup>

Like the test-anxiety literature, interpretations of social facilitation effects have begun to show more of a cognitive and less of a drive emphasis. One of the most promising of the cognitive approaches is Carver and Scheier's (1981a, 1981b) version of cybernetic theory. According to their analysis, the presence of others directs attention inward. If expectations are favorable, audience induced self-focus is hypothesized to facilitate performance. On the other hand, when expectations are unfavorable, increasing self-awareness has a detrimental influence on performance.<sup>5</sup>

Although expectations are often neither assessed nor intentionally manipulated in social facilitation studies, it is reasonable to assume that they still influence performance. From Carver and Scheier's perspective, task difficulty is a variable that contributes to the expectations that an individual forms. On easy tasks, people usually conclude that their work is satisfactory, and form positive expectations. Conversely, difficult tasks imply that performance is not satisfactory, and lead to negative expectations. Therefore, by augmenting self-focus, an audience should typically facilitate performance on simple tasks and impair performance on complex tasks.



Each of the three theories to be examined in this paper attributes the effects of an audience to a different variable. Drive theorists contend that task difficulty is the key factor; Wine hypothesizes that the audience will interact with the level of test anxiety; and Carver and Scheier propose that the effects of an audience on performance are dependent on expectation level. Since task difficulty is an important determinant of expectations, most audience and coaction experiments can be interpreted with equal facility from a drive or cybernetic perspective. While many test-anxiety studies support Wine's cognitive-attentional model, an individual's level of test anxiety is frequently not assessed in social facilitation research. Therefore, it is not presently clear how much of the social facilitation literature is consistent with Wine's views.

To date, only a few experiments have been conducted in which Carver and Scheier's theory generates predictions that are different from either Zajonc's or Wine's analyses. Although they were not originally designed to examine Carver and Scheier's views, recent studies by Bond (1982) and Geen (1979) provide a test of drive and control theories. After an analysis of these two investigations, an experiment will be reviewed in which Carver and Scheier's and Wine's theories made opposing predictions.

Comparisons of Drive, Cognitive-Attentional, and Control Theories

Bond (1982) presented some subjects with a list of predominantly difficult CVC trigrams that also included a few simple items. Other students received an easier list that contained several complex items. Drive theory predicts that a spectator will facilitate the acquisition of simple items and impair the learning of complex items. This should occur, even though both types of trigrams are on the same list.

Like Carver and Scheier (1981a, 1981b), Bond hypothesized that the effects of an audience depend on the expectations of the individual. Bond reasoned that subjects working on the predominantly easy list would assume that they were performing well. He contended that since success was anticipated, an audience would accelerate the acquisition of both simple and complex trigrams. Conversely, individuals working on the predominantly difficult list should experience embarrassment over their slow rate of learning. Thus, if a person received the predominantly difficult list, an audience was predicted to impair the acquisition of both simple and complex trigrams.

If the list was primarily composed of easy trigrams, the audience did not affect the acquisition of either simple or complex items. This result supports neither Zajonc nor Carver and Scheier. On the predominantly difficult list, both drive and cybernetic theories successfully predicted

that a spectator would impair the learning of complex tri-grams. The most interesting finding was that the audience had a detrimental effect on the acquisition of simple items embedded in the predominantly difficult list. This outcome is contrary to predictions based on drive theory but supports Carver and Scheier's interpretation of social facilitation.

The results of a study by Geen (1979) also permit a comparison between drive and control theories. He varied anticipations of success and failure by providing students false feedback on a task requiring the arrangement of abstract shapes. It was assumed that subjects who were told that they performed well on the initial task would anticipate success on a conceptually related second task. Similarly, subjects who were informed that they had performed poorly were expected to anticipate failing the second task. The second task involved the acquisition of a set of high-competitional paired-associates.

Since the dominant response is incorrect on high-competitional associates (Spence, Farber, & McFann, 1956), Zajonc would predict that an audience would have an adverse effect on second-task performance. This would be the case, regardless of the feedback received following the first task. In contrast, Carver and Scheier hypothesize that the directional effects of a spectator depend on the expectations of the individual. Thus, if subjects succeeded on the initial

task, the presence of others should improve second-task performance. However, if the person failed the first task, an audience would be predicted to have a detrimental impact on second-task performance.

It was found that an observer had a significant negative effect on performance if students failed the initial abstract shapes task. This result supports both Zajonc's and Carver and Scheier's theories. The audience did not produce a significant difference when subjects received a success experience.<sup>6</sup> Geen proposed that these results may indicate that feedback of success is a less potent manipulation than feedback of failure. Furthermore, he suggested that the effectiveness of the success treatment could be increased if the first and second tasks were more similar.

To test this analysis, Geen replicated the first experiment, except that he used a free recall test as the initial task. The findings from Geen's second experiment provide stronger confirmation of Carver and Scheier's theory. The audience facilitated performance on the second PA task, if subjects were told that they did well on the free-recall test. Conversely, if they believed they failed on the initial task, the audience impaired the acquisition of the PA list.

Although the results of the Geen and Bond investigations provide more evidence for a cybernetic than a drive account of social facilitation, one of Carver and Scheier's

hypotheses has received only inconsistent support. Whenever subjects anticipate success, the presence of others often has a weak or nonsignificant (Bond, 1982; Geen, Experiment 1, 1979) effect on performance. Since there are only a few studies that permit a comparison between drive and cybernetic theories, it would be premature to conclude that Carver and Scheier's views will replace drive analyses as the primary conceptual stimulus for social facilitation research. A much stronger case for a cybernetic interpretation of social facilitation could be made if there were additional evidence that even on difficult tasks an audience improves the performance of individuals with positive expectations.

One of the major tenets of Wine's analysis is that the self-focus experienced by HTA individuals has a detrimental impact on performance. In contrast to Wine's views, Carver and Scheier contend that self-awareness only impairs performance if expectations are negative. If expectations are positive, even the performance of HTA people should benefit from inducing self-focus. This is an important hypothesis for judging the relative adequacy of Carver and Scheier's theory since "it does not appear to be predictable from other analyses of test anxiety" (Carver & Scheier, 1981a, p. 238).

Slapion and Carver (1981) conducted an experiment to determine if self-focus necessarily has an adverse effect on HTA persons. They required HTA and LTA college students to work on an intelligence test that was normed on office

personnel. Since the overall level of difficulty was not high for these subjects, it is likely that expectations were favorable. A mirror was reported to have improved the performance of HTA individuals, but did not significantly affect the number of items worked correctly by LTA subjects.

The Slapion and Carver study demonstrated that enhancing self-focus does not always impair the performance of HTA subjects. Also, it brings to the forefront several questions that deserve additional investigation. One important issue concerns the mechanism responsible for producing facilitation among HTA subjects. For instance, why did Slapion and Carver find enhanced performance when most other researchers (e.g., Sarason, 1972, 1975; Wine, 1971, 1980) find a negative correlation between self-awareness and performance? Slapion and Carver suggested that in most other test-anxiety investigations, HTA subjects had unfavorable expectations. On the other hand, the HTA subjects in their study anticipated success. Therefore, by increasing self-focus, the mirror improved performance.

While expectations were probably critical in determining the response of HTA subjects to the mirror, it is likely that other variables were also important in producing Slapion and Carver's results. One key factor could have been the level of task difficulty. Slapion and Carver administered an intelligence test that they believed would be "easy" for college students. As Wine (1980) has pointed out, more

attention is usually required on difficult than easy tasks. Since the Slapion and Carver task did not require a great deal of attention, it could be argued that the task-irrelevant responses characteristic of HTA persons would have little or no effect. Thus, it is possible that the performance deficits Wine hypothesizes in HTA individuals would have been obtained if a more difficult task were used. Carver and Scheier's predictions would be quite different. From their perspective, task difficulty is important primarily because it contributes to the expectations a person forms. If an HTA subject has positive expectations, increasing self-focus should facilitate performance. This should be the case, regardless of whether the task is easy or difficult.

Another difference between Slapion and Carver's investigation and many other test-anxiety studies is the level of evaluation they employed. Most of the evidence that HTA is associated with inferior performance was obtained on tasks that are "ego" involving (e.g., Sarason, Mandler, & Craighill, 1952) or include a strong personal evaluative component. Slapion and Carver's instructions were designed to make the experimental situation "relatively nonevaluative." Hence, their discrepant results could at least in part be attributed to the nonevaluative nature of their instructions.

A related issue concerns the type of self-focus manipulation Slapion and Carver used. While a mirror is a

relatively nonsocial means of augmenting self-focus, it is not known if HTA persons would react in a similar manner to a more social manipulation of self-focus such as an audience. Carver and Scheier's theory predicts that if expectations are positive and the same behavioral standard is salient, mirrors and spectators should both facilitate performance. On the other hand, high-test anxiety often has pronounced deleterious effects (e.g., Ganzer, 1968; Pederson, 1970) when there is an opportunity to make a favorable or unfavorable impression on others. Thus, it is important to determine if social and nonsocial manipulations of self-focus have analogous effects on HTA persons.

Finally, it is not presently clear why the mirror did not have a significant effect on the performance of LTA subjects in the Slapion and Carver study. Slapion and Carver suggest that this result was due to a ceiling. While this explanation is plausible, it should be pointed out that the mean score of the LTA group was slightly higher in the absence of the mirror. Therefore, it is an equally tenable proposition that a more sensitive measure would have revealed that the mirror had a significantly negative effect on the performance of LTA individuals. Since expectations were positive, such a finding would be contrary to one of the basic tenets of Carver and Scheier's theory.

In sum, Carver and Scheier's cybernetic analysis suggests the need for a reinterpretation of the social facilitation



and test-anxiety literatures. However, only a few studies have been conducted in which a cybernetic account makes different predictions from the leading theories in these fields. For that reason, the present investigation will make an additional comparison between Carver and Scheier's analysis, the drive theory of social facilitation, and Wine's cognitive-attentional model of test anxiety.

The preceding discussion examined several issues which need to be considered in the further development of a cybernetic account of social facilitation and test anxiety. In order to extend a cybernetic analysis to other experimental settings, several of these factors will be incorporated into the present study. Since support for Carver and Scheier's theory has been least consistent when expectations were positive, both high- and low-test-anxious subjects will be led to anticipate success. Also, a social self-focus manipulation (audience) will be used, and the instructions will stress that the subjects are being evaluated.

### Hypotheses

The design was a 2 (Audience, Alone) x 2 (High, Low Test Anxiety) x 14 (Trials) in which the Audience and Test Anxiety were between and Trials was a within factor. The subjects were asked to learn the competition paired-associates (PA) list that was originally developed by Spence, Farber, and McFann (1956). This list is primarily composed of items in which the strength of competing incorrect response tendencies is maximized.

When incorrect responses are dominant, drive increments are hypothesized to impair performance. Since drive will be high in the audience and HTA conditions, each of these factors should adversely affect learning the competition list. Therefore, drive theory predicts a main effect for the Audience and Test Anxiety variables in which the audience arrangement is inferior to the alone group and the performance of HTA subjects is below that of LTA individuals.<sup>7</sup>

While drive theorists contend that the effects of an evaluative audience are dependent on the type of task, Wine (1971, 1980) has stressed the importance of attentional differences in HTA and LTA individuals. She hypothesized that HTA persons become self-preoccupied in evaluative situations, and that these task-irrelevant cognitions lead to a deterioration in performance. Since an evaluative observer induces self-focus, her cognitive-attentional model predicts that HTA subjects will perform at a poorer level in the audience than in the alone condition.

As Wine (1980) pointed out, much less is known about the cognitive concomitants of low-test anxiety. She does indicate that LTA people respond to evaluative pressures with cognitions that "are likely to be situationally specific, and active or problem solving in nature" (Wine, 1980, p. 377). If her analysis is correct, then the audience should have a more beneficial or less detrimental influence on the performance of LTA than HTA subjects. Thus, the cognitive-attentional model predicts an Audience x Test Anxiety interaction.

For Carver and Scheier (1981a, 1981b) the effects of increasing self-focus depend on the expectations of the individual. When favorable expectations predominate, self-awareness facilitates performance by augmenting efforts to conform to the standard. In the present study, all subjects will be led to anticipate success, and the audience will serve as a self-focus manipulation. Therefore, Carver and Scheier predicted that the presence of the spectator will accelerate acquisition of the competitive PA list. In contrast to Wine, Carver and Scheier's analysis suggests that in certain circumstances increasing self-focus can enhance the performance of HTA persons. If expectations are positive, an audience should improve the performance of HTA as well as LTA subjects. Therefore, Carver and Scheier's cybernetic model predicts a main effect for the Audience factor, in which the presence of others has a facilitatory effect on performance.

## CHAPTER II

## METHOD

Subjects

One hundred and sixty female undergraduates from High Point College, High Point, North Carolina, completed the A-Trait form of the State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970) during the first week of the semester.<sup>8</sup> Students scoring above and below the median were classified as high- and low-test anxious, respectively.<sup>9</sup> Four to six weeks after completing the inventory, 40 females received extra course credit for participating in the remainder of the experiment. Random assignment was employed with the stipulation that an equal number of subjects were assigned to each condition.

Apparatus and Tasks

An Apple II Plus computer was used to present the verbal materials on a 10-inch video monitor, and to time the occurrence of stimulus events. The first task was a free recall test (Table 1) composed of 30 words. These words referred to common foods, pieces of clothing, means of communication, sports, and animals. This task was chosen because Geen (1979, Experiment 2) had previously used a

Table 1  
Free Recall List

---

Dog	Clock
Blouse	Shirt
Television	Tomato
Volleyball	Mule
Apple	Peas
Spinach	Tennis
Snake	Coat
Strawberry	Telephone
Cabbage	Racing
Football	Plum
Hockey	Turnip
Tie	Bear
Soccer	Orange
Curtains	Cat
Pear	Golf

---

similar test to successfully manipulate expectations on a second PA task. Like Geen, the present investigation used the Spence, Farber, and McFann (1956) competitiveness list as the second task. The list (Table 2) included four associated pairs (e.g., roving-nomad) in which the stimulus term has a high initial association with the response term. Two non-associated pairs (e.g., gypsy-opaque; migrant-agile) were derived from each associated pair. The stimulus words of these pairs were highly synonymous with one another and also with both the stimulus and response terms of an associated pair. However, the stimulus terms of the nonassociated items had little or no initial associative connection with their response words.

### Procedure

The experimenter greeted the subject and took her from the waiting room to the laboratory. She was asked to sit in front of the video monitor and told that the experiment consisted of a free recall and a paired-associates task. The directions stressed "that each of these tasks was designed to accomplish the same objective. That is, to obtain a measure of your verbal memory."

Instructions for the free-recall task were then administered. Subjects were told that 30 words would appear on the monitor and that they were to learn as many of these words as possible. The 30 recall words were displayed concurrently

Table 2  
Competitive Paired-Associate List

Stimulus	Response
*Roving	Nomad
Gypsy	Opaque
Migrant	Agile
*Tranquil	Placid
Quiet	Double
Serene	Headstrong
*Little	Minute
Petite	Yonder
Undersized	Wholesome
*Barren	Fruitless
Arid	Grouchy
Desert	Leading

\*Highly associated word pairs.

and remained on the screen for 1 minute. Then the monitor cleared and the subjects were allowed 3 minutes to write their responses on a blank sheet of paper. While the student was studying the list and writing down her responses, the experimenter was not in the laboratory.

After the recall period, the experimenter returned carrying a large black notebook. He collected the answer sheet and told the student that he was "going to compare your performance to that of other undergraduates from small American colleges such as this one." He then left the room, supposedly to assess her performance. Approximately 3 minutes later he returned to administer feedback. All students were told that their score on the first task was "excellent" and that their performance placed them in the 86-99 percentile range. Furthermore, each subject was instructed that people who do well on the free recall task usually do well on the PA task. The experimenter stated that a "good" performance on the PA task was one in which the person answered more problems correctly than her peers.<sup>10</sup>

The paired-associates instructions were then given. Half of the subjects were alone when they performed the second task. The remaining students (audience condition) were asked by the experimenter if he could watch the work on the PA task. All persons granted this request. From where he sat, the experimenter could easily read the words on the monitor and determine whether the subjects' responses were correct or incorrect.



A 4-4-second rate of presentation and an 8-second intertrial interval were employed. The pairs were shown in three different orders. Responses to the stimulus words were made aloud and into a pencil microphone attached to the side of the monitor. All students were informed that their answers would be tape recorded, and that they would be examined after the end of the school year. This was done to explain the presence of the microphone and to diminish apprehension over having their responses recorded. It was assumed that deferring the assessment of performance for several months would minimize evaluative pressures in the alone condition. Actually the microphone was connected to both a tape recorder and a headset located in an adjacent room. The headset was used by the experimenter to monitor the performance of subjects in the alone arrangement. Fourteen anticipation trials were administered unless the subject first achieved the criterion. The criterion was two consecutive errorless trials.

After completing the PA task, subjects were fully debriefed and thanked for their participation.

## CHAPTER III

## RESULTS

Table 3 shows the mean number of trials required to reach the criterion of two successive errorless runs on the PA task. A 2 (Audience, Alone) x 2 (HTA, LTA) analysis of variance (Table 4) revealed that neither the main effect for the Audience,  $F(1, 36) < 1$ , nor the Anxiety,  $F(1, 36) < 1$ , variable was significant. However, there was a significant criss-cross interaction. Newman-Keul post-hoc tests found that all logical comparisons between means were significant (all  $p < .05$ ).

A 2 (Audience, Alone) x 2 (HTA, LTA) x 14 (Trials) analysis of variance was performed on the number of correct responses to the nonassociated pairs (Tables 5 and 6, Figures 1 and 2). This yielded nonsignificant outcomes for the Audience,  $F(1, 36) < 1$ , and Anxiety,  $F(1, 36) = 2.77$ ,  $p > .05$ , variables, but did reveal a significant main effect for Trials,  $F(13, 468) = 167.79$ ,  $p < .005$ . As expected, fewer mistakes occurred on the later trials, indicating that the subjects were learning the task. Neither the Audience x Trials,  $F(13, 468) < 1$ , nor the Anxiety x Trials,  $F(13, 468) = 1.60$ ,  $p > .05$ , interactions were significant. The Audience x Anxiety interaction was significant,  $F(1, 36) = 19.59$ ,

Table 3

Mean Trials to Criterion on the Paired-Associates Task\*

Audience Variable	Test Anxiety	
	Low	High
Alone	7.4	12.0
Audience	11.0	7.6

\*Subjects who did not achieve criterion, but made an errorless run on the 14th trial were given a score of 15. Subjects who made errors on the 14th trial were assigned a score of 16.

Table 4

Analysis of Variance Applied to Trials to Criterion Data

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>P</u>
A: Audience	1.600	1	1.600	<1	
B: Anxiety	3.600	1	3.600	<1	
A x B: Audience x Anxiety	160.000	1	160.000	16.90	<.005
Error	<u>340.800</u>	<u>36</u>	9.467		
	506.000	39			

Table 5

Mean Percentage of Correct Anticipations of Nonassociated Pairs

Audience Variable	Anxiety Level	<u>Trials</u>														Group Mean
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Alone	High	14	29	40	54	60	73	70	79	83	83	91	94	95	96	68
Audience	High	30	45	63	78	86	90	96	95	99	100	100	100	100	100	84
Alone	Low	38	56	76	84	91	96	100	100	99	100	100	100	100	100	89
Audience	Low	21	44	54	60	74	76	78	86	89	91	95	95	95	96	75

Table 6

## Analysis of Variance Applied to Nonassociated Pairs Data

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>P</u>
A: Audience	1.501	1	1.501	<1	
B: Anxiety	27.016	1	27.016	2.77	>.05
A x B: Aud. x Anx.	190.946	1	190.946	19.59	<.005
Error (a)	350.878	36	9.747		
C: Trials	1683.630	13	129.510	167.79	<.005
A x C: Aud. x Trials	2.474	13	0.190	<1	
B x C: Anx. x Trials	16.059	13	1.235	1.60	>.05
A x B x C: Aud. x Anx. x Trials	42.829	13	3.295	4.27	<.005
Error (b)	<u>361.222</u>	<u>468</u>	0.772		
	2676.555	559			

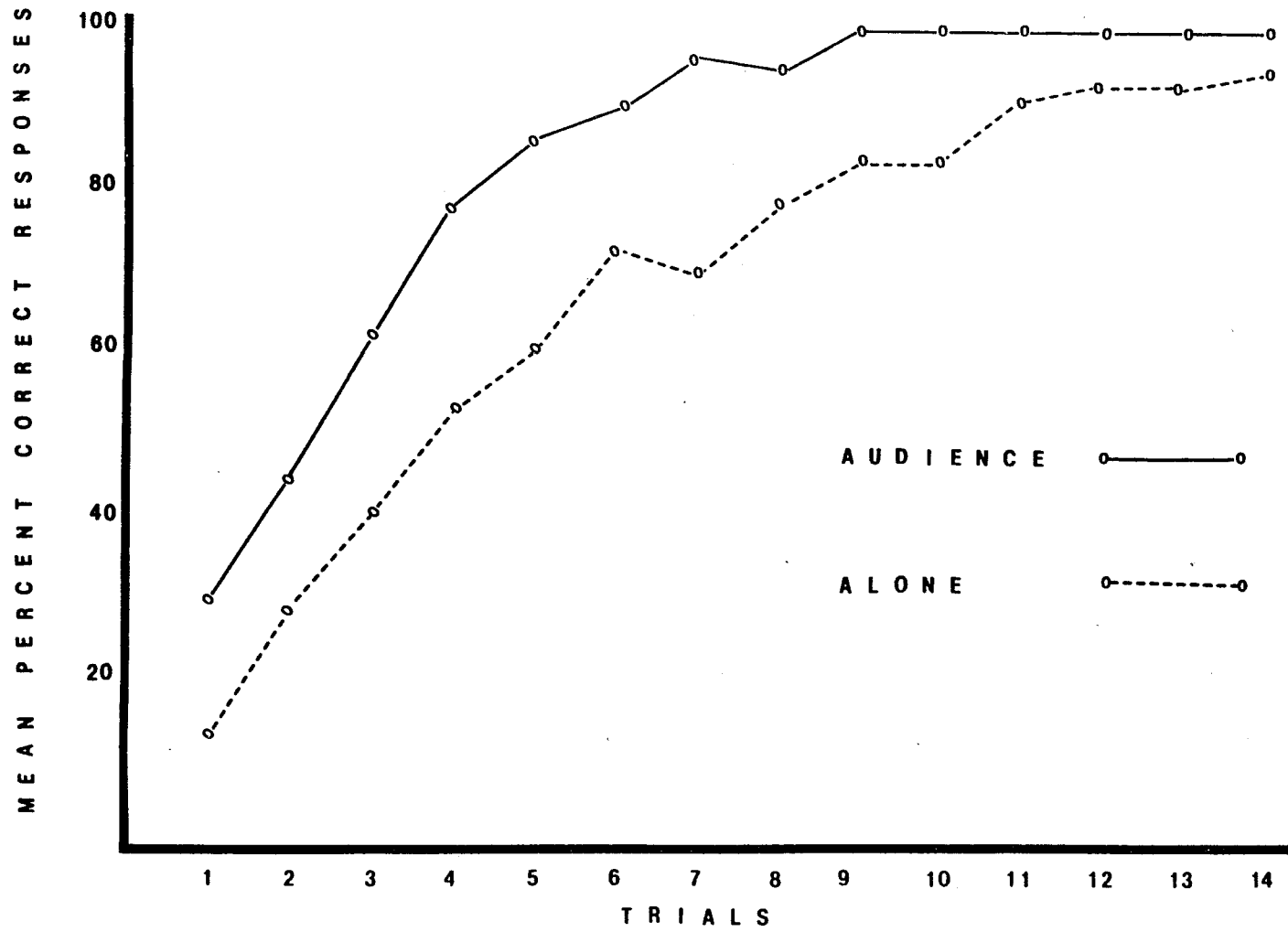


Figure 1. Learning curves for high-test-anxious subjects under alone conditions on nonassociated pairs.

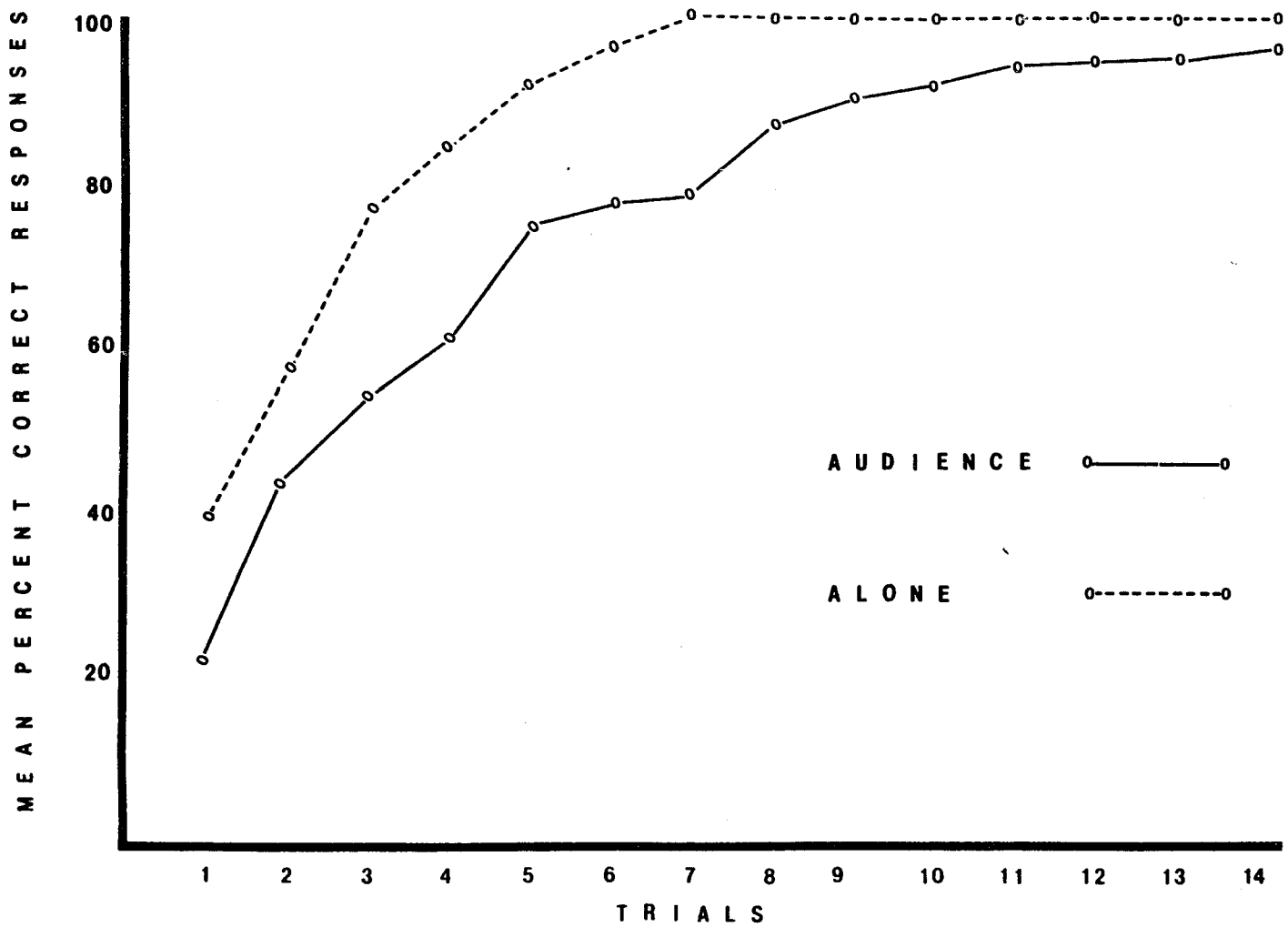


Figure 2. Learning curves for low-test-anxious subjects under audience and alone conditions on nonassociated pairs.

$p < .005$ . Subsequent Newman-Keul tests found that the HTA-Audience condition made significantly more correct anticipations than either the HTA-Alone or the LTA-Audience manipulation (both  $p < .01$ ). Also, the LTA-Alone arrangement was superior to the LTA-Audience and HTA-Alone groups (both  $p < .01$ ). Thus, both the trials to criterion and the number of correct response measures showed the same interaction. An Audience x Anxiety x Trials interaction,  $F(13, 468) = 4.27$ ,  $p < .005$ , was also recorded. This occurred primarily because the HTA-Audience and LTA-Alone groups approached a ceiling on the later trials.<sup>11</sup>



Table 7

Mean Percentage of Correct Anticipations of Associated Pairs

Audience Variable	Anxiety Level	<u>Trials</u>														Group Mean
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	
Alone	High	25	48	65	60	73	75	90	88	90	95	93	98	100	98	78
Audience	High	50	70	88	85	93	98	100	100	98	100	100	100	100	100	91
Alone	Low	53	78	90	88	83	93	93	98	100	98	100	100	100	100	91
Audience	Low	50	58	60	68	75	93	85	90	95	98	100	100	100	100	84

Table 8

## Analysis of Variance Applied to Associated Pairs Data

Source	<u>SS</u>	<u>df</u>	<u>MS</u>	<u>F</u>	<u>P</u>
A: Audience	2.064	1	2.064	1.08	>.05
B: Anxiety	1.207	1	1.207	<1	
A x B: Aud. x Anx.	23.207	1	23.207	12.15	<.005
Error (a)	68.742	36	1.910		
C: Trials	226.886	13	17.452	56.80	<.005
A x C: Aud. x Trials	3.486	13	.268	<1	
B x C: Anx. x Trials	5.443	13	.419	1.36	>.05
A x B x C: Aud. x Anx. x Trials	15.100	13	1.162	3.78	<.005
Error (b)	<u>143.800</u>	<u>468</u>	.307		
	489.935	559			

## CHAPTER IV

## DISCUSSION

When, as in the present experiment, incorrect responses are dominant, elevations in drive are hypothesized to impair performance (e.g., Cottrell, 1968; Good, 1973; Weiss & Miller, 1971; Zajonc, 1965). Although the finding that the audience adversely affected the performance of LTA subjects is consistent with a drive analysis, the facilitatory effect of the spectator on HTA persons is contrary to drive theory. These results contribute to a growing body of research (e.g., Bond, 1982; Geen, 1979) indicating that a drive construct alone is insufficient to account for the effects of an evaluative audience.

Wine (1971, 1980) proposed that HTA persons respond to evaluative situations by becoming preoccupied with cognitions concerning the self. In comparison, the cognitions of LTA individuals are hypothesized to be directed toward solving the task. As the cognitive attentional model hypothesized, an Audience x Test Anxiety interaction was found. However, the form of the interaction was opposite to that predicted by Wine's analysis.

The finding that is most difficult to reconcile with Wine's views is the facilitatory effect of the spectator on the performance of HTA subjects. Although providing no

support for Wine's theory, this result does not necessarily indicate that the spectator failed to produce task-irrelevant cognitions in HTA persons. Indeed, it would be unreasonable to suggest that the subjects did not pause to consider the impression that they were creating on the audience. However, any negative effect this may have had on performance must have been relatively small and was overshadowed by more important factors.

One interpretation of the HTA data that is consistent with Carver and Scheier's (1981a) theory is that self-focus manipulations have two effects on performance. First, as Wine has stressed, self-focus adversely affects performance by drawing attention away from the task. In most situations the purely distractive effect of a spectator probably has only a minimal influence on performance. Usually, the most pronounced effect of self-focus is that it leads subjects to assess their outcome expectancies. If HTA persons have favorable expectations, audience induced self-focus should augment efforts to attain the standard, producing an overall facilitatory effect on performance.

Carver and Scheier (1981a, 1981b) hypothesized that the directional effects of an audience depend on the expectations of the individual. Given that expectations were positive, their analysis successfully predicted the facilitatory effect of the audience on the HTA subjects. This result extends a cybernetic analysis of test-anxious persons to experimental

settings employing a difficult task, an evaluative context, and a social self-focus manipulation. While Carver and Scheier's interpretation was the only one of the three theories to predict the beneficial effect of the spectator on HTA individuals, the detrimental effect of the audience on LTA subjects is contrary to their analysis.

Since neither drive theory, Wine's cognitive-attentional model, nor Carver and Scheier's analysis predicted the results of this investigation, it is necessary to speculate on alternative explanations. Although Carver and Scheier's theory is not consistent with all of the data, a cybernetic framework can still incorporate the present findings. One reason that Carver and Scheier's theory may have failed to predict the results of this experiment is that they are incorrect in their assessment of the relationship between expectations and the approach-withdrawal decision.

Carver and Scheier proposed that if expectations are positive, individuals attempt to match the standard, and that if expectations are negative, mental or physical withdrawal is initiated. A modification of this hypothesis that will be considered in some detail is that an inverted U provides a more accurate description of the relationship between expectations and the probability of attempted discrepancy reduction. In other words, if expectations are moderate, approach tendencies predominate and persons attempt to

achieve the standard. However, if expectations are either extremely positive or extremely negative, withdrawal is the most powerful tendency and individuals do not attempt to meet the standard.

A study by Weiner, Heckhausen, Meyer, and Cook (1972) provides support for the hypothesis that expectations and attempted discrepancy reduction are curvilinearly related. The purpose of their investigation was to measure the relationship between task difficulty and attributions of effort as a determinant of outcome. The level of difficulty was manipulated by indicating the percentage of others who succeeded at the task (10%, 30%, 50%, 70%, and 90%). Subjects rank-ordered the tasks in terms of how important effort would be in determining whether a success or failure occurred. In addition, they were asked on what task it would be the best strategy to try hard. Effort was found to be a more important causal factor at tasks of intermediate difficulty, and less significant when the subjective probability of success,  $P(S)$ , was very high or very low. Similarly, subjects believed that the most functional strategy was to exert maximum effort when there was a moderate likelihood of success.

Although Weiner et al. did not actually measure effort expended on a task, their results suggest that efforts to attain the standard would be greatest at moderate  $P(S)$  levels. If the likelihood of success is perceived to be very low,

people tend to give up and withdraw. When the probability of success is thought to be very high, people tend to relax, conserve energy, and to some extent withdraw from the task.

In order to apply the curvilinear function to test anxiety research, it is necessary to take into account: (1) the effect of situational factors on expectations, (2) differences in how high- and low-test-anxious persons assess their probability of success, and (3) the influence of the audience on self-focus. In the present study, success feedback following the free-recall test was a positive situational factor. The purpose of this procedure was to lead both high- and low-test-anxious subjects to anticipate that success rather than failure was the most likely outcome on the paired-associate task.

One of the most well-established findings (e.g., Deffenbacher, 1978; Sarason & Stoops, 1978; Trapp & Kausler, 1958) in the test-anxiety literature is that in the same environment HTA persons usually have less favorable expectations than LTA individuals. That is, in comparison with LTA persons, HTA individuals are more pessimistic or less optimistic in assessing their chances of success. When, as in this experiment, situational factors lead to favorable expectations, HTA subjects will be somewhat less positive and more moderate in their expectations of LTA subjects.

The curvilinear relationship between expectations and attempted discrepancy reduction considered in this manuscript

suggests that efforts to approach or attempt to attain the standard are strongest at intermediate expectation levels. When expectations are extreme, withdrawal from the task is the prevailing tendency. Given that HTA persons had moderately favorable expectations, they should be more likely to attempt to meet the standard than to withdraw from the task. Conversely, because they had extremely favorable expectations, withdrawal was the prepotent response among LTA individuals.

If as cyberneticists claim, a spectator augments self-focus, then the directional effects of the presence of others on performance will depend on whether the prevailing tendency is to approach or to withdraw from the task. Since approach was the predominate tendency among HTA persons, the HTA-Audience arrangement was superior to the HTA-Alone condition. Among LTA individuals, withdrawal was the prepotent response. Therefore, the LTA-Alone group made fewer errors than the LTA-Audience manipulation. It should be noted that while this interpretation handles the effects of an audience on high- and low-test-anxious persons, it does not explain performance differences between the HTA-Alone and LTA-Alone conditions.

The Audience x Test Anxiety interaction found in the present study was opposite to that reported by most investigators. In this experiment evaluation facilitated the performance of HTA individuals and impaired the performance



of LTA persons. The most common finding in the literature (e.g., Cox, 1966; Ganzer, 1968; Paul & Erikson, 1964; Pederson, 1970; Sarason, Mandler, & Craighill, 1952) is that evaluation has a more beneficial or at least less detrimental effect on the performance of low- than high-test-anxious subjects. Although such an analysis would be post hoc, expectational differences could account for these discrepant results. While expectations were positive in the present investigation, many test-anxiety studies are designed to generate negative expectations. For example, subjects have been given feedback indicating that failure would be the probable outcome on an upcoming task or receive a novel or difficult assignment.

The preceding interpretation contends that in the same environment HTA persons are more pessimistic than LTA individuals. Thus, when situational factors suggest failure, the expectations of HTA persons will be extremely negative, and the expectations of LTA individuals will be closer to the intermediate range. When expectations are moderate, approach or attempting to match the standard is hypothesized to be the predominate tendency. Therefore, if situational factors imply failure, an audience or other self-focus manipulations should improve the performance of low-test-anxious persons. On the other hand, withdrawal is the prevailing response when expectations are extremely negative. Thus, the presence of others impairs the performance of HTA individuals if situational factors are negative.

The preceding interpretation hypothesized that expectations and the probability of attempted discrepancy reduction are curvilinearly related. Since expectations are an important factor contributing to anxiety or arousal, this proposition is similar to the Yerkes-Dodson (1908) law.<sup>12</sup>

A second account of the present study assumes that: (1) there is an inverted U relationship between anxiety and performance and that (2) the audience served to reduce anxiety. If the spectator attenuated anxiety, anxiety should be most intense in the HTA-Alone and least intense in the LTA-Audience conditions. Moderate levels of anxiety should be found in the HTA-Audience and the LTA-Alone arrangement. Given that anxiety and performance follow a curvilinear function, performance in the HTA-Alone and LTA-Audience groups should be inferior to the HTA-Audience and LTA-Alone conditions.

There is substantial support (e.g., Beck, 1988; Cofer & Appley, 1964; Yerkes & Dodson, 1908) for the premise that an inverted U describes the relationship between anxiety or arousal and performance. Also, experiments using social support manipulations have reported results suggesting that anxiety reduction occurred. Social support has been defined as "the existence or availability of people with whom one can associate and on whom one can rely" (Sarason, 1981, p. 101).

Geen (1977) tested high- and low-test-anxious persons in an alone, an evaluative audience, and an audience

arrangement in which the purpose of the spectator was to provide assistance on a later task. The offer of help or social support attenuated the detrimental impact of the audience on the performance of both HTA and LTA subjects. The magnitude of this effect was greatest among HTA persons. Similarly, Sarason (1981, Experiment 2) found that an emphatic and encouraging experimenter increased the number of difficult anagrams solved by HTA persons. Social support had a nonsignificant effect on LTA subjects.

In the Geen and Sarason investigations, the experimenter actively intervened in offering assistance or words of encouragement. If the experimenter-spectator decreased anxiety in the present study, then a less blatant means of social support must have been involved. In the current investigation, the experimenter communicated the favorable outcome of the free recall test and indicated that a success would likely occur on the PA task. Thus, by a conditioning process, the experimenter's presence during the second task may have reassured the subject, producing a decrease in anxiety. Had the same spectator been previously associated with anxiety-augmenting conditions, his presence during the PA task would have created social anxiety.

In conclusion, the first interpretation proposed to account for the results of this study contends that the effect of the audience was due to an increase in self-focus. The second explanation hypothesizes that the spectator was

previously associated with anxiety reduction and therefore came to attenuate anxiety on the subsequent PA task. A straightforward extension of this conditioning viewpoint is that an audience previously paired with anxiety-inducing circumstances will heighten anxiety on later tasks.

In the present study, increases in self-focus and social support had the same directional effect on performance. Future research should examine situations in which the self-focus and social support/anxiety interpretations make different predictions. For example, consider the case of a highly test-anxious person who anticipates failure on an upcoming task. If the spectator's most potent effect is to enhance self-focus, then the audience condition should be inferior to the alone arrangement. On the other hand, if the spectator was previously associated with anxiety reduction, a socially supportive audience should improve performance.

The results of this study have implications for applied as well as basic research. One product of test-anxiety investigations has been the development and the application of therapeutic techniques (e.g., Goldfried, 1971; Meichenbaum, 1972; Wolpe, 1958) designed to minimize anxiety. These therapies are based on the premise that high-test anxiety is a condition that is detrimental to the individual and should be alleviated. Presumably, if the cognitions and emotionality characteristic of test anxious persons became more like that of low-test-anxious individuals, then performance would improve and a more positive affective state would

be experienced. At the very least, the findings of this investigation indicate that high-test anxiety is a characteristic with positive as well as negative aspects. If situational factors are favorable, high-test-anxious persons flourish under evaluative scrutiny and outperform low-test-anxious individuals.

## Footnotes

<sup>1</sup>It is of historical interest that Triplett (1898) is often given credit for performing the first experiment in social psychology (e.g., Cottrell, 1977; Tedeschi & Lindskold, 1976). Exactly how this misperception was initiated is not clear. Certainly, Triplett was aware of prior experimental work, and discusses Fééré's (1887) research in some detail. Triplett also mentions that in 1889 Dr. E. B. Turner compared timed trials of paced and unpaced bicycle races, and that Manouvrier "in his dynamometric studies found his subject increased the energy of his movement when spectators were present" (p. 530). Since the research of Fééré, Turner, and Manouvrier all meet the basic criteria of an experiment (Campbell & Stanly, 1963), Triplett should more properly be considered an early rather than the first experimental social psychologist.

<sup>2</sup>The Hull-Spence Model was actually proposed in terms of excitatory potential rather than response strength. When applied to the social facilitation literature, it can be assumed that excitatory potential parallels response strength.

<sup>3</sup>In this paper the terms cybernetic and control theory will refer to the work of Carver and Scheier unless stated otherwise.

<sup>4</sup>Wine (1980) describes the HTA person as highly concerned with evaluation from others, focused on self and social evaluative cues, task-avoidance, preoccupied negative cognitions, having a low belief in self-efficacy, and having "static" cognitions which interfere with problem solving. In contrast, the LTA individual is concerned with determining the appropriate action in the current situation, is focused on the task, has a high belief in self-efficacy, and employs "active" problem-solving cognitions.

<sup>5</sup>While expectations vary along a continuum, at any given moment the individual's decision to withdraw or to pursue the standard is a dichotomous one. In other words, the person is viewed as acting in a similar manner to a computer which receives analog data and uses the information to make a digital response.

<sup>6</sup>This finding is consistent with Weiss and Miller's (1971) contention that a spectator will not augment drive if the subject anticipates a positive outcome.

<sup>7</sup>The versions of drive theory proposed by Zajonc (1965, 1980), Cottrell (1968, 1972), Good (1973), and Sanders and Baron (1975) make these predictions. Since all subjects were led to anticipate success, Weiss and Miller (1971) hypothesize that the audience would not affect performance.

<sup>8</sup>Spielberger et al. reported that after 104 days test-retest correlations on the A-Trait scale were .77 for undergraduate females and .73 for males. Alpha reliabilities of .89 were obtained with college women and .90 with college men, indicating a high degree of internal consistency. Validity has been established in a variety of ways. For example, A-Trait scores had a .75 correlation with the IPAT Anxiety Scale (Cattell & Scheier, 1963) and a .80 correlation with the Taylor Manifest Anxiety Scale (Taylor, 1953). Correlations between A-Trait scores and subscales on the Personality Research Form (Jackson, 1967) and Edwards Personal Preference Schedule (Edwards, 1954) were generally as predicted.

<sup>9</sup>The median for the High Point College females tested on the A-Trait scale was 38. Spielberger et al. found a median of 37 for 648 Florida State University undergraduate females. Thus, the medians of the two groups were similar.

<sup>10</sup>Seta and Hassan (1980) demonstrated that it is important to consider whether a subject's standard or criterion is to exceed their own previous performance or the performance of other individuals. These instructions were designed to insure that the social criterion predominated.

<sup>11</sup>The practice of analyzing nonassociated and associated pairs separately has been followed in most studies using the competitive PA list (e.g., Cottrell, Rittle, Wack, 1967; Spence, Farber, & McFann, 1956). The results of the analyses of variance on nonassociated (Tables 5 and 6) and associated (Tables 7 and 8) pairs paralleled one another.

<sup>12</sup>A number of theorists (e.g., Deffenbacher, 1980; Liebert & Morris, 1967; Osterhouse, 1972) have proposed that worry and emotionality constitute the basic components of test anxiety.

## Reference Notes

1. Goldman, C. An examination of social facilitation.  
Unpublished manuscript. University of Michigan,  
1967.
2. Zajonc, R. B. Compresence. Paper presented at the  
meeting of the Midwestern Psychological Association,  
Cleveland, May 1972.
3. Beck, H. P. Dishabituation in the protozoan Spirostomum  
ambiguum. Paper presented at the Southeastern  
Annual Behavior Society, 1976.



## BIBLIOGRAPHY

- 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. Boston: Houghton Mifflin, 1924.
- Applewhite, P., & Gardner, F. A theory of protozoan habituation. Nature, 1971, 230, 285-287.
- Baron, R. S., Moore, D. L., & Sanders, G. S. Distraction as a source of drive in social facilitation research. Journal of Personality and Social Psychology, 1978, 36, 816-824.
- Beck, H. P., & Seta, J. J. The effects of frequency of feedback on a simple coaction task. Journal of Personality and Social Psychology, 1980, 38, 75-80.
- Beck, R. C. Motivation: Theories and principles. Englewood Cliffs, N.J.: Prentice-Hall, 1978.
- Bergum, B. O., & Lehr, D. J. Vigilance performance as a function of paired monitoring. Journal of Applied Psychology, 1962, 46, 341-343.
- Bergum, B. O., & Lehr, D. J. Effects of authoritarianism on vigilance performance. Journal of Applied Psychology, 1963, 47, 75-77.
- Berlyne, D. E. Conflict, arousal, and curiosity. New York: McGraw-Hill, 1960.
- Blank, T. O., Staff, I., & Shaver, P. Social facilitation of word associations: Further questions. Journal of Personality and Social Psychology, 1976, 34, 725-733.
- Bond, C. F. Social facilitation: A self-presentational view. Journal of Personality and Social Psychology, 1982, 42, 1042-1050.
- Borden, R. J. Witnessed aggression: Influence of an observer's sex and values on aggressive responding. Journal of Personality and Social Psychology, 1975, 31, 567-573.

- Bruning, J. L., Capage, J. E., Kozoh, G. F., Young, P. F., & Young, W. E. Socially induced drive and range of cue utilization. Journal of Personality and Social Psychology, 1968, 9, 242-244.
- Burnham, W. H. The groups as a stimulus to mental activity. Science, 1910, 31, 761-767.
- Buss, A. H. Self-consciousness and social anxiety. San Francisco: Freeman, 1980.
- Campbell, D. T., & Stanly, J. C. Experimental and quasi-experimental designs for research. Chicago: Rand McNally, 1963.
- Carment, D. W. Rate of simple motor responding as a function of coaction, competition, and sex of the participants. Psychonomic Science, 1970, 19, 340-341. (a)
- Carment, D. W. Rate of simple motor responding as a function of differential outcomes and the actual and implied presence of a coactor. Psychonomic Science, 1970, 20, 115-116. (b)
- Carment, D. W., & Latchford, M. Rate of simple motor responding as a function of coaction, sex of the participants, and the presence or absence of the experimenter. Psychonomic Science, 1970, 20, 253-254.
- Carver, C. S., & Glass, D. C. Coronary-prone behavior pattern and interpersonal aggression. Journal of Personality and Social Psychology, 1978, 36, 361-366.
- Carver, C. S., & Scheier, M. F. Self-focusing effects of dispositional self-consciousness, mirror presence, and audience presence. Journal of Personality and Social Psychology, 1978, 36, 324-332.
- Carver, C. S., & Scheier, M. F. Attention and self-regulation: A control-theory approach to human behavior. New York: Springer-Verlag, 1981. (a)
- Carver, C. S., & Scheier, M. F. The self-attention-induced feedback loop and social facilitation. Journal of Experimental Social Psychology, 1981, 17, 545-568. (b)
- Cattell, R. B., & Scheier, I. H. Handbook for the IPAT Anxiety Scale (2nd ed.). Champaign, Ill.: Institute for Personality and Ability Testing, 1963.

- Clark, N., & Fouts, G. T. Effects of positive, neutral, and negative experiences with an audience on social facilitation in children. Perceptual and Motor Skills, 1973, 37, 1008-1010.
- Cofer, C. N., & Appley, M. H. Motivation: Theory and research. New York: Wiley, 1964.
- Cottrell, N. B. Performance in the presence of other human beings: Mere presence, audience, and affiliation effects. In E. C. Simmel, R. 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. International Encyclopedia of Psychiatry, Psychology, Psychoanalysis, and Neurology. Social Facilitation, 1977, 10, 283-285.
- Cottrell, N. B., Rittle, R. H., & Wack, D. L. The presence of an audience and list type (competitional or non-competitional) as joint determinants of performance in paired-associates learning. Journal of Personality, 1967, 35, 425-434.
- Cottrell, N. B., Wack, D. L., Sekerak, G. J., & Rittle, R. H. Social facilitation of dominant responses by the presence of an audience and the mere presence of others. Journal of Personality and Social Psychology, 1968, 9, 245-250.
- Cox, F. N. Some effects of test anxiety and presence or absence of other boys' performance on a repetitive motor task. Journal of Experimental Child Psychology, 1968, 6, 1-12.
- Daly, H. B. Learning of a hurdle-jump response to escape cues paired with reduced reward or frustrative non-reward. Journal of Experimental Psychology, 1969, 79, 146-157.
- Dashiell, J. F. An experimental analysis of some group effects. Journal of Abnormal and Social Psychology, 1930, 25, 190-199.

- Dashiell, J. F. Experimental studies of the influence of social situations on the behavior of individual human adults. In C. Murchison (Ed.), Handbook of social psychology. Worcester, Mass.: Clark University Press, 1935.
- Davis, D., & Brock, T. C. Use of first person pronouns as a function of increased objective self-awareness and prior feedback. Journal of Experimental Social Psychology, 1975, 11, 381-388.
- Deffenbacher, J. L. Worry, emotionality, and task-generated interference in test anxiety: An empirical test of attentional theory. Journal of Educational Psychology, 1978, 70, 248-254.
- Deffenbacher, J. L. Worry and emotionality in test anxiety. In I. G. Sarason (Ed.), Test anxiety: Theory, research, and application. Hillsdale, N.J.: Erlbaum, 1980.
- Deffenbacher, K. A., Platt, G. J., & Williams, M. A. Differential recall as a function of socially induced arousal and retention interval. Journal of Experimental Psychology, 1974, 103, 809-811.
- Dembroski, T. M., & McDougall, J. M. Stress effects on affiliation preferences among subjects possessing the Type A coronary-prone behavior pattern. Journal of Personality and Social Psychology, 1978, 36, 23-33.
- Dembroski, T. M., McDougall, J. M., & Shields, J. L. Physiologic reactions to social challenge in persons evidencing the Type A coronary-prone behavior pattern. Journal of Human Stress, 1977, 3, 2-9.
- Dua, J. K. Effect of an audience on the acquisition and extinction of avoidance. British Journal and Social and Clinical Psychology, 1977, 16, 207-212.
- Duval, S., & Wicklund, R. A. A theory of objective self-awareness. New York: Academic Press, 1972.
- Duval, S., & Wicklund, R. A. Effects of objective self-awareness on attribution of causality. Journal of Experimental Social Psychology, 1973, 9, 17-31.
- Easterbrook, J. A. The effect of emotion on cue utilization and the organization of behavior. Psychological Review, 1959, 66, 183-201.
- Edwards, A. L. Manual: Edwards Personal Preference Schedule. New York: Psychological Corp., 1954.

- Escenbrenner, A. J. Effects of intermittent noise on the performance of a complex psychomotor task. Human Factors, 1971, 13, 59-63.
- Fenigstein, A., & Carver, C. S. Self-focusing effects of false heartbeat feedback. Journal of Personality and Social Psychology, 1978, 36, 1241-1250.
- Fenigstein, A., Scheier, M. F., & Buss, A. H. Public and private self-consciousness: Assessment and theory. Journal of Consulting and Clinical Psychology, 1975, 43, 522-527.
- Féré, C. Sensation et mouvement, études expérimentales de psycho-mécanique. Paris: F. Alcan, 1887.
- Festinger, L. A theory of social comparison processes. Human Relations, 1954, 7, 117-140.
- Fitts, P. M. Factors in complex skill training. In R. Glaser (Ed.), Training research and education. Pittsburgh: University of Pittsburgh Press, 1962.
- Froming, W. J., Walker, G. R., & Lopyan, K. J. Public and private self-awareness: When personal attitudes conflict with societal expectations. Journal of Experimental Social Psychology, 1982, 18, 476-487.
- Ganzer, V. G. Effects of audience presence and test anxiety on learning and retention in a serial learning situation. Journal of Personality and Social Psychology, 1968, 8, 194-199.
- Gastorf, J. W., Suls, J. M., & Sanders, G. S. Social facilitation and the Type A coronary-prone behavior pattern. Journal of Personality and Social Psychology, 1980, 38, 773-780.
- Gates, M. F., & Allee, W. C. Conditioned behavior of isolated and grouped cockroaches in a simple maze. Journal of Comparative Psychology, 1933, 15, 331-358.
- Geen, R. G. Effects of being observed on short- and long-term recall. Journal of Experimental Psychology, 1973, 100, 395-398.
- Geen, R. G. Effects of evaluation apprehension on memory over intervals of varying length. Journal of Experimental Psychology, 1974, 102, 908-910.
- Geen, R. G. Test anxiety, observation, and range of cue utilization. British Journal of Social and Clinical Psychology, 1976, 15, 253-259.

- Geen, R. G. The effects of anticipation of positive and negative outcomes on audience anxiety. Journal of Consulting and Clinical Psychology, 1977, 45, 715-716.
- Geen, R. G. Effects of being observed on learning following success and failure experiences. Motivation and Emotion, 1979, 3, 355-371.
- Geen, R. G. The effects of being observed on performance. In P. B. Paulus (Ed.), Psychology of group influence. Hillsdale, N.J.: Erlbaum Associates, 1980.
- Geen, R. G., & Gange, J. J. Drive theory of social facilitation: Twelve years of theory and research. Psychological Bulletin, 1977, 84, 1267-1288.
- Geller, V., & Shaver, P. Cognitive consequences of self-awareness. Journal of Experimental Social Psychology, 1976, 12, 99-108.
- Goldfried, M. R. Systematic desensitization as training in self-control. Journal of Consulting and Clinical Psychology, 1971, 37, 228-234.
- Good, K. J. Social facilitation: Effects of performance anticipation, evaluation, and response competition on free association. Journal of Personality and Social Psychology, 1973, 28, 270-275.
- Grush, J. E. Audiences can inhibit or facilitate competitive behavior. Personality and Social Psychology Bulletin, 1978, 4, 119-122.
- Henchy, 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.
- Houston, B. K., & Jones, T. M. Distraction and Stroop color-word performance. Journal of Experimental Psychology, 1967, 74, 54-56.
- Hull, C. L. Principles of behavior. New York: Appleton-Century-Crofts, 1943.
- Hunt, P. J., & Hillery, J. M. Social facilitation in a coaction setting: An examination of the effects over learning trials. Journal of Experimental Social Psychology, 1973, 9, 563-571.

- Innes, J. M. The effect of presence of co-workers and evaluative feedback on performance of a simple reaction time task. European Journal of Social Psychology, 1972, 2, 466-470.
- Innes, J. M., & Young, R. F. The effect of presence of an audience, evaluation apprehension and objective self-awareness on learning. Journal of Experimental Social Psychology, 1975, 11, 35-42.
- Jackson, D. N. Personality Research Form Manual. Goshen, N.Y.: Research Psychologists Press, Inc., 1967.
- Jenkins, C. D. Psychologic and social precursors of coronary disease. New England Journal of Medicine, 1971, 284, 244-255.
- Jenkins, C. D., Zyzanski, S. J., & Rosenman, R. H. Risk of new myocardial infarction in middle-aged men with manifest coronary heart disease. Circulation, 1976, 53, 342-347.
- Kanfer, F. H., & Goldfoot, D. A. Self-control and tolerance of noxious stimulation. Psychological Reports, 1966, 18, 79-85.
- Kleinsmith, L. J. & Kaplan, S. Paired-associates learning as a function of arousal and interpolated interval. Journal of Experimental Psychology, 1963, 65, 190-193.
- Klinger, E. Feedback effects and social facilitation of vigilance performance: Mere coaction versus potential evaluation. Psychonomic Science, 1969, 14, 161-162.
- Krantz, D. S., Glass, D. C., & Snyder, M. L. Helplessness, stress level, and coronary-prone behavior pattern. Journal of Experimental Social Psychology, 1974, 10, 284-300.
- Liebert, R. M., & Morris, L. W. Cognitive and emotional components of test anxiety: A distinction and some initial data. Psychological Reports, 1967, 20, 975-978.
- Liebling, B. A., Seiler, M., & Shaver, P. Self-awareness and cigarette-smoking behavior. Journal of Experimental Social Psychology, 1974, 10, 325-332.
- Liebling, B. A., Seiler, M., & Shaver, P. Unsolved problems for self-awareness theory: A reply to Wicklund. Journal of Experimental Social Psychology, 1975, 11, 82-85.

- Liebling, B. A., & Shaver, P. Evaluation, self-awareness, and task performance. Journal of Experimental Social Psychology, 1973, 9, 298-306.
- Markus, H. The effect of mere presence on social facilitation: An unobtrusive test. Journal of Experimental Social Psychology, 1978, 14, 389-397.
- Martens, R. Effect of an audience on learning and performance of a complex motor skill. Journal of Personality and Social Psychology, 1969, 12, 252-260.
- Martens, R., & Landers, D. M. Evaluation potential as a determinant of coaction effects. Journal of Experimental Social Psychology, 1972, 8, 347-359.
- Matlin, M. M., & Zajonc, R. B. Social facilitation of word associations. Journal of Personality and Social Psychology, 1968, 10, 435-460.
- Mayer, A. Ueber einzel-und gesamtleistung des schulkindes. Archiv fur die Gesamte Psychologie, 1903, 1, 276-416.
- Meichenbaum, D. H. Cognitive modification of test anxious college students. Journal of Consulting and Clinical Psychology, 1972, 39, 370-380.
- Meumann, E. Haus-und schularbeit. Experimente au Kindern der volksschule. Die Deutsche Schule, 1904, 8, 278-303; 337-359; 416-431.
- Miller, G. A., Galanter, E., & Pribram, K. H. Plans and the structure of behavior. New York: Holt, Rinehart, & Winston, 1960.
- Miller, N. E. Studies of fear as an acquirable drive:  
I. Fear as motivation and fear-reduction as reinforcement in the learning of new responses. Journal of Experimental Psychology, 1948, 38, 89-101.
- Moede, W. Der wetteifer, seine struktur und sein ausmass. Zeitschrift fur Padagogische Psychologie, 1914, 15, 353-368.
- Morgan, W. P., & Pollock, M. L. Psychologic characterization of the elite distance runner. In P. Milvy (Ed.), The marathon: Physiological, medical, epidemiological, and psychological studies. New York: New York Academy of Sciences, 1977.



- Myers, A. K., & Miller, N. E. Failure to find a learned drive based on hunger: Evidence for learning motivated by "exploration." Journal of Comparative and Physiological Psychology, 1954, 47, 428-436.
- Osterhouse, R. A. Desensitization and study skills training as treatment for two types of test anxious subjects. Journal of Consulting Psychology, 1972, 19, 301-307.
- Paul, G. L., & Eriksen, C. W. Effects of test anxiety on "real-life" examinations. Journal of Personality, 1964, 32, 480-494.
- Paulus, P. B., & Murdoch, P. Anticipated evaluation and audience presence in the enhancement of dominant responses. Journal of Experimental Social Psychology, 1971, 7, 280-291.
- Pederson, A. M. Effects of test anxiety and coaching on learning and performance. Perceptual and Motor Skills, 1970, 30, 55-62.
- Pennebaker, J. W., & Lightner, J. M. Competition of internal and external information in an exercise setting. Journal of Personality and Social Psychology, 1980, 39, 165-174.
- Pennebaker, J. W., & Skelton, J. A. Psychological parameters of physical symptoms. Personality and Social Psychology Bulletin, 1978, 4, 524-530.
- Pessin, J. The comparative effects of social and mechanical stimulation on memorizing. American Journal of Psychology, 1933, 45, 263-270.
- Powers, W. T. Behavior: The control of perception. Chicago: Aldine, 1973. (a)
- Powers, W. T. Feedback: Beyond behaviorism. Science, 1973, 179, 351-356. (b)
- Rajecki, D. W., Ickes, W., Corcoran, C., & Lerner, K. Social facilitation of human performance: Mere presence effects. Journal of Social Psychology, 1977, 102, 297-310.
- Sanders, G. S. Driven by distraction: An integrative review of social facilitation theory and research. Journal of Experimental Social Psychology, 1981, 17, 227-251.
- Sanders, G. S., & Baron, R. S. The motivating effects of distraction on task performance. Journal of Personality and Social Psychology, 1975, 32, 956-963.

- Sanders, G. S., Baron, R. S., & Moore, D. Distraction and social comparison as mediators of social facilitation effects. Journal of Experimental Social Psychology, 1978, 14, 291-303.
- Sarason, I. G. Experimental approaches to test anxiety: Attention and the uses of information. In C. D. Spielberger (Ed.), Anxiety: Current trends in theory and research (Vol. 2). New York: Academic Press, 1972.
- Sarason, I. G. Anxiety and self-preoccupation. In I. G. Sarason & C. D. Spielberger (Eds.), Stress and anxiety (Vol. 2). New York: Wiley, 1975.
- Sarason, I. G. The test anxiety scale: Concept and research. In C. D. Spielberger & I. G. Sarason (Eds.), Stress and anxiety (Vol. 5). New York: Halsted-Wiley, 1978.
- Sarason, I. G. Test anxiety, stress, and social support. Journal of Personality, 1981, 49, 101-114.
- Sarason, I. G., & Palola, E. G. The relationship of test and general anxiety, difficulty of task, and experimental instructions to performance. Journal of Experimental Psychology, 1960, 59, 185-191.
- Sarason, I. G., & Stoops, R. Test anxiety and the passage of time. Journal of Consulting and Clinical Psychology, 1978, 46, 102-109.
- Sarason, S. B., Mandler, G., & Craighill, P. G. The effects of differential instructions on anxiety and learning. Journal of Abnormal and Social Psychology, 1952, 47, 561-565.
- Sasfy, J., & Okun, M. Form of evaluation and audience expertness as joint determinants of audience effects. Journal of Experimental Social Psychology, 1974, 10, 461-467.
- Schachter, S. The psychology of affiliation. Stanford: Stanford University Press, 1959.
- Scheier, M. F., & Carver, C. S. Private and public self-attention, resistance to change, and dissonance reduction. Journal of Personality and Social Psychology, 1980, 39, 390-405.
- Scheier, M. F., Fenigstein, A., & Buss, A. H. Self-awareness and physical aggression. Journal of Experimental Social Psychology, 1974, 10, 264-273.

- Schmidt, F. Experimentelle untersuchungenuber die hausaufgaben des schulkindes. Sammlung von Abhandlungen zur Psychologischen Padagogik. Leipzig, 1904.
- Sengupta, N. N., & Sinha, C. P. N. Mental work in isolation and in groups. Indian Journal of Psychology, 1926, 1, 106-110.
- Seta, J. S. The impact of social comparison processes on coactor's task performance. Journal of Personality and Social Psychology, 1982, 42, 281-291.
- Seta, J. J., & Hassan, R. K. Awareness of prior success or failure: A critical factor in task performance. Journal of Personality and Social Psychology, 1980, 39, 70-76.
- Slapion, J. J., & Carver, C. S. Self-directed attention and facilitation of intellectual performance among persons high in test anxiety. Cognitive Therapy and Research, 1981, 5, 115-121.
- Sokolov, E. N. The modeling properties of the nervous system. In M. Cole & I. Maltzman (Eds.), A handbook of contemporary Soviet psychology. New York: Basic Books, 1969.
- Spence, J. T., & Spence, K. W. The motivational components of manifest anxiety: Drive and drive stimuli. In C. D. Spielberger (Ed.), Anxiety and behavior. New York: Academic Press, 1966.
- Spence, K. W. Behavior theory and conditioning. New Haven: Yale University Press, 1956.
- Spence, K. W., Farber, I. E., & McFann, H. H. The relation of anxiety (drive) level to performance in competition and non-competition paired-associates learning. Journal of Experimental Psychology, 1956, 52, 296-305.
- Spielberger, C. D., Gorsuch, R. L., & Lushene, R. E. Manual for the state-trait anxiety inventory. Palo Alto, Calif.: Consulting Psychologists Press, 1970.
- Steigleder, M. K., Weiss, R. K., Cramer, R. E., & Feinberg, R. A. Motivating and reinforcing functions of competitive behavior. Journal of Personality and Social Psychology, 1978, 36, 1291-1301.
- Stroop, J. R. Factors affecting speed in serial verbal reactions. Psychological Monographs, 1938, 50, 38-48.

- Taylor, J. A. A personality scale for manifest anxiety. Journal of Abnormal and Social Psychology, 1953, 48, 285-290.
- Tedeschi, J. T., & Lindskold, S. Social psychology: Interdependence, interaction, and influence. New York: Wiley and Sons, 1976.
- Tolman, E. C. Cognitive maps in rats and men. Psychological Review, 1948, 55, 189-208.
- Trapp, E. P., & Kausler, D. H. Test anxiety level and goal-setting behavior. Journal of Consulting Psychology, 1958, 22, 31-34.
- Travis, L. E. The effect of a small audience upon eye-hand coordination. Journal of Abnormal and Social Psychology, 1925, 20, 142-146.
- Triplett, N. The dynamogenic factors in pacemaking and competition. American Journal of Psychology, 1898, 9, 507-533.
- Turner, E. B. Physiology of pacing and waiting. 1889.
- Uno, T., & Grings, W. W. Autonomic components of orienting behavior. Psychophysiology, 1965, 1, 311-321.
- Wankel, L. M. Competition in motor performance: An experimental analysis of motivational components. Journal of Experimental Social Psychology, 1972, 8, 427-437.
- Weiner, B., Heckhausen, H., Meyer, W., & Cook, R. E. Causal ascriptions and achievement behavior: A conceptual analysis of effort and reanalysis of locus of control. Journal of Personality and Social Psychology, 1972, 21, 239-248.
- Weiss, R. F., & Miller, F. G. The drive theory of social facilitation. Psychological Review, 1971, 78, 44-57.
- Whittmore, I. C. The influence of competition on performance: An experimental study. Journal of Abnormal and Social Psychology, 1924, 19, 236-253.
- Wicklund, R. A. Discrepancy reduction or attempted distraction? A reply to Liebling, Seiler, and Shaver. Journal of Experimental Social Psychology, 1975, 11, 78-81.
- Wicklund, R. A. Objective self-awareness. In L. Berkowitz (Ed.), Advances in experimental social psychology. New York: Academic Press, 1978.

- Wicklund, R. A., & Duval, S. Opinion change and performance facilitation as a result of objective self-awareness. Journal of Experimental Social Psychology, 1971, 7, 319-342.
- Wiener, N. Cybernetics: Control and communication in the animal and the machine. Cambridge, Mass.: M.I.T. Press, 1948.
- Wine, J. D. Test anxiety and direction of attention. Psychological Bulletin, 1971, 76, 92-104.
- Wine, J. D. Cognitive-attentional theory of test anxiety. In I. G. Sarason (Ed.), Test anxiety: Theory, research, and application. Hillsdale, N.J.: Erlbaum, 1980.
- Wolpe, J. Psychotherapy by reciprocal inhibition. Stanford: Stanford University Press, 1958.
- Yerkes, R. M., & Dodson, J. D. The relation of strength of stimulus to habit-formation. Journal of Comparative Neurological Psychology, 1908, 188, 459-482.
- Zajonc, R. B. Social facilitation. Science, 1965, 149, 269-274.
- Zajonc, R. B. Compresence. In P. B. Paulus (Ed.), Psychology of group influence. Hillsdale, N.J.: Erlbaum, 1980.
- Zajonc, R. B., Heingartner, A., & Herman, E. M. Social enhancement and impairment of performance in the cockroach. Journal of Personality and Social Psychology, 1969, 13, 83-92.
- Zajonc, R. B., & Sales, S. M. Social facilitation of dominant and subordinate responses. Journal of Experimental Social Psychology, 1966, 2, 160-168.
- Zajonc, R. B., Wolosin, R. J., Wolosin, M. A., & Loh, W. D. Social facilitation and imitation in group risk-taking. Journal of Experimental Social Psychology, 1970, 6, 26-46.