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Social facilitation effects: Mere enhancement of dominant responses?

A. S. R. Manstead and G. R. Semin

Five experimental studies of social facilitation are reported. These were conducted as part of a project which set out to investigate cognitive aspects of social facilitation effects by examining the impact of cognitive factors on drive (and therefore task performance) under conditions of audience presence. The first two studies failed to obtain evidence that cognitive factors mediate audience effects but, more surprisingly, failed also to find evidence of social facilitation effects *per se*. Three further studies, each using a different experimental task, also produced no evidence at all of these supposedly well-established effects. These findings are discussed in the context of other studies which also suggest that enhancement of dominant responses is not a reliable consequence of audience presence. An attentional model of facilitation/inhibition effects is tentatively outlined as a means of reconciling the present findings with the undisputed fact that audience presence, along with other factors, can both improve and impair task performance.

Geen & Gange (1977) have recently reviewed 12 years of theory and research on social facilitation since 1965. Their principal objective was to examine the adequacy of Zajonc's (1965) drive theory analysis of social facilitation effects, in the light of subsequent empirical and theoretical developments. While they expect future work on social facilitation to adopt an increasingly cognitive approach to the phenomenon, they conclude that the drive theory explanation still offers the most parsimonious account of social facilitation effects for the time being, although they recognize that Cottrell's (1972) elaboration of the theory appears to be justified.

The purpose of the present paper is not to dispute Geen & Gange's conclusion, but simply to present empirical evidence which appears to be inconsistent with predictions derived from the drive theory of social facilitation. The present series of studies was not designed to serve as critical tests of the drive theory explanation. Rather, they were conducted as part of a project which aimed initially to investigate the possibility that the 'drive' component of social facilitation is more cognitive than Zajonc's analysis implies.

Zajonc's original (1965) version of the drive theory explanation of social facilitation is non-cognitive in its general orientation, and his work with infra-human subjects is consistent with this stance. In particular, Zajonc used the term 'mere presence' in connection with the arousing effects of the presence of conspecifics. Cottrell (1972) took issue with this aspect of Zajonc's analysis and, drawing on empirical work conducted by himself and others (e.g. Cottrell *et al.*, 1968; Henchy & Glass, 1968), he maintained that 'the presence of others is a learned source of drive, rather than a source of drive which is innate or 'wired into' the organism, as is tacitly assumed in the Zajonc hypothesis' (1972, p. 222).

Thus Cottrell's elaboration of drive theory is one remove from Zajonc's non-cognitive position, in that it acknowledges, at least by implication, that the individual's perception of the role played by his audience (i.e. whether it is evaluative or non-evaluative) is an important mediator of social facilitation effects. However, Cottrell was also concerned to develop a framework which could incorporate findings from animal studies, and his notion of 'learned drive' seems to have been devised with the intent of leaving open the possibility that lower species are able to learn that the presence of others has instrumental consequences.

This desire to develop a theoretical framework which accounts for social facilitation effects in both humans *and* animals seems to have been responsible for a neglect of the

interface between the individual human being and his social context, for drive theorists have given virtually no consideration to the matter of how the individual's perception of his social situation might affect the quality of his task performance. The impact of audience presence may well depend upon the perceived identity of the audience, its relationship to the individual, the nature of the task being performed, and so on. Support for such a view comes from studies finding that the presence of others can have a drive *reducing* effect (cf. Schachter, 1959; Wrightsman, 1960; Davidson & Kelley, 1973), and from a recent study showing that audience presence can *inhibit* the emission of dominant responses (Grush, 1978).

Thus the initial aim of the research programme from which the present studies emerged was to pursue the possibility that cognitive factors mediate social facilitation effects; and to enlarge the drive theory of social facilitation so as to take account of such cognitive factors.

The first two studies to be reported were conducted in order to test some implications of applying an attribution theory perspective to the study of social facilitation. Experiment 1 sought to test the effects of manipulating subjects' perceptions of how rapidly the audience expected them to master the experimental task. Experiment 2 was designed to test the effect of manipulating the perceived source of any arousal subjects experienced in the experimental situation. Here the rationale and procedure of previous studies investigating misattribution of arousal (e.g. Nisbett & Schachter, 1966; Zanna & Cooper, 1974) were applied to social facilitation.

Both of these studies employed as the experimental task the paired associates lists developed by Spence and colleagues (Spence *et al.*, 1956*a, b*) and already used in the context of social facilitation by Cottrell *et al.* (1967). The task comprises three list-types, Practice, Competitional and Non-competitional. Cottrell *et al.* reported that audience presence impairs performance on the Competitional list and improves performance on the Non-competitional list.

Experiment 1

Individual subjects learned one of two list types, Competitional (C) or Non-competitional (N-C), either alone or in the implied presence of an audience. It was anticipated that previously established social facilitation effects would be obtained, in that audience presence would enhance N-C list performance and impair C list performance.

In addition to these basic manipulations, some subjects were led to think that the audience expected them to achieve a standard which appeared to be beyond their reach, while others were led to think that the audience expected them to achieve a standard which appeared to be within their reach. The manipulation of performance outcome expectation (POE) was achieved by specifying a number of trials within which previous subjects had supposedly mastered the task.

It was expected that specifying a low number of trials (HPOE) would increase drive and that specifying a high number of trials (LPOE) would diminish drive. In consequence it was anticipated that the POE manipulation would have an impact on task performance similar to that of the audience presence manipulation, with HPOE improving N-C list performance and impairing C list performance, and LPOE producing the reverse effects.

Thus the design of the study was a $2 \times 2 \times 2 \times 3$ factorial, with list-type (C vs. N-C), audience presence (audience vs. alone), sex of subject (males vs. female) and performance outcome expectation (HPOE, no POE and LPOE) as the independent variables. The number of trials required to achieve a criterion of two consecutive error-free recitations of the relevant list was employed as the dependent measure of task performance.

Method

Subjects. Two hundred and two subjects (102 males, 100 females) were recruited from the University of Sussex student population by means of an advertisement which offered £1 to persons for participation in a 'social psychological study'. Of these, 192 were included in the final sample, 96 males and 96 females. The mean age of subjects was 21.9 years.

Apparatus. The experimental task employed the three lists (Practice, N-C, and C) of paired-associates devised by Spence *et al.* (1956*a, b*). These lists, together with most of the necessary instructions, were recorded on to videotape and presented to the subject via videotape-recorder (VTR) and 18 in television monitor. Two rooms were used: one was employed as the control room, and contained the VTR and a 12 in TV monitor; the subject was seated in the adjacent room which contained the 18 in TV monitor, a microphone and Revox audiotape-recorder, and a CCTV camera mounted on a tripod. The two rooms were connected by intercom, and by a large one-way mirror. The side of this mirror letting on to the experimenter's control room was covered by a heavy curtain for the duration of the experiment, while the side letting on to the subject's room was concealed or revealed according to condition (see below).

Procedure. Subjects were seated at the table, facing the TV monitor. The experimenter started the VTR, thereby presenting to the subject the videotaped instructions. These first explained how and when to respond during a serial anticipation paired-associates task. Subjects were then given four anticipation trials using the Practice list.

Audience condition. After the practice trials, subjects in the audience condition were told that their performance would be watched by two observers, and that it would also be filmed. The justification given was that it was necessary to ensure that their performance was accurately evaluated. The experimenter and an assistant then entered the room and drew the curtain, thereby revealing the one-way mirror, and also adjusted the position of the TV camera (which had been pointing at the floor) such that it was clearly focused on the subject.

Alone condition. Subjects were informed that earlier studies had shown that task performance is adversely affected if subjects feel they are being observed or overheard; and that since the present investigators wished to examine performance uncontaminated by these factors, steps would be taken to reassure subjects that their performance was not being monitored. Accordingly, the subject was requested to switch off the intercom microphone at this point. It was explained that some record of performance was nevertheless needed, and that this would be obtained via the remotely operated audiotape-recorder: tape records would be analysed by a research assistant blind to subject identity.

No POE. Subjects in this control condition then embarked on the experimental task, using either the C or N-C list. Serial anticipation trials continued, up to a maximum of 30, until the criterion of two consecutive error-free recitations was achieved.

POE manipulations. Results already obtained from the No POE conditions were used in order to calculate the number of trials mentioned in the HPOE and LPOE manipulations. The 20th and 80th percentile points were calculated for the distribution of number of trials required by No POE subjects to achieve the criterion. Immediately prior to starting the experimental task, POE subjects were told by the experimenter 'We have found that most people finish this task within *X* trials', where the value of *X* was the 20th percentile point for HPOE subject and the 80th percentile point for LPOE subjects.

Following the experimental task, all subjects were interviewed by the experimenter. This interview was conducted in order to assess (a) whether subjects had any prior knowledge of the experimental procedure or hypotheses; and (b) whether subjects had found the audience and POE manipulations credible. After this interview, subjects were fully debriefed and paid. They were also requested not to discuss details of the experiment.

Results

Manipulation check. After the post-experimental interview each subject was rated by the experimenter with respect to naïvety regarding the purpose of the study, the extent to which the audience manipulation was believed by the subject, and – for HPOE and LPOE subjects only – the extent to which the POE manipulation was believed by the subject. Any subject who was not rated by the experimenter as being definitely naïve *or* as not believing the relevant manipulation(s) was excluded from the final sample. Ten subjects failed to satisfy this criterion, six males and four females. None of the 16 treatments contained more than two replacement subjects.

Trials to criterion. Preliminary analysis revealed that this main dependent measure was significantly correlated with three other measures, which in turn were distributed significantly differently across treatments. These three measures were Machiavellianism (Mach V), birth order, and number of correct responses on final (fourth) practice trial. (Since Machiavellianism [Mach V] and birth order data were available, these measures were incorporated into the analysis.) In order to control for possible confounding effects, trials to criterion data were analysed using analysis of covariance, with Machiavellianism, birth order and final practice trial score as covariates. Only one significant effect was revealed: a highly significant ($P < 0.001$) main effect for list-type, with subjects needing more trials to achieve the criterion on the C list ($\bar{x} = 11.84$) than on the N-C list ($\bar{x} = 5.66$). There was no evidence of the predicted interactions either between list-type and POE or, more surprisingly, between list-type and audience presence.

Experiment 2

Both Zajonc's (1965) original and Cottrell's (1972) elaborated version of the drive theory of social facilitation assume that the individual experiences arousal in the presence of an evaluative audience. In the present study placebo pills were employed in an attempt to manipulate the perceived source of such arousal. Subjects given placebos which allegedly had arousal side-effects would have an alternative (i.e. non-audience) source to which they could attribute experienced arousal. They were consequently expected to show decreased task performance effects due to audience presence, relative to subjects given placebos without mention of side-effects being made. Conversely, subjects given placebos which allegedly had tranquillizing side-effects would be led to infer that they were especially aroused by audience presence, since any arousal they experienced would presumably have been greater without the 'tranquillizer'. They were therefore expected to show increased task performance effects due to audience presence, relative to the no-side-effects condition.

A $2 \times 2 \times 3$ factorial design was employed, with audience presence (audience vs. alone), sex of subject (male vs. female) and side-effects (arousal, none, relaxation) as the independent variables. The dependent measure of task performance was the same as in the previous study, and it was expected that audience presence and side-effects would interact in the manner described above.

Method

Subjects. Seventy-three subjects, 34 males and 39 females, were recruited from the student population of the University of Sussex to serve as participants in this study. They received 50p each for participating. Nine females and four males opted to withdraw from the study, leaving 30 subjects of each sex in the final sample, with a mean age of 20.6 years.

Apparatus and procedure. The experimental task consisted of two of Spence *et al.*'s (1956*a, b*) paired-associates lists, namely Practice and Competitional. Details of experimental location and mode of presenting the experimental material were identical to those reported in connection with Expt 1, as was the basic experimental procedure.

Additional instruction, pertaining to the side-effects manipulation, was given by the experimenter. At the outset of the experiment, all subjects were told: 'Before we start, I should explain that this research programme is investigating how people learn verbal materials. One of the things we are interested in is the effect that certain drugs have on the learning process. In this experiment we would like to give you a tablet of the drug Nomocol. This drug is reputed to increase the ability to learn verbal materials. Nomocol is effective within 5 minutes of ingestion, is totally absorbed within 30 minutes and has no effect after this time.' The experimenter then explained that the university health authorities had given clearance for the drug to be administered, and showed the subject a signed letter from the Director of the University Health Centre to this effect (see Acknowledgements). At this point the side-effects manipulation was introduced. *No-side-effects* subjects were simply told that the Nomocol tablet would have no side-effects. *Arousal (Relaxation)* subjects were given the following instruction: 'I should also tell you that the compound of Nomocol that we are using here contains some chemical elements that produce a reaction of tenseness (relaxation) 5 minutes after ingestion. These elements work on the sympathetic (parasympathetic) nervous system, which is the system that arouses (relaxes) you, and will therefore increase (decrease) your heart rate. You will also find that your body temperature increases (decreases) slightly. You may also feel as though your mind is racing a little (calmer than usual). In general the tablet will arouse (relax) you, but these effects will totally disappear after 30 minutes.' Subjects were then reminded that they were free to withdraw from the experiment if they so wished. If the subject agreed to continue, the experimenter gave the subject a tablet (in fact a placebo) together with a glass of water, and added: 'While we are waiting for the Nomocol to be absorbed, I would like you to watch the TV screen. There you will see some instructions explaining what we would like you to do.'

The subject was then given four serial anticipation trials using the practice list before embarking on the C list. Trials then continued (up to a maximum of 30) until the criterion of two successive error-free recitations of the list was achieved.

The subject was then asked to complete a post-experimental questionnaire. This consisted of five brief phrases, each accompanied by an appropriately labelled seven-point scale. These were as follows: 'I remembered things... better than usual/worse than usual'; 'My mind was... calmer than usual/racing a little'; 'I was more... tense than usual/relaxed than usual'; 'My heart rate was... faster than usual/slower than usual'; 'I was... hotter than usual/colder than usual.' Four of these scales were designed to assess the subject's perceived physical reaction to the 'drug'. After completing this questionnaire subjects were interviewed by the experimenter and then fully debriefed.

Results

Manipulation checks. The perceived impact of the side-effects manipulation was assessed by summing across the four rating scales pertaining to physical reactions. Analysis of variance performed on this index of physical state revealed a near-significant effect due to the side effects factor ($F = 3.14$, d.f. = 2, 48, $P < 0.06$). None of the other effects was significant. The appropriate mean scores for the three side-effects conditions, averaged across other factors, are shown in Table 1.

Table 1. Mean rating of physical reaction during task performance ($n = 20$ per cell)

Side-effects condition		
Arousal	No side-effects	Relaxation
19.05	18.30	17.00

Note. The higher the mean, the more aroused the rated physical reaction.

It can be seen that perceived physical reaction was greatest in the arousal condition, least in the relaxation condition, and intermediate in the no side-effects condition. However, further analysis, using the Newman-Keuls procedure, showed that these treatment means

do not differ significantly from each other. These figures suggest that the side-effects manipulation did have an effect, albeit a very weak one, on perceived physical reaction.

The effectiveness of the audience presence manipulation was assessed by the experimenter during the post-experimental interview with the subject, as in the previous study. No subjects were rejected from the sample on this basis.

Trials to criterion. Trials to criterion data were analysed by means of analysis of variance. No significant main effects or interactions were revealed. Thus neither the expected main effect due to audience presence nor the predicted two-way interaction between audience presence and side-effects was obtained.

Discussion

The two experiments reported above provided no evidence to support hypotheses derived from a cognitive variant of the drive theory account of social facilitation phenomena. Furthermore, there was no evidence of typical social facilitation phenomena.

In considering reasons for this failure to obtain standard social facilitation effects, one possibility was that the paired-associates task as employed in these two studies is insufficiently sensitive to the effects of increased drive. Consistent with this rationale is the fact that there is only one reported study which has shown that audience presence tends to enhance the emission of dominant responses using the Spence *et al.* (1956*a, b*) lists, and even in the case of this study (Cottrell *et al.*, 1967) it was found that audience presence did not affect the performance of learners designated as 'fast' on the basis of practice trial performance. [Since the completion of the present series of studies, another study employing the Spence *et al.* lists and reporting social facilitation effects has been published (Baron *et al.*, 1978).]

Overall it was concluded that further studies should be conducted, each employing an experimental task more suitable for the investigation of social facilitation effects than the paired-associates task used in Expts 1 and 2. The main goal of these further studies was to investigate the reliability of social facilitation phenomena.

Experiment 3

Drive models of social facilitation hold that the *dominance* of correct responses is a crucial factor in determining whether the presence of evaluating others has a beneficial or detrimental effect on task performance. In the Spence *et al.* (1956*a, b*) paired-associates task, it is assumed that correct responses are dominant in the N-C list. There is nevertheless no direct evidence that this is the case, or that it applies equally across individuals, since it is impossible for an investigator to control the individual's training history with respect to verbal learning.

In adopting a novel task, such as the learning of an unfamiliar maze, relatively rigorous control over the individual's training history becomes possible. Thus subjects can be given differential amounts of training in maze learning, such that there is no ambiguity regarding the relative dominance of the correct responses.

Two previous studies have employed maze-learning tasks in studying social facilitation effects in human subjects (Husband, 1931; Hunt & Hillery, 1973). In the present study, it was decided that the relative dominance of correct responses should be manipulated directly by giving groups of subjects differential amounts of training. Pilot studies indicated that maze-learning performance using a 10 × 10 contact maze typically shows a dramatic improvement after the sixth trial. It was therefore decided that the dominance of correct responses could be manipulated by giving one group of subjects two training trials (correct responses subordinate) and a second group six training trials (correct responses dominant).

Audience presence was manipulated orthogonally to this training manipulation. It was expected that maze learning would be improved by audience presence in the case of the six-trial group, and impaired by audience presence in the case of the two-trial group.

Method

Subjects. Forty-eight subjects (24 males, 24 females) participated in this study on a voluntary, unpaid basis. All were undergraduate students at the University of Sussex. Their mean age was 20.8 years.

Apparatus. This consisted of an electronically wired 10×10 contact maze. The correct path through this maze was indicated by silence following the selection (by electronic stylus) of a new contact. Incorrect choices were met with an audible 'click', and also triggered an automatic counting device in a remote unit. The correct path through this maze involved a total of 14 binary and 30 triadic choices.

The maze itself was located on a table, in front of a wall containing a large one-way mirror (as with Expts 1 and 2). Also on the table was a 12 in television monitor. The experimental room was connected by intercom to the control room.

Procedure. Subjects were randomly assigned to one of the four basic conditions: low training/alone; low training/audience; high training/alone; high training/audience. Instructions concerning how to perform the maze-learning task were pre-recorded on videotape, with a full audiovisual demonstration of how to proceed with the task. They concluded with a final instruction to practise the maze-learning task until further notice. This practice session was terminated after two or six trials, depending on training condition.

The manipulation of audience presence was achieved in the same basic fashion as that reported in Expts 1 and 2 of the present series. After the delivery of this manipulation, all subjects were instructed to try to trace the correct path through the maze, making as few errors as possible, and to repeat this process until they received further instruction. Subjects were stopped as soon as one error-free trial had been accomplished. Each subject was then interviewed by the experimenter, and finally was fully debriefed.

Results

Manipulation check. No subjects were excluded from the final sample on the grounds that they had not found the audience presence manipulation fully credible.

Trials to criterion. Analysis of variance revealed only a significant main effect for sex of subject ($F = 6.33$, d.f. = 1, 40, $P < 0.015$), with male subjects achieving the criterion in significantly fewer trials than females (16.04 vs. 21.96). The predicted interaction between audience presence and training level failed to achieve significance ($F = 2.66$, d.f. = 1, 40, $P < 0.107$). The means relating to this interaction are shown in Table 2. Inspection of the means reveals that the non-significant interaction term reflects a trend in the *opposite* direction to that which was hypothesized. While low training subjects achieved the criterion in marginally *fewer* trials in the audience condition than in the alone condition, high training subjects required a markedly *greater* number of trials to reach the criterion in the audience condition than in the alone condition.

Table 2. Mean number of trials required to achieve criterion of one error-free trial (averaged across sex of subject, $n = 12$ per cell)

	Training level	
	Low	High
Audience presence		
Alone	21.58	14.83
Audience	19.33	20.25

Other dependent measures. Analysis of two other measures of task performance, namely numbers of errors on experimental trials and total time required to reach the criterion, revealed a similar pattern of effects to those obtained in the trials to criterion data. With both measures there was a significant effect due to sex of subject; and a near-significant ($P < 0.10$ in both cases) interaction between audience presence and training level, with means falling in a pattern opposite to that predicted.

In view of the near-significant reversals of the anticipated effects, it was decided that a third condition should be devised, in which the dominance of correct responses would be quite unambiguous. The aim was, quite simply, to train subjects on a relatively simple maze-learning task until they achieved a criterion of mastery, and then see whether the audience presence variable would produce the drive theory predicted outcome, i.e. improved performance in the presence of an audience.

Very high training condition. In this third training level condition, a further 24 subjects (12 males, 12 females) were recruited from the undergraduate population of the University of Sussex. The 10×10 contact maze was modified, such that the correct route was easier to learn. This new route involved seven binary and 29 triadic choices. For these very high training subjects, all details of the experiment were identical to those involving the low and high training groups, except that very high training subjects had as many training trials as were required in order to achieve a criterion of one error-free trial. All very high training subjects were stopped after 10 experimental trials. Dependent measures employed were total number of errors made in the course of these 10 experimental trials, and the total amount of time taken to complete the 10 experimental trials. Twelve subjects (six males, six females) were randomly allocated to the audience condition, and the remaining 12 to the alone condition.

Errors. A t test for independent means revealed that the mean number of errors made in the alone and audience conditions differed significantly ($t = 2.16$, d.f. = 22, $P < 0.042$). However, the difference was in the reverse direction to that predicted: Alone subjects made an average of 7.42 errors, as compared with an average of 22.25 errors made by audience subjects.

Time. Analysis of the time data also revealed a significant ($t = 2.24$, d.f. = 22, $P < 0.035$) difference between audience and alone conditions in the opposite direction from that expected: alone subjects took an average of 206.17 s, while audience subjects took an average of 271.08 s.

Discussion

Far from providing evidence of the reliability of social facilitation phenomena, these results indicate near-significant reversals of the anticipated effects in the low and high training condition; and significant reversals of the expected effects in the very high training condition.

Two further studies of social facilitation were conducted, each of which was a slightly modified replication of the procedure employed in a previously reported demonstration of social facilitation effects. The aim in both cases was simply to establish the replicability of such effects.

Experiment 4

The experimental task involved in the present study was based on the task employed by Geen (1973). It is a one-trial learning task, in which subjects are presented with six stimulus-response pairs once only, and are then asked to recall correctly the paired

response on subsequent presentation of the stimulus. The stimulus material consists of six nonsense syllables, which are paired with six digits. Thus subjects are asked to recall the appropriate digit upon the second presentation of the stimulus nonsense syllable.

This task is appropriate to the study of social facilitation effects for two reasons. First, it unambiguously constitutes a task which involves the acquisition of novel responses, and is therefore a task in which performance should be impaired by the presence of passive or coacting others. Secondly, the task is entirely devoid of verbal material which is meaningful. The use of nonsense syllables and digits should therefore eliminate some of the confounding effects due to individual differences in verbal ability noted by Cottrell *et al.* (1967).

Geen (1973) measured audience effects on recall 2 min after the initial presentation of the stimulus-response pairs. Results were consistent with a drive theory interpretation of social facilitation effects, subjects in the alone condition recalling a significantly greater number of correct digits than subjects in the audience condition.

Method

Subjects. A total of 79 subjects participated in this study, on a voluntary unpaid basis. Subjects were randomly allocated to the audience and alone conditions. Twenty-seven males and 11 females took part in the alone condition; while 27 males and 14 females took part in the audience condition. All subjects were undergraduate students at the University of Sussex, and the mean age of subjects was 21.5 years.

Apparatus and procedure. In all basic respects the apparatus and procedure utilized in this study were the same as those described in connection with earlier studies in this series. The experiment itself began with the delivery, via videotape, of instructions to the subject. Two videotapes had been prepared, which differed only with respect to the audience presence manipulation.

Each tape began with an explanation that the experiment involved a single trial learning task, and the subject would see a list of six syllables, paired with six digits. There then followed a visual example of how the task material would be presented. It was explained to the subject that the experiment itself consisted of a number of such presentations, and that the subject's task would be to recall the digit associated with various syllables when these syllables were subsequently presented alone.

The tapes then delivered the audience presence manipulation. This manipulation was executed in the same fashion as other experiments in the present series (see Expt 1 for details).

The learning trial was then delivered by videotape. This consisted of the six nonsense syllables listed by Geen (1973), and first used by Kleinsmith & Kaplan (1963). The syllables were TOV, CEF, JEX, LAJ and DAX. They were randomly paired with the digits 2, 3, 4, 5, 6 and 7.

In order to prevent covert rehearsal between the end of the learning trial and the beginning of the recall trial, the subject was then instructed to open an envelope and read the enclosed passage. Exactly 2 min after the end of the learning trial, the subject's attention was drawn to the monitor by means of an auditory signal. The six nonsense syllables were then shown, punctuated by 2 s pauses, in which the subject was supposed to respond by announcing the appropriate response digit.

At the end of the recall trial, subjects were given a post-experimental interview and were fully debriefed.

Results

Manipulation check. Post-experimental interviews indicated that all subjects had found the audience presence manipulation to be credible.

Number of digits correctly recalled. Analysis of the number of digits correctly recalled revealed a significant difference between the alone and audience conditions ($t = 2.05$, d.f. = 77, $P < 0.05$). However, this difference was once again in the reverse direction to that which was predicted. Thus alone subjects recalled an average of 1.87 digits correctly, whereas audience subjects recalled an average of 2.58 digits correctly.

Discussion

The results of the present study fail to replicate Geen's (1973) finding that an evaluating audience significantly impairs the short-term recall of novel responses. Indeed, the findings of the present study show a reversal of the effect reported by Geen, with subjects in the audience condition recalling a significantly greater number of digits correctly. Since Geen's findings are consistent with predictions derived from the drive theory account of social facilitation, it is clear that the results of the present study represent a further failure to find evidence of the effects predicted by such a model.

Experiment 5

The pseudo-recognition task has been used by several investigators to demonstrate that the presence of others enhances the emission of dominant responses at the expense of subordinate responses. Subjects initially practise saying aloud various novel 'foreign' words. This practice session contains the key manipulation, namely the frequency with which each word is repeated. Frequencies typically vary from one exposure per word to 16 exposures per word, and this is assumed to establish a hierarchy of verbal habits of varying strength. Subjects are then asked to perform the task of recognizing the foreign words in 'pseudo-recognition' trials. On about 80 per cent of these trials the subject is shown very brief word-like flashes, which are tachistoscopically presented. Subjects are instructed to say aloud which of the foreign words presented earlier was being shown on each of these trials, and to guess if unsure. It is assumed that these pseudo-recognition trials place the previously established verbal habits in competition with one another. The drive theory prediction is that dominant words will be given as responses more frequently in the presence of others, by comparison with non-dominant words. Several studies have found support for this hypothesis (e.g. Zajonc & Sales, 1966; Cottrell *et al.*, 1968; Henchy and Glass, 1968).

The present study simply sought to replicate the effect of audience-induced drive upon a hierarchy of competing responses. Three conditions were employed: an alone condition, similar to that used in earlier studies in this series; an implied audience condition, again similar to the audience condition used in the earlier studies; and a live audience condition, in which the experimenter sat in the same room as the subject during the pseudo-recognition phase of the experiment, recording the responses. It was predicted that the two audience conditions would give rise to equivalent results, and that these findings would follow the pattern found in previous studies, with dominant responses being emitted more frequently relative to the alone condition.

Method

Subjects. Thirty subjects (15 males, 15 females) were recruited from the undergraduate population of the University of Manchester, in order to participate in what was described as a 'word recognition experiment'. Their average age was 19.6 years and they were paid 50p for their participation.

Apparatus. A 'group tachistoscope' was employed, consisting of a specially adapted slide projector, and a time control unit which allowed fine control of exposure and inter-exposure durations. This apparatus was situated in the room adjacent to the experimental room, and the image was projected on to the back of a screen which was situated in a vacant panel of the door connecting the two rooms. For this study it was not possible to employ a one-way mirror in the implied audience condition, so the usual CCTV camera manipulation was supplemented by a 9 in preview monitor in the experimental room. This was placed in such a way that subjects in the implied audience condition could see their own image on the monitor while the camera was being aligned, although the monitor was turned away from the subject during training and pseudo-recognition trials, in order to avoid the possibility of straightforward distraction effects. All other apparatus employed was similar to that used in the earlier studies.

Procedure. The procedure adopted was closely modelled on that described by Zajonc & Sales (1966). Ten 'Turkish' words were used in the training trials. Each subject was exposed to these words at one of five different frequencies. The allocation of words to frequencies was counterbalanced by the use of five different combinations of word and frequency. Within each condition (alone, implied audience and live audience) three subjects received any one of these five combinations of training word and training frequency. The training trials consisted of a total of 62 word presentations, the order of these presentations being randomized for each subject. The 62 slides were shown at 4 s intervals.

Following the training trials, the alone and implied audience manipulations were implemented by instruction, as in previous experiments. In the live audience condition, no information concerning the observation of the subject during the task was provided: the experimenter simply remained in the experimental room, seated diagonally behind the subject. In all three conditions, there was a 1 min pause before the start of the pseudo-recognition trials.

The pseudo-recognition trials then followed. These trials consisted of the tachistoscopic presentation of the 124 slides of word-like images. These images were of the same size and configuration as the 'Turkish' words shown in the training trials, but were in fact composed of irregular black lines. Five different types of these pseudo-stimulus slides were employed, 25 of each of four types of 24 of the fifth type. These pseudo-stimulus slides were split into four blocks, each containing 31 such slides. To each of these blocks was added one slide of each of the 10 words used in the training trials. The order within each block of 41 slides was randomized for each subject. These four pseudo-recognition blocks were shown at the rate of one slide every 10 s. The exposure time for pseudo-stimulus slides was determined by pilot runs which established an exposure time preventing detection that the slide was a pseudo-stimulus but sufficiently slow for the word-like image to be just noticeable. The exposure time for the 10 genuine stimulus slides was also determined by pilot runs, which established an exposure time at which the words could just be recognized.

During the pseudo-recognition trials, the experimenter noted the frequency with which the subject provided responses in each of the 10 training word categories. Where the response provided by the subject was ambiguous in pronunciation, a criterion of correct pronunciation of the first syllable was employed (cf. Zajonc and Sales, 1966, p. 163).

At the conclusion of the pseudo-recognition trials, the subject was asked to complete a questionnaire containing four questions: 'During the word recognition task were you apprehensive about your responses being incorrect?'; 'Did you feel that your performance on the word recognition task was being evaluated?'; 'How difficult did you find the word recognition task?'; and 'To what extent did you feel you were being watched while you were doing the task?'. Subjects were instructed to respond to each question by circling a number on a seven-point scale with end-points labelled 'not at all' and 'extremely'. After completing this questionnaire, subjects were fully debriefed and paid.

Results

Manipulation check. Two-way analyses of variance were performed on the ratings of apprehension, evaluation, task difficulty and degree to which the subject had felt watched, with audience presence and sex of subject as the two factors. The only significant effects revealed were main effects due to the audience presence factor in the case of the ratings of evaluation ($F = 5.60$, d.f. = 2, 24, $P < 0.025$) and degree to which the subject felt watched ($F = 13.39$, d.f. = 2, 24, $P < 0.005$). The means for these two sets of ratings, broken down by audience presence condition, are shown in Table 3. Duncan's multiple range test

Table 3. Mean ratings of evaluation and 'watched', broken down by audience presence condition ($n = 10$ per cell)

Rating scale	Audience presence condition		
	Alone	Implied audience	Live audience
Evaluation	3.1 _a	5.4 _b	3.8 _a
Watched	2.2 _a	5.5 _c	3.8 _b

Note. Means having different subscripts within a row differ significantly at $P < 0.05$, using Duncan's multiple range test.

comparisons of the mean evaluation ratings indicated that the implied audience condition produced significantly higher ratings than both the alone and live audience conditions, and that the difference between these latter two conditions is not significant. Similar comparisons of the 'watched' ratings showed that all three means differ significantly from each other, with implied audience producing the highest ratings and alone the lowest.

Pseudo-recognition trials. Data from these trials were converted into proportional frequencies, prior to statistical analysis, since not all subjects provided guesses on each trial (in spite of the instruction to do so). These data are shown in Table 4, in the form of mean percentage of response emissions, broken down by training frequency and audience presence.

Table 4. Mean percentages of response emissions, by training frequency and audience presence ($n = 10$ per cell)

	Training frequency				
	1	2	4	8	16
Alone	11.42	14.87	27.26	11.73	34.74
Implied audience	10.16	15.89	18.59	20.26	35.12
Live audience	11.83	18.49	20.23	20.10	29.36
Column means	11.13	16.42	22.03	17.36	33.07

The data were analysed by means of analysis of variance, with repeated measures on the training frequency factor.* The only significant effects were a main effect due to training frequency ($F = 37.19$, d.f. = 3, 360, $P < 0.001$), and two interactions involving sex of subject. The predicted interaction between audience presence and training frequency was not obtained. It can be seen from the outcome of this analysis and from inspection of the means in Table 4 that variation in response emission, in so far as it was systematic, tended to be a function of training frequency. Although the pattern of mean scores shows that response emission was not a simple linear function of training frequency, there is no indication that dominant (i.e. high training frequency) responses were more likely to be emitted under either of the audience conditions.

Discussion

Analysis of the rating scale manipulation check data provided confirmation that the audience presence manipulation employed in this series of studies is effective, with the implied audience condition giving rise to significantly higher ratings on the 'watched' and 'evaluation' scales than did the live audience condition. Despite the effectiveness of the audience manipulation, no evidence of enhancement of dominant responses was obtained.

General discussion

The five studies reported above failed to provide any evidence of supposedly well-established social facilitation effects and in some cases significant reversals of such effects were obtained. This pattern of findings is puzzling and calls for a careful examination of the experimental procedures employed. It seems highly unlikely that the

* The conversion of these data into proportional frequencies would naturally mask any main effect due to audience presence, so the data from the intermediate training frequency (four trials) were omitted from this analysis. In the event, the main effect for the audience presence factor fell well short of attaining statistical significance.

nature of the experimental tasks was responsible for the non-significant and reverse significant effects obtained, since four different tasks were employed, three of which had previously been found to be sensitive to increased drive. Furthermore, the procedures followed in Expts 4 and 5 were closely modelled on earlier studies which reported significant social facilitation effects.

One objection which might be raised in connection with these studies is the nature of the audience presence manipulations employed, in that 'implied' rather than 'live' audiences were used (except in Expt 5, where both types were incorporated into the design). There are two points which can be made in reply to such an objection. First, the post-experimental manipulation checks in the present studies supported the assumption that an unseen 'audience' would lead subjects to feel that they were being observed; indeed, the manipulation check ratings obtained in Expt 5 indicated that subjects felt *more* evaluated and watched in the 'implied' audience condition than in a 'live' audience condition. Secondly, there is evidence from the literature that 'pseudo-audience' conditions are highly effective. For example, Wapner & Alper (1952) found that an unseen audience, known to be able to observe the subject through a one-way mirror, was more inhibiting than a visible audience. As Kelley & Thibaut (1969) have remarked, 'The notion of audience "presence" should not be taken too literally, in terms of occupying a position in view of the individual' (p. 5). Overall we are confident that the implied audience manipulation did induce evaluation apprehension for our subjects.

In fact there are positive advantages in using an implied audience rather than a live one. Apart from the practical benefit of greater economy, there is the theoretically more important advantage that the stimulus situation can more easily be held constant across experimental sessions, and there is no danger that subjects will be distracted by those purely spurious stimuli (movements, coughs, etc.) which inevitably occur with a live audience.

It might still be argued that Zajonc's 'mere presence' variant of drive theory has not been directly tested in the above experiments, on the grounds that they did not include a condition in which the audience was 'merely' physically present. In reply to this we would first suggest that the dispute between proponents of the 'mere presence' and 'evaluation apprehension' variants of drive theory is one concerning the sufficiency of conditions under which social facilitation effects are obtained, rather than a fundamental disagreement about either the consequences of audience presence or even the processes underlying such effects. As Markus (1978) has observed, 'Even among mere presence theorists... there is no argument with the idea that evaluation apprehension can be a very significant factor in social facilitation in humans' (p. 390). Our results suggest, however, that the imagined presence of an evaluative audience does not consistently produce the outcome expected by all drive theorists, namely the enhancement of dominant responses. It is nevertheless acknowledged that Expts 1-4 of the present series do not provide strong evidence against the mere presence theory, particularly if it is assumed that mere *physical* presence invokes processes distinct from those induced by the imagined presence of an evaluative audience. A second point is that Expt 5 of the present series *did* include a mere presence condition. While it might be argued that an experimenter does not constitute an audience, it is difficult to see how, from the perspective of a mere presence theorist, our experimenter did not satisfy the conditions of being 'merely present', since to suggest that there is some phenomenological difference between the mere presence of an experimenter and that of a third party is to invoke the very cognitive processes which mere presence must by definition not involve.

In case any attempt to question the reliability of a soundly established phenomenon on the basis of five studies should seem unreasonable, it is worth pointing out that the social

facilitation literature is not as clear-cut or consistent as is usually assumed. Starting with the widely employed pseudo-recognition procedure, it is worth noting that a French study (Duflos *et al.*, 1969) failed to find evidence of social facilitation effects, despite using a task very similar to the standard pseudo-recognition task.

Perhaps more important is the fact that findings of studies employing pseudo-recognition are open to an alternative explanation. The training phase can be regarded as providing the subject with information about the relative frequency of presentation within the experimental context of various 'foreign' words. Thus it would be a 'safe bet' to respond on pseudo-recognition trials by guessing with words of high training frequency. Differential response rates between audience and alone conditions can then be explained by assuming that subjects are more likely to make safe bets when observed by an evaluative audience, i.e. are less prepared to make errors in public than private – something which has nothing to do with social facilitation as conceptualized by drive theorists.

Next, take the maze procedure used by Hunt & Hillery (1973). Paulus *et al.* (1976) have reported that in their research they have consistently found impaired performance in the presence of co-actors using the maze task initially reported by Hillery & Hunt as producing *enhanced* performance under coaction. Byers (1973) has also found that co-action impairs performance on this task. Thus the findings obtained in Expt 3 of the present series are not the only ones showing that the presence of others impairs performance on a maze task in which correct responses are supposedly dominant.

Thirdly, there is the less well explored but potentially very interesting procedure involving word-associations. Matlin & Zajonc (1968) found a highly significant reduction in word-association latency in their audience condition which they interpreted as supporting drive theory, arguing that increased drive enhanced the emission of dominant responses and thereby reduced latency of responses. However, Blank *et al.* (1976) pointed out various shortcomings in Matlin & Zajonc's procedure and also reported findings from their own study showing that presence of an observer had no effect on response latencies in word-association. They conclude as follows: 'Taken together, our results provide little, if any, support for drive theory; instead they point up the need for a more social, cognitive explanation' (p. 732). Blank *et al.* go on to suggest that an information-processing approach to the task of explaining the cognitive processes mediating social facilitation effects would be more satisfactory than drive theory.

We share these doubts about drive theory. Zajonc's (1965) explanation of social facilitation phenomena and its subsequent elaboration by Cottrell (1972) represent an ingenious solution to a problem which had puzzled social psychologists for decades. With regard to the formal criteria by which theories are evaluated, the drive and learned drive models have the advantages of parsimony, elegance and generality. It nevertheless seems possible that the seductive appeal of this body of theory has led to premature closure of theoretical thinking in this area. Alternative explanations of social facilitation phenomena are likely to compare unfavourably with drive models in terms of the formal criteria of 'good' theory, in that they will probably not invoke a single process to account for a variety of observed (or postulated) regularities in performance. It nevertheless appears that social facilitation effects are not reliably obtained under conditions regarded as sufficient by drive theorists to produce such effects.

As a tentative step in the direction of providing an alternative explanatory framework for social facilitation phenomena, we would suggest a model based on the concept of attention. First, it is proposed that because *highly routinized* task performance is not consciously monitored on a continuous basis, this type of performance will tend to be suboptimal. Consequently, disruption of routine performance and/or the presence of a critical audience will serve to focus attention more sharply on task performance, resulting in 'improved'

performance. On the other hand, the setbacks which almost inevitably occur during the learning of complex tasks (i.e. failures at stages of task performance which had been temporarily mastered) will tend to distract the learner's attention from the immediate task (i.e. mastering a subsequent stage of the task), thereby interrupting the steady progression of learning and so leading to increased errors. Further, the presence of an audience during task learning provides an additional source of distraction from the task in hand, especially when performance setbacks occur, due to the learner's concern with how he or she is being evaluated. Recent studies by Baron and his colleagues (Baron *et al.*, 1978; Sanders *et al.*, 1978) provide fairly compelling evidence that the presence of others is distracting. Errors will increase as a consequence of this additional distraction and the impact of audience presence upon task performance seems likely to increase as a function of task complexity.

Such a model implies that performance will only be substantially improved as a function of audience presence when the task in question is so well learned that continuous monitoring of task performance is no longer required. This in turn would go some way towards explaining the absence of facilitation effects in the present series of studies. The N-C list of paired-associates in Expt 1 was a learning task, however simple, necessarily involving continuous monitoring of task performance. The very high training condition of Expt 3 certainly established that the correct responses were dominant, in that they were much more likely to be emitted than were incorrect responses, but the task still required continuous monitoring of performance: since all subjects in this condition had, by definition, only achieved one entirely correct performance of the task, they had no chance to master it to the point where performance becomes relatively automatic. Finally, there is no sense in which high training frequency words, in Expt 5, constituted habitual responses in the pseudo-recognition task.

The proposed model also suggests that performance will only be significantly impaired by audience presence when the task in question is complex in nature. This helps to account for the absence of inhibition effects in the present series of studies. The competition list of paired-associates employed in Expts 1 and 2 did not provide our subjects with much difficulty, as evidenced by the fact that they required substantially fewer trials to achieve the criterion than did subjects in other studies using the same task. The maze task utilized in Expt 3 was rather more complex, and it is noticeable that evidence of inhibition was found in this study, albeit in conditions in which it had not been anticipated. The task employed in Expt 4 was undoubtedly difficult, but since the task involved one-trial learning there was no scope for setbacks in performance and consequent increases in errors on further trials. As it was, subjects in the audience condition made significantly fewer errors on the single trial than did those in the alone condition. Finally, the pseudo-recognition task does not lend itself to the present analysis, since it involves guesswork rather than learning.

The model outlined above has some conceptual parallels with Schneider & Schiffrin's recently proposed (and much more fully developed) theory of human information-processing (Schneider & Schiffrin, 1977; Schiffrin & Schneider, 1977).* Schneider & Schiffrin distinguish between 'automatic' and 'controlled' information processing and present a large body of evidence consistent with such a distinction. Their view is that automatic processing is unhindered by capacity limitations of the short-term store, does not require attention, and develops after considerable amounts of training; whereas controlled processing is capacity-limited, requires attention, and can be adopted quite rapidly.

In Schneider & Schiffrin's terminology, the present model of social facilitation can be regarded as proposing that the performance of novel and/or complex tasks, inevitably

* The authors would like to thank an anonymous reviewer for bringing these parallels to their attention.

involving a considerable element of controlled processing, is harmed by the presence of an evaluative audience, because the latter places further demands upon the individual's already stretched attentional capacity. It is also proposed that task performance characterized by a high proportion of automatic sequences is usually performed suboptimally and that in this case the presence of an evaluative audience leads the individual to focus more attention upon the progress of these automatic sequences, thereby improving the task performance. Thus the presence of a critical audience should improve the driving of a highly experienced driver, but impair that of the novice driver, since the latter would suffer from attentional overload whereas the former has spare attentional capacity which can be devoted to considering the audience's reaction to the task performance.

This model of social facilitation naturally needs to be tested, and two research strategies are suggested in this connection. First, the impact of audience presence on the performance of 'overlearned' tasks and complex, novel tasks should be investigated, in order to establish whether the effects observed with such tasks are more reliable and more sizeable than those obtained with tasks which vary merely with respect to the 'dominance' of correct responses. As Baron *et al.* (1978) have noted, those studies of social facilitation within the drive theory tradition which have reported significant interactions between task type and audience presence have not typically found significant simple effects. Secondly, the impact of audience presence upon task performance should be compared with the impact of non-social distractors. To the extent that non-social distractors produce effects analogous to those resulting from audience presence, an attentional capacity model would seem to provide a more parsimonious explanation of social facilitation effects than does drive theory. However, there is one problem with this last point. Baron and his colleagues (Sanders & Baron, 1975; Baron *et al.*, 1978; Sanders *et al.*, 1978) have recently been developing and testing a 'distraction-conflict theory' of social facilitation which shares with the present model the idea that audience presence is attention-demanding, but which goes on to argue that the 'attentional conflict' thereby produced gives rise to drive, which in turn mediates social facilitation effects. Distraction-conflict theory does not therefore supplant drive theory, but seeks rather to specify in attentional terms the antecedents of drive. Baron and his colleagues have already reported findings which support an attentional modification to drive theory, but acknowledge (Baron *et al.*, 1978, p. 823) that attentional overload may be responsible for their findings. Whether their distraction-conflict modification of drive theory or the present non-drive model provides a more satisfactory account of social facilitation phenomena must remain an open question, pending further experimentation. If performance improvements can be shown to ensue from the focusing of attention on tasks which are typically performed automatically, then a non-drive explanation of audience effects would seem to be preferable, since performance impairment can certainly be explained in terms of attentional overload, without recourse to the concept of drive.

To conclude, a model of social facilitation phenomena has been outlined which seeks to distinguish between the beneficial and detrimental effects of evaluative observation on task performance, and to account for these two effects in terms of different underlying processes. In the case of 'overlearned' tasks, audience presence (among other factors) is thought to improve performance by focusing attention on the task being performed; in the case of novel and/or complex tasks, audience presence (among other factors) is thought to impair performance by making demands upon attention. This model helps to explain the absence of social facilitation effects in the present series of studies, without denying the obvious fact that audience presence can, under certain conditions, either improve or impair task performance. However, it does not resolve the apparent inconsistencies between the findings of the present studies and those of earlier studies employing similar or identical tasks.

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